FINAL ENVIRONMENTAL ASSESSMENT

Final Rule to Authorize the Incidental Take of Small Numbers of Pacific Walruses (*Odobenus rosmarus divergens*) and Polar Bears (*Ursus maritimus*) During Oil and Gas Industry Exploration Activities in the Chukchi Sea

DEPARTMENT OF THE INTERIOR
U.S. FISH AND WILDLIFE SERVICE

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EXECUTIVE SUMMARY

On January 31, 2012, the Alaska Oil and Gas Association (AOGA), on behalf of its members, and ConocoPhillips, Alaska, Inc. (CPAI), petitioned the U.S. Fish and Wildlife Service (Service) to promulgate regulations to allow the nonlethal incidental take of small numbers of walruses and polar bears in the Chukchi Sea and the adjacent western coast of Alaska. The AOGA requested for the regulations to be applicable to all persons conducting activities associated with oil and gas exploration for a period of five years, from June 11, 2013, to June 11, 2018. The information provided by the petitioners stated that projected oil and gas activities over this timeframe will be limited to exploration activities. Therefore, development and production activities were not considered in this assessment.

The Service is tasked with analyzing the impact that lawful oil and gas industry activities will have on polar bears and walruses during normal operating procedures. Prior to issuing regulations in response to the AOGA petition, the Service must evaluate the level of industrial activities, its associated potential impacts to walruses and polar bears, and the effects on the availability of these species for subsistence use.

The Service is promulgating regulations that authorize the incidental take of small numbers of Pacific walruses (*Odobenus rosmarus divergens*) and polar bears (*Ursus maritimus*) during oil and gas industry (Industry) exploration activities in the Chukchi Sea region (Alternative 2). Incidental Take Regulations (ITRs), issued under section 101(a)(5)(A) of the Marine Mammal Protection Act, allow for the incidental, but not intentional, take of small numbers of marine mammals by citizens engaged in a specified activity at specific geographical sites. The ITRs provide a mechanism for the Service to work with Industry to minimize the effects of industry activity on marine mammals through appropriate mitigation and monitoring measures, which provide important information on marine mammal distribution, movements and interactions with industry. The proposed regulations include: permissible methods of nonlethal taking; measures to ensure that Industry activities will have the least practicable adverse impact on the species and their habitat, and on the availability of these species for subsistence uses; and requirements for monitoring and reporting of any incidental takings which may occur to the Service. Upon issuance of final regulations, the Service can issue Letter(s) of Authorization (LOA[s]), upon request, for activities proposed to be conducted in accordance with the final regulations.

Tribal Consultation and Public Involvement

Tribal Consultation

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, and described later in this document, Industry applicants for an LOA will develop a communication plan. They 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, cooperative agreements have been completed by the Service, the Alaska Nanuuq Commission (ANC), the Eskimo Walrus Commission (EWC), and the Qayassiq Walrus Commission (QWC). 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. To help realize mutual management goals, the Service, ANC, and EWC regularly hold meetings to discuss future expectations and outline a shared vision of co-management.

The Service also has ongoing cooperative relationships with the North Slope Borough (NSB) and the Inupiat-Inuvialuit Joint Commission to manage the polar bear harvest in the Southern Beaufort Sea 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. Section VIII summarizes the Native organization the Service consulted regarding the petition by Industry.

Through these various interactions and partnerships we have determined that the issuance of these regulations is appropriate. We are open to discussing ways to continually to improve our coordination and information exchange, including through the LOA/POC process, as may be requested by Tribes.

Public Involvement

Prior to promulgating these ITRs, the Service published a proposed rule in the *Federal Register*. There was a comment period (January 9, 2013 to February 8, 2013) for all interested parties to submit comments contributing to the development of the final determination on ITRs for the Chukchi Sea. In addition, numerous agencies and organization have been notified of the petition to promulgate ITRs (Section VIII).

I. AUTHORITY

Section 101(a)(5)(A) of the Marine Mammal Protection Act of 1972 (MMPA), as amended (16 U.S.C. § 1371), 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 if the Service finds, based on the best scientific evidence available, that the total take 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, permissible methods of taking, and other means to ensure the least practicable adverse impact to 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. The regulations may also stipulate monitoring activities and reporting requirements to mitigate potential impacts to the species and subsistence hunting of those species. Service regulations [50 CFR § 18.27(f)] provide for the issuance of an LOA once specific regulations are in place to authorize activities under the provisions of these regulations. An LOA can only be issued to citizens of the United States.

Definitions of key terms used in the proposed regulation are listed below. Additional definitions can be found in 50 CFR Part 18.

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

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.

Small numbers: is defined in the regulations (50 CFR 18.27); however, we do not rely on that definition here as it conflates the “small numbers” and “negligible impact” requirements, which we recognize as two separate and distinct requirements for promulgating ITRs under the MMPA. Instead, in our small numbers determination, we evaluate whether the numbers of marine mammals likely to be taken by the activity are small relative to the overall population.

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

Harass: (for non-military readiness activities), any act of pursuit, torment, or annoyance that: i) has the potential to injure a marine mammal or marine mammal stock in the wild; or ii) has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering.

II. PROPOSED ACTION

A. Introduction

This Environmental Assessment (EA) has been prepared to implement provisions of the National Environmental Policy Act of 1969 (NEPA) [42 U.S.C. § 4321 *et cetera*]. The action being considered under NEPA is whether issuance of regulations authorizing the incidental taking of small numbers of Pacific walruses (*Odobenus rosmarus divergens*) and polar bears (*Ursus maritimus*) during oil and gas exploration activities in the Chukchi Sea is, or is not, a major Federal action. A positive finding would require the development of an Environmental Impact Statement (EIS).

It is important to note that the issuance of ITRs does not authorize the actual activities associated with oil and gas exploration. It is also important to note that this document is not evaluating the potential impacts of oil and gas exploration activities on Pacific walruses and polar bears. Rather, this EA evaluates the potential impacts of implementing regulations for the incidental take of Pacific walruses and polar bears in the Chukchi Sea region upon the two species and upon the subsistence use of these species. Furthermore, unlike the authorizations for Industry activities issued by other agencies, ITRs are issued for a specific length of time; in this case, a period of five years. This EA will be used to determine if the action (the implementation of Incidental Take Regulations for a period of five years) will have significant impacts, and provide information to inform the decision on whether or not to issue regulations authorizing the incidental take of Pacific walruses and polar bears.

In Alaska, Industry activities occurring in Federal waters and on Federal lands are permitted by the Department of the Interior's (DOI) Bureau of Ocean Energy Management (BOEM) and the Bureau of Safety and Environmental Enforcement (BSEE), both formerly known as the Mineral Management Service (MMS), and the Bureau of Land Management (BLM). Activities on State lands are permitted by the State of Alaska. Regardless of whether an activity is on State, Federal, or privately owned property, a U.S. Army Corps of Engineers (USACE) permit also is required for work that occurs in waters of the U.S. (including wetlands).

The Service is responsible for the management of Pacific walruses and polar bears, species which are protected under the MMPA (16 U.S.C. § 1361 *et seq*.). Pacific walruses and polar bears also receive protection under the Endangered Species Act of 1973, as amended (ESA). The Pacific walrus was added to the list of candidates for listing under the ESA in 2011 (76 FR 7634; February 10, 2011), and the polar bear was listed as a threatened species in 2008 (73 FR 28212; May 15, 2008). Polar bears and pacific walruses are also protected under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) (27 U.S.T. 1087) under Appendix II and Appendix III, respectively.

B. Purpose and Need

Section 101 of the MMPA places a moratorium on the taking of marine mammals in U.S. waters; however, section 101(a)(5)(A) allows the incidental, but not intentional, taking of marine mammals upon request by a U.S. citizen provided that certain findings are made. Industry has expressed interest in exploring for oil and gas in the Chukchi Sea, an area which includes important habitat areas for Pacific walruses and polar bears. Thus, it is possible that while conducting legal activities in pursuit of oil and gas resources, Industry actions could result in the incidental take of walruses and polar bears by harassment.

On January 31, 2012, the Service was petitioned by AOGA on behalf of its members to promulgate regulations for non-lethal incidental take of small numbers of Pacific walruses and polar bears during oil and gas exploration activities in the Chukchi Sea for a period of five years from June 11, 2013, to June 11, 2018. The information provided by the petitioner indicates that projected oil and gas activities over this time frame will be limited to offshore exploration activities and onshore support facilities and projects. Development and production activities were not considered in the petition. The petitioners specifically requested that these regulations be issued for non-lethal take only. Industry has indicated that, through implementation of the mitigation measures described in their petition and developed with input from the Service, it is confident lethal take will not occur. Mitigation measures are described in detail below in Section VI of this document. All projected exploration activities described by the petitioner, as well as projections of reasonably foreseeable exploratory activities for the period June 11, 2013, to June 11, 2018, were considered in our analyses.

C. Location

The geographic area covered by the requested ITRs (hereafter referred to as the Chukchi Sea Region; Figure 1) encompasses all Chukchi Sea waters north and west of Point Hope (68°20’20” N, -166°50’40 W, BGN 1947) to the U.S. – Russia Convention Line of 1867, and west of a north-south line through Point Barrow (71°23’29” N, -156°28’30 W, BGN 1944), and up to 200 miles (~322 kilometers [km]) north of Point Barrow. The north-south line described through

Point Barrow is the western border of the geographic region of the Beaufort Sea incidental take regulations (76 FR 47010; August 3, 2011).

The region also includes coastal areas up to 25 miles (~40 km) inland from the coast between the western boundary of the south National Petroleum Reserve-Alaska (NPR-A) near Icy Cape (70°20’00”, - 148°12’00) and a north-south line through Point Barrow (71°23’29” N, -156°28’30 W, BGN 1944). This terrestrial region encompasses a portion of the Northwest and South Planning Areas of the NPR-A. Specific locations where oil and gas activity may occur within the geographic area of these regulations over the next five years will primarily be in the Lease Sale 193 area.

D. Description of Activities

As stated earlier, this EA evaluates the potential impacts of implementing regulations for the incidental take of Pacific walruses and polar bears in the Chukchi Sea Region upon the two species and upon the subsistence use of these species. The issuance of incidental take regulations does not authorize the actual activities associated with Industry exploration. This document does not attempt to comprehensively evaluate the potential impacts of Industry activities on Pacific walruses and polar bears. However, oil and gas activities that are anticipated and considered in our analysis of the ITRs are based upon information provided by AOGA for the timeframe of 2013 to 2018. It also includes additional similar activities that were defined during our analysis. A detailed description of Industry activities can be found in the petition (http://alaska.fws.gov/fisheries/mmm/Chukchi_Sea/Petitions/AOGA%20Chukchi%20Sea%20IT

R%20Petition.pdf) and the proposed rule (78 FR 1944-19480). They are also provided in Attachment 1 of this document. Briefly, these activities include:

Offshore Activities

Exploratory drilling, seismic surveys, geotechnical surveys, and shallow hazards surveys will be conducted in the Chukchi Sea from June 11, 2013, to June 11, 2018. This time period contains the entire open water seasons of 2013 to 2017 but, terminates before the start of the 2018 open water season.

Three to eight exploratory wells are estimated to be drilled per year by multiple operators in the Chukchi Sea Region. The number of wells is not necessarily reflective of the number of exploration drilling programs or drilling units. All wells will be drilled offshore during the open water season from self-contained drilling units on current lease holdings on the Outer Continental Shelf (OCS). Seismic surveys, geotechnical surveys, and shallow hazards surveys may all be conducted in any given year. Ice gouge surveys will likely be conducted each year of the specified period (except 2018), with surveys being conducted up to 3,100 mi (5,000 km) in length annually. Strudel scour surveys and other types of bathymetric surveys will also be conducted (in Alaska State waters only). Geotechnical studies will be conducted in conjunction with some of these offshore bathymetric surveys.

Various environmental studies will take place during 2013 to 2018, mostly related to the offshore exploration activities. These surveys may include physical oceanography studies (temperature, salinity, ocean acidification, currents, ice movements), sedimentation and water quality studies, ecological studies (plankton, benthos, fish, seabird, and marine mammal communities), acoustical studies (to characterize ambient and industrial sounds and to record vocalizations of marine mammals), and meteorology.

Onshore Activities

No exploration drilling, seismic surveys, or shallow hazard surveys are expected onshore in the Chukchi Sea Region. Onshore geotechnical surveys and environmental studies are expected to be conducted each year. Most geotechnical surveys will be conducted in the winter. Environmental studies will likely be conducted in spring, summer, or fall.

E. Scope of Analysis

Industry has requested the Service provide incidental take authorization under the MMPA. When the public proposes to conduct a specific activity requiring authorization from a Federal agency, the agency shall establish the scope of the analysis under NEPA. The purpose of establishing the scope of analysis is to address impacts of the specific activities requiring Service authorization, as well as those portions of the entire project over which the Service may have sufficient control and responsibility to warrant a more comprehensive review.

It is important to note that by analyzing incidental take of marine mammals by Industry activities the Service does not authorize the Industry activities *per se*, but rather the Service's role under the MMPA is to determine if incidental take should be allowed during the course of Industry conducting otherwise lawful activities during the five-year period of the ITRs. The Service has concluded that there is limited Service control and responsibility associated with the Industry exploration activities themselves. Consequently, the scope of analysis for this proposed action (promulgating regulations) will be limited primarily to analyzing impacts related to the proposed Industry activities that include: 1) marine streamer 3D and 2D seismic surveys (vessels, airgun arrays and support from helicopters); 2) high resolution site clearance surveys (vessels, airgun arrays); 3) offshore drilling operations (vessels, drilling on seafloor, ice breakers, air support (helicopter); 4) onshore geotechnical surveys; 5) onshore environmental surveys; and 6) related infrastructure (ice roads, Rolligon trails, airfields, support vehicles and equipment, and barging of equipment). Other related impacts of the proposed activity not within the scope, or a direct product of Service authorization, will be summarized and/or identified in the cumulative effects section of this document.

III. ALTERNATIVES CONSIDERED

A. Alternative 1: No Action

The no action alternative for this EA results in no ITRs being issued. The moratorium and prohibitions on the taking of marine mammals imposed by the MMPA prohibits Industry from "taking" marine mammals, including incidental taking. Therefore, no mitigation to minimize the effects of Industry activities on walruses and polar bears, monitoring, or reporting would be required. Under this alternative, takings that could occur incidental to oil and gas activities would be subject to prohibitions found in the MMPA, and Industry will be liable for penalties should a take occur.

B. Alternative 2 (Preferred Alternative): Issuance of Five Year Incidental Take Regulations with General Mitigation Measures and Additional Requirements

The preferred alternative is to promulgate ITRs, which will authorize incidental take of small numbers of Pacific walruses and polar bears associated with Industry activities in the Chukchi Sea and adjacent Alaska coast. The intent of the preferred alternative is to provide the petitioners an overall “umbrella” set of guidelines that, when followed, allow for the incidental, but not intentional, take of small numbers of Pacific walruses and polar bears during Industry exploration activities. Once final regulations promulgated, Industry may apply for an LOA for activities described in the regulations. Each LOA will include all of the general mitigation measures (as described in Section VI), as well as specify additional mitigation requirements, if necessary, that are tailored to the specific activity proposed by Industry. Additional mitigation measures in individual LOAs will be evaluated on a case-by-case basis to afford additional protection to sensitive areas, such as areas being used by feeding walruses. These regulations do not allow the intentional taking of polar bears or Pacific walruses.

C. Alternatives Not Considered Feasible or Practicable

Alternatives that the Service considered, but determined were not feasible, included: initiating an Incidental Harassment Authorization (IHA) program, separating Industry operations by the type of activity (drilling or seismic surveys), the location of activities (offshore or onshore), the timing of the activity (open water or ice covered), and promulgating separate rules for each type of activity.

In contrast to the “umbrella guidelines” type of authorization provided by a five-year ITR, an IHA, which is valid for no more than one year, entails issuing individual authorizations for specific activities on a year-to-year basis. 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 in the area. The IHA process has limitations in that authorizations are issued on a piecemeal basis (project by project), and consequently they generally do not provide for the comprehensive coverage necessary to evaluate potential impacts from the various onshore and offshore Industry activities that may encounter walruses and polar bears over a five-year period. While an IHA program is possible, it is not practical and the Service concludes that promulgating a five-year ITR, is a more thorough process for evaluating anticipated activities and potential impacts holistically, as well as a more efficient use of staff time. Similar reasoning was used to evaluate alternatives that included separating Industry operations by type of activity or by 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 from all anticipated activities to be covered by the specific regulations. The applicant's anticipated taking from its own activities is only one factor to consider; the total takings expected from all persons conducting the activities to be covered by the regulations must be considered. Our analysis indicate that separating Industry operations, however it might be accomplished, is not a viable alternative as we cannot separate, exclude, or exempt specific activities and make a "total taking" negligible finding.

IV. AFFECTED ENVIRONMENT

A. Physical Environment

The physical environment associated with this EA consists of the geographic, oceanographic, and climatic attributes of the Chukchi Sea and adjacent coast of Alaska and are described in detail in the BOEM Chukchi Sea EIS for Lease Sale 193 at, *http://www.boem.gov/uploadedFiles/BOEM/About_BOEM/BOEM_Regions/Alaska_Region/Environment/Environmental_Analysis/2007-026-Vol%20I.pdf* and the Chukchi Sea Final Supplemental EIS, Chukchi Sea Planning Area, Oil and Gas Lease Sale 193 at, *http://www.boem.gov/About-BOEM/BOEM-Regions/Alaska-Region/Environment/Environmental-Analysis/OCS-EIS/EA-BOEMRE-2011-041.aspx*.

The regional climate of polar bear habitat west and north of Alaska is typical of the Arctic zone, where weather extremes are common and climate influences the geographic features (Truett and Johnson 2000). Summers are short in duration, with continuous daylight, where average summer temperatures range between 40^{o} to 60^{o} F (~5^{o} to 15^{o} C). During the summer the ground thaws to a depth of 12 to 16 inches (in) (~30 to 40 centimeters [cm]), and the landscape is dominated by wetlands. Winters are dark and cold, and last eight to nine months. January is usually the coldest month of winter when average temperatures range between -4^{o} to -76^{o} F - (~20^{o} and -60^{o}C) (Truett and Johnson 2000). Annual precipitation is low and averages 5 to 7 in (~13 to 18 cm), usually in the form of snow (Truett and Johnson 2000). Surface winds are common throughout the year and result in wind chill factors well below the actual temperature.

The Alaska coast west and south of Barrow to Point Hope is dominated by nearly continuous sea cliffs up to 40 feet (ft) high (12 meters [m]) that expose permafrost layers below the tundra. Some stretches of coastline possess relatively narrow beaches below the cliffs. Some areas possess offshore barrier islands along the coast that enclose shallow lagoons. The Arctic coastal plain is primarily flat near the coast with numerous lakes and streams. Coastal terrain gradually increases in relief to the south towards the foothills of the Brooks Range.

The Chukchi Sea environment can be divided into three separate dynamic conditions based upon seasonal variations:

Summer (open water). The open water season usually begins in late June and is characterized by warming temperatures and stream runoff. 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 area is 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 and September.

Broken ice. The broken ice period is that time 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 Chukchi Sea begin with freeze up and an increase in the amount of sea ice. The ice reaches a maximum thickness of approximately 6.5 ft (~2 m) by March and April. The thickness of sea ice is highly variable. New ice formed in a given year is typically thinner than older multi-year ice. There are considerable variations from year to year. The edge of the pack ice in September, when sea ice is at or close to its seasonal minimum extent, can be anywhere from a dozen to hundreds of miles (dozens to hundreds of km) offshore (Labelle *et al.* 1983). In recent years, however, the sea ice has exhibited record lows in extent, forming later in fall and retreating earlier in summer (NSIDC, 2012)**.** From November through May, ice covers nearly all of the Chukchi Sea. The winter sea ice regime can be divided into three distinct zones: landfast, 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 shallow water up to approximately 45 feet deep (~13.71 m), but by late winter may extend to deeper water. Wind and water stress on floating sheets of ice results in deformation and displacement of ice. Ice deformations take the form of ridges and rubble fields. As winter progresses, displacements and deformations 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, as the name indicates, is a region of dynamic interaction between the stable landfast ice and the moving ice of the pack ice zone. This interaction in the shear zone results in the formation of ridges and leads. Leads are channels of open water through areas of ice, which provide habitat for marine mammals.

Pack ice. The pack ice zone lies seaward of the shear zone, and includes both first year (new) ice and multi-year (old) ice. The first year ice that forms in the fractures, leads, and polynyas (large areas of open water surrounded by ice) varies in thickness from less than 1 inch (2.54 cm) to greater than a few feet (few meters). Multi-year ice is ice that has persisted for more than a year. The interactions between ice of various types, ages, and thicknesses driven by wind and currents create deformed ice, known as ice ridges. These ridges are usually about 3 to 6 feet in height (~1 to 1.8 m), but may reach heights of 20 feet (~ 6m).

B. Biological Environment

The biological environment associated with this EA in the Chukchi Sea includes the Pacific walrus population and polar bears from the Chukchi/Bering seas polar bear population (also referred as the Alaska-Chukotka polar bear population), one of the 19 sub-populations of polar bears world-wide. The term stock is defined in the MMPA as “a group of marine mammals of the same species or smaller taxa in a common spatial arrangement, that interbreed when mature” and may be used interchangeably here with the term, “sub-population” or “population,” for polar bears and with the term, “population,” for Pacific walruses.

Pacific walrus (*Odobenus rosmarus divergens*)

The Pacific walrus is the largest pinniped species (aquatic carnivorous mammals with all four limbs modified into flippers) in the Arctic. Walruses are readily distinguished from other Arctic pinnipeds by their enlarged upper canine teeth, which form prominent tusks. Males, which have relatively larger tusks than females, also tend to have broader skulls (Fay 1982).

Two modern subspecies of walruses are generally recognized (Wozencraft 2005, p. 525; ITIS, 2010): the Atlantic walrus (*O. r. rosmarus*), which ranges from the central Canadian Arctic eastward to the Kara Sea (Reeves 1978) and the Pacific walrus (*O. r. divergens*), which ranges across the Bering and Chukchi seas (Fay 1982). The small, geographically isolated population of walruses in the Laptev Sea (Heptner *et al.* 1976; Vishnevskaia and Bychkov 1990; Andersen *et al.* 1998; Wozencraft 2005; Jefferson *et al.* 2008) which was previously known as the Laptev walrus (Lindqvist *et al.* 2009) is now considered part of the Pacific walrus population. Atlantic and Pacific walruses are genetically and morphologically distinct from each other (Cronin *et al.* 1994), likely because of range fragmentation and differentiation during glacial phases of extensive Arctic sea ice cover (Harington 2008).

<u>Stock Definition, Range, and Abundance</u>

Pacific walrus are represented by a single stock of animals that inhabit the shallow continental shelf waters of the Bering and Chukchi seas (Sease and Chapman 1988). Though some heterogeneity in the populations has been documented by Jay *et al.* (2008) from differences in the ratio of trace elements in the teeth, Scribner *et al.* (1997) found no difference in mitochondrial and nuclear DNA among Pacific walruses sampled from different breeding areas. The population ranges across the international boundaries of the United States and Russian Federation, and both nations share common interests with respect to the conservation and management of this species (Figure 2). Pacific walruses are identified and managed in the United States and the Russian Federation as a single population (USFWS 2010a).

Pacific walruses range across the continental shelf waters of the northern Bering Sea and Chukchi Sea, relying principally on broken pack ice habitat to access feeding areas of high benthic productivity (Fay 1982). Pacific walruses migrate up to 932 mi (1,500 km) between summer foraging areas in the Arctic (primarily the offshore continental shelf of the Chukchi Sea) and highly productive, seasonally ice covered waters in the sub-Arctic (northern Bering Sea) in winter. Although many adult male Pacific walruses remain in the Bering Sea during the ice free season where they forage from coastal haulouts, most of the population migrates north in summer and south in winter following seasonal patterns of ice advance and retreat. Walruses are rarely spotted south of the Aleutian Archipelago; however, migrant animals (mostly males) are occasionally reported in the North Pacific. Pacific walruses are presently identified and managed as a single panmictic population (USFWS 2010a).

Fossil evidence suggests that walruses occurred in the northwest Pacific during the last glacial maximum (20,000 years before present) with specimens recovered as far south as northern California (Gingras *et al.* 2007; Harrington 2008). More recently, commercial harvest records indicate that Pacific walruses were hunted along the southern coast of the Russian Federation in the Sea of Okhotsk and near Unimak Pass (Aleutian Islands) and the Shumigan Islands (Alaska Peninsula) of Alaska during the 17^{th} Century (Elliott 1882).

Pacific walruses are highly mobile, and their distribution varies markedly in response to seasonal and annual variations in sea ice cover. During the January to March breeding season, walruses congregate in the Bering Sea pack ice in areas where open leads (fractures in sea ice caused by wind drift or ocean currents), polynyas (enclosed areas of unfrozen water surrounded by ice), or thin ice allow access to water (Fay 1982; Fay *et al.* 1984). The specific location of winter breeding aggregations varies annually depending upon the distribution and extent of ice. Breeding aggregations have been reported southwest of St. Lawrence Island, Alaska; south of Nunivak Island, Alaska; and south of the Chukotka Peninsula in the Gulf of Anadyr, Russian Federation (Fay 1982; Mymrin *et al.* 1990; Figure 1 in Garlich-Miller *et al.* 2011a).

In spring, as the Bering Sea pack ice deteriorates, most of the population migrates northward through the Bering Strait to summer feeding areas over the continental shelf in the Chukchi Sea. However, several thousand animals, primarily adult males, remain in the Bering Sea during the summer months, foraging from coastal haulouts in the Gulf of Anadyr, Russian Federation, and in Bristol Bay, Alaska (Figure 1 in Garlich-Miller *et al.* 2011a).

Summer distributions (both males and females) in the Chukchi Sea vary annually, depending upon the extent of sea ice. When broken sea ice is abundant, walruses are typically found in patchy aggregations over continental shelf waters. Individual groups may range from less than 10 to more than 1,000 animals (Gilbert 1999; Ray *et al.* 2006). Summer concentrations have been reported in loose pack ice off the northwestern coast of Alaska, between Icy Cape and Point Barrow, and along the coast of Chukotka, Russian Federation, and Wrangel Island (Fay 1982; Gilbert *et al.* 1992; Belikov *et al.* 1996). In years of low ice concentrations in the Chukchi Sea, some animals range east of Point Barrow into the Beaufort Sea; walruses have also been observed in the Eastern Siberian Sea in late summer (Fay 1982; Belikov *et al.* 1996). The pack ice of the Chukchi Sea usually reaches its minimum extent in September. In years when the sea ice retreats north beyond the continental shelf, walruses congregate in large numbers (up to several tens of thousands of animals in some locations) at terrestrial haulouts on Wrangel Island and other sites along the northern coast of the Chukotka Peninsula, Russian Federation, and northwestern Alaska (Fay 1982; Belikov *et al.* 1996; Kochnev 2004; Ovsyanikov *et al.* 2007; Kavry *et al.* 2008; MacCracken 2012).

In late September and October, walruses that summered in the Chukchi Sea typically begin moving south in advance of the developing sea ice. Satellite telemetry data indicate that male walruses that summered at coastal haulouts in the Bering Sea also begin to move northward towards winter breeding areas in November (Jay and Hills 2005). The male walruses' northward movement appears to be driven primarily by the presence of females at that time of year (Freitas *et al.* 2009).

<u>Distribution in the Chukchi Sea</u>

During the summer months, walruses are widely distributed across the shallow continental shelf waters of the Chukchi Sea. Significant summer concentrations include near Wrangel and Herald Islands in Russian waters and at Hanna Shoal (northwest of Point Barrow) in United States waters (Jay *et al.* 2012). As the ice edge advances southward in the fall, walruses reverse their migration and re-group on the Bering Sea pack ice.

The distribution of walruses in the eastern Chukchi Sea where exploration activities will occur is influenced primarily by the distribution and extent of seasonal pack ice. In June and July, scattered groups of walruses are typically found in loose pack ice habitats between Icy Cape and Point Barrow (Fay 1982; Gilbert *et al.* 1992). Recent telemetry studies investigating foraging patterns in the eastern Chukchi Sea suggest that many walruses focus foraging efforts near Hanna Shoal, northwest of Point Barrow (Jay *et al.* 2012). In August and September, concentrations of animals tend to be in areas of unconsolidated pack ice, usually within 62 mi (~100 km) of the leading edge of the ice pack (Gilbert 1999). Individual groups occupying unconsolidated pack ice typically range from less than 10 to more than 1,000 animals. (Gilbert 1999; Ray *et al.* 2006). In August and September, the edge of the pack ice generally retreats northward to about 71° N latitude, however in light ice years, the edge can retreat north beyond the continental shelf (Douglas 2010). Sea ice normally reaches its minimum (northern) extent sometime in September, and ice begins to reform rapidly in October and November. Walruses typically migrate out of the eastern Chukchi Sea in October in advance of the developing sea ice (Fay 1982; Jay *et al.* 2012).

<u>Hanna Shoal Walrus Use Area</u>

Hanna Shoal is a region of the northeastern Chukchi Sea of shallow water and moderate to high benthic productivity (Grebmeier *et al.* 2006, Dunton 2013) that is important to many species of wildlife, including the Pacific walrus. Walruses forage in the region from June-October, at times reaching numbers of tens of thousands of animals (Brueggeman et al. 1989, 1990; MacCracken 2012; Jay *et al.* 2012). The Hanna Shoal region has been defined variably in different technical and scientific documents, based on different attributes such as: bathymetry, currents, sea ice dynamics, benthic productivity, animal use patterns, and other administrative considerations. For example, the Audubon Society (Smith 2011) defined Hanna Shoal based on bathymetry, delineating an area of approximately 5,700 km^2 (2,200 mi^2). The National Marine Fisheries Service (NMFS; 2013) defined Hanna Shoal as an area of high biological productivity and a feeding area for various marine mammals, including bearded and ringed seals. Their maps delineate an area of approximately 3,041 mi^2. The BOEM Environmental Studies Program reflects both a Hanna Shoal Regional Study Area and a Hanna Shoal Core Study Area of about 720,000 km^2 (278,000 mi^2) and 150,000 km^2 (58,000 mi^2), respectively (BOEM 2012). For the purposes of this EA (and the ITRs), the Service is delineating the Hanna Shoal region by use patterns of Pacific walruses, hereinafter referred to as the Hanna Shoal Walrus Use Area (HSWUA), and further described below.

The Hanna Shoal region has long been recognized as a critical foraging area for the Pacific walrus in summer and fall (Brueggeman *et al.* 1989, 1990; MacCracken 2012; Jay *et al.* 2012), and we delineated the HSWUA using walrus foraging and occupancy utilization distributions (UDs) from Jay *et al.* (2012) for the months of June through September (see Figure 2). Jay *et al.* (2012) used walrus satellite telemetry from the Chukchi Sea to delineate UDs of walrus foraging and occupancy during summer and fall from 2008 to 2011. The UDs described in Jay *et al.* (2012) represent the probability of animals using an area during the time specified. Utilization distributions are a commonly accepted way to delineate areas of concentrated use by a species and the 50% UD is often identified as the core use area or area of most concentrated use in many habitat use studies (Samuel *et al.* 1985; Powell 2000; Laver and Kelley 2008). We consider the combined 50% foraging and occupancy UDs from Jay *et al.* (2012) at Hanna Shoal from June to September to represent the core use area during the time of most concentrated use by walruses; and therefore the most appropriate way to delineate the Hanna Shoal region as it pertains to walrus.

To delineate the HSWUA, we overlaid the 50% UDs for both foraging and occupancy in Jay *et al.* (2012) in the Hanna Shoal area, as defined bathymetrically by Smith (2011), for the months of June through September. The combined exterior boundary of those 50% UDs produced two adjacent polygons, one on the north slope of the bathymetrically defined shoal and one on the south slope of the bathymetrically defined shoal. We recognize that animals using those two polygons would be frequently crossing back and forth between these polygons, and therefore joined the two polygons at the closest point on the west and east ends. The final HSWAU totals approximately 24,600 km^2 (9,500 mi^2) (Figure 2) and can be viewed at: http://alaska.fws.gov/fisheries/mmm/pdf/itr_fr2013_pb_pw.pdf.

We believe that it is critical to minimize disturbance to walruses in this area of highly concentrated use during July through September. Due to the large numbers of walruses that could be encountered in the HSWUA from July through September, the Service has determined that additional mitigation measures, such as seasonal restrictions, reduced vessel traffic, or rerouting vessels, may be necessary for activities within the HSWUA to minimize potential disturbance and ensure consistency with the MMPA mandates that only small numbers of walruses be affected with a negligible impact on the stock. On a case-by-case basis, as individual LOA applications are received, we will examine the proposed activities in light of the boundaries of the HSWUA, the nature and timing of the proposed activities, and other available information at the time. If the Service determines that the proposed activity is likely to negatively impact more than small numbers of walruses, we will consider whether additional mitigation and monitoring measures, could reduce any potential impacts to meet the small numbers and negligible impact standards. The Service will make those determinations on a case by case basis.

Population Status

The size of the Pacific walrus population has never been known with certainty. Based on large sustained harvests in the 18th and 19th centuries, Fay (1982) speculated that the pre-exploitation population was represented by a minimum of 200,000 animals. Since that time, population size is believed to have fluctuated in response to varying levels of human exploitation. Large scale commercial harvests are believed to have reduced the population to 50,000 to 100,000 animals by the mid-1950s (Fay *et al.* 1997). The population apparently increased rapidly in size during the 1960s and 1970s in response to harvest regulations that limited the take of females (Fay *et al.* 1989). Between 1975 and 1990, visual aerial surveys jointly conducted by the United States and Soviet Union at 5-year intervals produced population estimates ranging from 201,039 to 246,360 (Table 1). Efforts to survey the Pacific walrus population were suspended by both countries after 1990, due to unresolved problems with survey methods that produced population estimates with unknown bias and unknown, but presumably large, variances that severely limited their utility (Speckman *et al.* 2010).

In 2006, a joint United States - Russian Federation survey was conducted in the pack ice of the Bering Sea, using thermal imaging systems to detect walruses hauled out on sea ice and satellite transmitters were utilized to account for walruses in the water (Speckman *et al.* 2010). The number of walruses within the surveyed area was estimated at 129,000, with a 95 percent confidence interval of 55,000 to 507,000 individuals. This is a conservative minimum estimate, as weather conditions forced termination of the survey before much of the southwest Bering Sea was surveyed; animals were observed in that region as the surveyors returned to Anchorage, Alaska. Table 1 provides a summary of survey results.

Table 1. Estimates of Pacific walrus population size, 1975 to 2006.

Year	Population size [a] (95% confidence interval)	Reference
1975	214,687 (–20,000 to 480,000)[b]	Udevitz *et al.* 2001
1980	246,360 (–20,000 to 540,000)	Johnson *et al.* 1982; Fedoseev 1984
1985	242,366 (–20,000 to 510,000)	Udevitz *et al.* 2001
1990	201,039 (–19,000 to 460,000)	Gilbert *et al.* 1992
2006	129,000 (55,000 to 507,000)	Speckman *et al.* 2010

[a]due to differences in methods, comparisons of estimates across years (population trends) are subject to several caveats and not reliable.

[b] 95 percent confidence intervals for 1975 to 1990 are from Figure 1 in Hills and Gilbert (1994).

These survey results suggest that the walrus population has declined; however, discrepancies among the survey methods and large confidence intervals that in some cases overlap zero do not support such a definitive conclusion. Resource managers in the Russian Federation have concluded that the population has declined and reduced harvest quotas in recent years accordingly (Kochnev 2004; 2005; 2010, pers. comm.), based in part on the lower abundance estimate generated from the 2006 survey. However, past survey results are not directly comparable due to differences in survey methods, timing of surveys, segments of the population surveyed, and incomplete coverage of areas where walruses may have been present (Fay *et al.*

1997); thus, these results do not provide a basis for determining trends in population size (Hills and Gilbert 1994; Gilbert 1999). Whether prior estimates are biased low or high is unknown, because of problems with detecting individual animals on ice or land, and in open water, and difficulties counting animals in large, dense groups (Speckman *et al.* 2010). In addition, no survey has ever been completed within a time frame that could account for the redistribution of individuals (leading to double counting or undercounting), or before weather conditions either delayed the effort or completely terminated the survey before the entire area of potentially occupied habitat had been covered (Speckman *et al.* 2010). Due to these problems, as well as seasonal differences among surveys (fall or spring) and technological advancements that correct for some problems, we do not believe the survey results provide a reliable basis for estimating a population trend.

Changes in the walrus population have also been investigated by examining changes in biological parameters over time. Based on evidence of changes in abundance, distributions, condition indices, pregnancy rates, and minimum breeding age, Fay *et al.* (1989) and Fay *et al.* (1997) concluded that the Pacific walrus population increased greatly in size during the 1960s and 1970s, and postulated that the population was near, or had exceeded the carrying capacity (K) of its environment by the early 1980s. We would expect the population to decline if K is exceeded. In addition, harvests increased in the 1980s: changes in the size, composition, and productivity of the sampled walrus harvest in the Bering Strait Region of Alaska over this time frame are consistent with this hypothesis (Garlich-Miller *et al.* 2006; MacCracken 2012). Harvest levels declined sharply in the early 1990s, and increased reproductive rates and earlier maturation in females occurred, suggesting that density dependent regulatory mechanisms had been relaxed and the population was likely below K (Garlich-Miller *et al.* 2006; MacCracken 2012). However, Garlich-Miller *et al.* (2006) also noted that there are no data concerning the trend in abundance of the walrus population or the status of its prey to verify this hypothesis, and that whether density dependent changes in life history parameters might have been mediated by changes in population abundance or changes in the carrying capacity of the environment is unknown.

Habitat

The Pacific walrus is an ice dependent species that relies on sea ice for many aspects of its life history. Unlike other pinnipeds, walruses are not adapted for a pelagic existence and must haul out on ice or land regularly. Floating pack ice serves as a substrate for resting between feeding dives (Ray *et al.* 2006), breeding behavior (Fay *et al.* 1984), giving birth (Fay 1982), and nursing and care of young (Kelly 2001). Sea ice provides access to offshore feeding areas over the continental shelf of the Bering and Chukchi seas, passive transportation to new feeding areas (Richard 1990; Ray *et al.* 2006), and isolation from terrestrial predators (Richard 1990; Kochnev 2004; Ovsyanikov *et al.* 2007). Sea ice provides an extensive substrate upon which the risk of predation and hunting is greatly reduced (Kelly 2001; Fay 1982).

Sea ice in the Northern Hemisphere is comprised of first year sea ice that formed in the most recent autumn/winter period, and multi-year ice that has survived at least one summer melt season. Sea ice habitats for walruses include openings, or leads, that provide access to the water and to food resources. Walruses generally do not use multi-year ice or highly compacted first year ice in which there is an absence of persistent leads or polynyas (Richard 1990). Expansive areas of heavy ice cover are thought to play a restrictive role in walrus distributions across the Arctic and serve as a barrier to the mixing of populations (Fay 1982; Dyke *et al.* 1999; Harington 2008). Walruses generally do not occur farther south than the maximum extent of the winter pack ice, possibly due to their reliance on sea ice for breeding and rearing young (Fay *et al.* 1984) and isolation from terrestrial predators (Kochnev 2004; Ovsyanikov *et al.* 2007), or because of the higher densities of benthic invertebrates in northern waters (Grebmeier *et al.* 2006).

Walruses may utilize ice that is greater than ~8 in (20 cm), but generally require ice thicknesses of 20 in (~50 cm) or more to support their weight, and are not found in areas of extensive, unbroken ice (Fay 1982; Richard 1990). Thus, in winter they concentrate in areas of broken pack ice associated with divergent ice flow or along the margins of persistent polynyas (Burns *et al.* 1981; Fay *et al.* 1984; Richard 1990) in areas with abundant food resources (Ray *et al.* 2006). Females with young generally spend the summer months in pack ice habitats of the Chukchi Sea. Some authors have suggested that the size and topography of individual ice floes are important features in the selection of ice haulouts, noting that some animals have been observed returning to the same ice floe between feeding bouts (Ray *et al.* 2006). Conversely, walruses can and will exploit a broad range of ice types and ice concentrations in order to stay in preferred foraging or breeding areas (Freitas *et al.* 2009; Jay *et al.* 2010a; Ray *et al.* 2010). Walruses tend to make shorter foraging excursions when they are using sea ice rather than land haulouts (Udevitz *et al.* 2009), suggesting that it is more energetically efficient for them to haulout on ice than forage from shore. Fay (1982) notes that several authors reported that when walruses had the choice of ice or land for a resting place, ice was always selected. However, walrus occupancy of an area can be somewhat independent of ice conditions. Many walruses will stay over productive feeding areas even to the point when the ice completely melts out. It appears that adult females and younger animals can remain at sea for a week or two before coming to shore to rest.

When suitable sea ice is not available walruses haul out on land to rest. A wide variety of substrates, ranging from sand to boulders, are used. Isolated islands, points, spits, and headlands are occupied most frequently. The primary consideration for a terrestrial haulout site appears to be isolation from disturbances and predators, although social factors, learned behavior, protection from strong winds and surf, and proximity to food resources also likely influence the choice of terrestrial haulout sites (Richard 1990). Walruses tend to use established haulout sites repeatedly and exhibit some degree of fidelity to these sites (Jay and Hills 2005), although the use of coastal haulouts appears to fluctuate over time, possibly due to localized prey depletion (Garlich-Miller and Jay 2000). Human disturbance is also thought to influence the choice of haulout sites; many historic haulouts in the Bering Sea were abandoned in the early 1900s when the Pacific walrus population was subjected to high levels of exploitation (Fay 1982; Fay *et al.* 1984).

Adult male walruses use land based haulouts more than females or young, and consequently, have a greater geographical distribution through the ice free season. Many adult males remain in the Bering Sea throughout the ice free season, making foraging trips from coastal haulouts in Bristol Bay, Alaska, and the Gulf of Anadyr, Russian Federation (Figure 1 in Garlich-Miller *et al.* 2011a), while females and juvenile animals generally stay with the drifting ice pack throughout the year (Fay 1982). Females with dependent young may prefer sea ice habitats because coastal haulouts pose greater risk from trampling injuries and predation (Fay and Kelly 1980; Ovsyanikov *et al.* 1994; Kochnev 2004; Ovsyanikov *et al.* 2007; Kavry *et al.* 2008; Mulcahy *et al.* 2009). Females may also prefer sea ice habitats because they may have difficulty feeding while caring for a young calf that has limited swimming range (Cooper *et al.* 2006; Jay and Fischbach 2008).

The numbers of male walruses using coastal haulouts in the Bering Sea during the summer months, and the relative uses of different coastal haulout sites in the Bering Sea have varied over the past century. Harvest records indicate that walrus herds were once common at coastal haulouts along the Alaska Peninsula and the islands of northern Bristol Bay (Fay *et al.* 1984). By the early 1950s, most of the traditional haulout areas in the Southern Bering Sea had been abandoned, presumably due to hunting pressure. During the 1950s and 1960s, Round Island was the only regularly used haulout in Bristol Bay, Alaska. In 1960, the State of Alaska established the Walrus Islands State Game Sanctuary, which closed Round Island to hunting. Peak counts of walruses at Round Island increased from 1,000 to 2,000 animals in the late 1950s (Frost *et al.* 1983) to more than 10,000 animals in the early 1980s (Sell and Weiss 2010), but subsequently declined to 2,000 to 5,000 over the past decade (Sell and Weiss 2010). General observations indicate that declining walrus counts at Round Island may, in part, reflect a redistribution of animals to other coastal sites in the Bristol Bay region. For example, walruses have been observed increasingly regularly at the Cape Seniavin haulout on the Alaska Peninsula since the 1970s, and at Cape Pierce and Cape Newenham in northwest Bristol Bay since the early 1980s (Jay and Hills 2005; Winfree 2010; Figure 1 in Garlich-Miller *et al.* 2011a), and more recently at Hagemeister Island.

Traditional male summer haulouts along the Bering Sea coast of the Russian Federation include sites along the Kamchatka Peninsula, the Gulf of Anadyr (most notably Rudder and Meechkin spits), and Arakamchechen Island (Garlich-Miller and Jay 2000; Figure 1 in Garlich-Miller *et al.* 2011a). Walruses have not occupied several of the southernmost haulouts along the coast of Kamchatka in recent years, and the number of animals in the Gulf of Anadyr has also declined in recent years (Kochnev 2005). Factors influencing abundance at Bering Sea haulouts are poorly understood, but may include changes in prey densities near the haulouts, changes in population size, disturbance levels, and changing seasonal distributions (Jay and Hills 2005) (presumably mediated by sea ice coverage or temperature).

Historically, coastal haulouts along the Arctic (Chukchi Sea) coast have been used less consistently during the summer months than those in the Bering Sea because of the presence of pack ice for much of the year in the Chukchi Sea. Since the mid-1990s, reductions of summer sea ice coincided with a marked increase in the use of coastal haulouts along the Chukchi Sea coast of the Russian Federation during the summer months (Kochnev 2004; Kavry *et al.* 2008). Large, mixed (composed of various age and sex groups) herds of walruses, up to several tens of thousands of animals, began to use coastal haulouts on Wrangel Island, Russian Federation in the early 1990s, and several coastal haulouts along the northern Chukotka coastline of the Russian Federation have emerged in recent years, likely as a result of reductions in summer sea ice in the Chukchi Sea (Kochnev 2004; Ovsyanikov *et al.* 2007; Kavry *et al.* 2008; Figure 1 in Garlich-Miller *et al.* 2011a).

In 2007, 2009, 2010, and 2011, walruses were also observed hauling out in large numbers with mixed sex and age groups along the Chukchi Sea coast of Alaska in late August, September, and October (Thomas *et al.* 2009; USFWS 2010a, unpublished data; Garlich-Miller *et al.* 2011b; MacCracken 2012). Monitoring studies conducted in association with oil and gas exploration suggest that the use of coastal haulouts along the Arctic coast of Alaska during the summer months is dependent upon the availability of sea ice. For example, in 2006 and 2008, walruses foraging off the Chukchi Sea coast of Alaska remained with the ice pack over the continental shelf during the months of August, September, and October. However in 2007 and 2009, the pack ice retreated beyond the continental shelf and large numbers of walruses hauled out on land at several locations between Point Barrow and Cape Lisburne, Alaska (Ireland *et al.* 2009; Thomas *et al.* 2009; USFWS 2010a, unpublished data; Figure 1 in Garlich-Miller *et al.* 2011a), and in 2010 and 2011, at least 20,000 to 30,000 walruses were observed hauled out approximately 3 miles (4.8 km) north of the Native Village of Point Lay, Alaska (Garlich-Miller *et al.* 2011b).

Transitory coastal haulouts have also been reported in late fall (October to November) along the southern Chukchi Sea coast, coinciding with the southern migration. Mixed herds of walruses frequently come to shore to rest for a few days to weeks along the coast before continuing on their migration to the Bering Sea. Cape Lisburne, Alaska, and Capes Serdtse-Kamen’ and Dezhnev, Russian Federation, are the most consistently used haulouts in the Chukchi Sea at this time of year (Garlich-Miller and Jay 2000). Large mixed herds of walruses have also been reported in late fall and early winter at coastal haulouts in the northern Bering Sea at the Punuk Islands and Saint Lawrence Island, Alaska; Big Diomede Island, Russian Federation; and King

Island, Alaska, prior to the formation of sea ice in offshore breeding and feeding areas (Fay and Kelly 1980; Garlich-Miller and Jay 2000; Figure 1 in Garlich-Miller *et al.* 2011a).

Life History

Walruses are long lived animals with low rates of reproduction, much lower than other pinniped species. Walruses may live 35 to 40 years and some may remain reproductively active until relatively late in life (Garlich-Miller *et al.* 2006). Females give birth to one calf every 2 or more years. Breeding occurs between January and March in the pack ice of the Bering Sea. Calves are usually born in late April or May the following year during the northward migration from the Bering Sea to the Chukchi Sea. Calving areas in the Chukchi Sea extend from the Bering Strait to latitude 70°N (Fay *et al.* 1984).

At birth, walrus calves weigh approximately 143 pounds (lb) (65 kilograms [kg]) and 44.5 in are (113 cm) long (Fay 1982). Calves are capable of entering the water shortly after birth, but tend to haulout frequently, until their swimming ability and blubber layer are well developed. Females tend newborn calves closely and calves accompany their mother from birth until weaned after 2 years or more. Cows brood neonates to aid in their thermoregulation (Fay and Ray 1968), and carry them on their back or under their flipper while in the water (Gehnrich 1984). Females with newborns often join to form large "nursery herds" (Burns 1970). Summer distribution of females and young walruses is related to the movements of the pack ice relative to feeding areas.

After the first 7 years of life, the growth rate of female walruses declines rapidly, and they reach a maximum body size by approximately 10 years of age. Females reach sexual maturity at 4 to 9 years of age. Adult females can reach lengths of up to 9.8 ft (3 m) and weigh up to 2,425 lb (1,100 kg). Male walrus tend to grow faster and for a longer period than females. Males become fertile at 5 to 7 years of age; however, they are usually unable to compete for mates until they reach full adult body size at 15 to 16 years of age. Adult males can reach lengths of 11.5 ft (3.5 m) and can weigh more than 4,409 lb (~2,000 kg) (Fay 1982).

Behavior

Walruses are social and gregarious animals. They tend to travel in groups and haul out of the water to rest on ice or land in densely packed groups. On land or ice, in any season, walruses tend to lie in close physical contact with each other. Young animals often lie on top of adults. Group size can range from a few individuals up to several thousand animals (Gilbert 1999; Kastelein *et al.* 2002; Jefferson *et al.* 2008). At any time of the year, when groups are disturbed, stampedes from a haulout can result in injuries and mortalities. Calves and young animals are particularly vulnerable to trampling injuries (Fay 1980; Fay and Kelly 1980). The reaction of walruses to disturbance ranges from no reaction to escape into the water, depending on the circumstances (Fay *et al.* 1984). Many factors play into the severity of the response, including the age and sex of the animals, and the size and location of the group (on ice, in water, Fay *et al.* 1984). Females with calves appear to be most sensitive to disturbance, and animals on shore are more sensitive than those on ice (Fay *et al.* 1984). A fright response caused by disturbance can cause stampedes on a haulout, resulting in injuries and mortalities (Fay and Kelly 1980).

Mating occurs primarily in January and February in broken pack ice habitat in the Bering Sea. Breeding bulls follow herds of females and compete for access to groups of females hauled out onto sea ice. Males perform visual and acoustical displays in the water to attract females and defend a breeding territory. Sub-dominant males remain on the periphery of these aggregations and apparently do not display. Intruders into display areas are met with threat displays and physical attacks. Individual females leave the resting herd to join a male in the water where copulation occurs (Fay *et al.* 1984; Sjare and Stirling 1996).

The social bond between the mother and calf is very strong, and it is unusual for a cow to become separated from her calf (Fay 1982). The calf normally remains with its mother for at least 2 years, sometimes longer, if not supplanted by a new calf (Fay 1982). After separation from their mother, young females tend to remain with groups of adult females, whereas young males gradually separate from the females and begin to associate with groups of other males. Walruses appear to base their individual social status on a combination of body size, tusk size, and aggressiveness. Individuals do not necessarily associate with the same group of animals and must continually reaffirm their social status in each new aggregation (Fay 1982; NAMMCO 2004).

Walruses produce a variety of sounds (barks, knocks, grunts, rasps, clicks, whistles, contact calls, etc.; Miller 1985; Stirling *et al.* 1987) which range in frequency from 0.1 to 4000 Hertz (Hz) (Miller 1985; Richardson *et al.* 1995). Airborne vocalizations accompany nearly every social interaction that occurs on land or ice (Miller 1985; Charrier *et al.* 2011) and facilitates kin recognition, male breeding displays, recognition of conspecifics, and female mate choice (Insley *et al.*2003; Charrier *et al.* 2011). Miller (1985) indicated that barks and other calls were used to promote group cohesion and prompted herd members to attend to young distressed animals. Walruses also vocalize extensively while underwater which has been used to track movements, study behavior, and infer relative abundance (Stirling *et al.* 1983; Hannay *et al.* 2012, Mouy *et al.* 2012). The purposes of underwater vocalizations are not explicitly known but are associated with breeding (Ray and Watkins 1975; Stirling *et al.* 1987; Sjare *et al.* 2003), swimming, and diving (Hannay *et al.* 2012). Stirling *et al.* (1987) suggested that variation among individuals in stereotyped underwater calls may be used to identify individuals. Mouy *et al.* (2012) opined that knocks made while diving may be used to locate the bottom and identify bottom substrates associated with prey. Underwater vocalizations may also be used to communicate with other walruses.

Because of walrus grouping behavior, all vocal communications occur within a short distance (Miller 1985). Walrus' underwater vocalizations can be detected for only a few miles (few kilometers) (Mouy *et al.* 2012) and likely do not act as long distance communication.

<u>Prey</u>

Walruses consume mostly benthic (region at the bottom of a body of water) invertebrates and are highly adapted to obtain bivalves (Fay 1982; Bowen and Siniff 1999; Born *et al.* 2003; Dehn *et al.* 2007; Boveng *et al.* 2008; Sheffield and Grebmeier 2009). Fish and other vertebrates have occasionally been found in their stomachs (Fay 1982; Sheffield and Grebmeier 2009). Walruses root in the bottom sediment with their muzzles and use their whiskers to locate prey items. They use their fore flippers, nose, and jets of water to extract prey buried up to 12.6 in (32 cm) (Fay

1982; Oliver *et al.* 1983; Kastelein 2002; Levermann *et al.* 2003). The foraging behavior of walruses is thought to have a major impact on benthic communities in the Bering and Chukchi seas (Oliver *et al.* 1983; Klaus *et al.* 1990). Ray *et al.* (2006) estimate that walruses consume approximately 3 million metric tons (3,307 tons) of benthic biomass annually, and that the area affected by walrus foraging is in the order of thousands of square (sq) miles (thousands of sq km) annually. Consequently, walruses play a major role in benthic ecosystem structure and function, which Ray *et al.* (2006) suggested increased nutrient flux and productivity.

The earliest studies of food habits were based on examination of stomachs from walruses killed by hunters. These reports indicated that walruses were primarily feeding on bivalves (clams), and that non-bivalve prey was only incidentally ingested (Fay 1982; Sheffield *et al.* 2001). However, these early studies did not take into account the differential rate of digestion of prey items (Sheffield *et al.* 2001). Additional research indicates that stomach contents include over 100 taxa of benthic invertebrates from all major phyla (Fay 1982; Sheffield and Grebmeier 2009), and while bivalves remain the primary component, walruses are not adapted to a diet solely of clams. Other prey items have similar energetic benefits (Wacasey and Atkinson 1987). Based on analysis of the contents from fresh stomachs of Pacific walruses collected between 1975 and 1985 in the Bering Sea and Chukchi Sea, prey consumption likely reflects benthic invertebrate composition (Sheffield and Grebmeier 2009). Of the large number of different types of prey, statistically significant differences between males and females from the Bering Sea were found in the occurrence of only two prey items, and there were no statistically significant differences in results for males and females from the Chukchi Sea (Sheffield and Grebmeier 2009). Although these data are for Pacific walrus stomachs collected 25 to 35 years ago, we have no reason to believe there has been a change in the general pattern of prey use described here.

Walruses typically swallow invertebrates without shells in their entirety (Fay 1982). Walruses remove the soft parts of mollusks from their shells by suction, and discard the shells (Fay 1982). Born *et al.* (2003) reported that Atlantic walruses consumed an average of 53.2 bivalves (range 34 to 89) per dive. Based on caloric need and observations of captive walruses, walruses require approximately 64 to 174 lbs (29 to 74 kg) of food per day (Fay 1982). Adult males forage little during the breeding period (Fay 1982; Ray *et al.* 2006), while lactating females may eat two to three times that of non-pregnant, non-lactating females (Fay 1982). Calves up to 1 year of age depend primarily on their mother's milk (Fay 1982) and are gradually weaned in their second year (Fisher and Stewart 1997).

Although walruses are capable of diving to depths of more than 820 ft (250 m) (Born *et al. 2003*), they usually forage in waters of 262 ft (80 m) or less (Fay and Burns 1988, Born *et al.* 2003; Kovacs and Lydersen 2008), presumably because of higher productivity of their benthic foods in shallow waters (Fay and Burns 1988; Carey 1991; Jay *et al.* 2001; Grebmeier *et al.* 2006). Walruses make foraging trips from land or ice haulouts that range from a few hours up to several days and up to 60 mi (~100 km) (Jay *et al.* 2001; Born *et al.* 2003; Ray *et al.* 2006; Udevitz *et al.* 2009). Walruses tend to make shorter and more frequent foraging trips when sea ice is used as a foraging platform compared to terrestrial haulouts (Udevitz *et al.* 2009). Satellite telemetry data for walruses in the Bering Sea in April of 2004, 2005, and 2006 showed they spent an average of 46 hours in the water between resting bouts on ice, which averaged 9 hours

(Udevitz *et al.* 2009). Because females and young travel with the retreating pack ice in the spring and summer, they are passively transported northward over feeding grounds across the continental shelves of the Bering and Chukchi seas. Male walruses appear to have greater endurance than females, with foraging excursions from land haulouts that can last up to 142 hours (about 6 days) (Jay *et al.* 2001).

Mortality

Polar bears are known to prey on walrus calves, and killer whales (*Orcinus orca*) have been known to take all age classes of walruses. Predation levels are thought to be highest near terrestrial haulout sites where large aggregations of walruses can be found; however, few observations exist for offshore environs. Pacific walruses have been hunted by coastal Natives in Alaska and Chukotka for thousands of years. Exploitation of the Pacific walrus population by Europeans has also occurred in varying degrees since the late 17^{th} century. Currently only Native Alaskans and Chukotkans can hunt Pacific walruses to meet subsistence needs. The Service, in partnership with the EWC and the Association of Traditional Marine Mammal Hunters of Chukotka, administered subsistence harvest monitoring programs in Alaska and Chukotka in 2000 to 2005. Harvests from 2006 to 2010 averaged 4,854 walruses per year (Service, unpubl. data). These mortality estimates include corrections for under reported harvest and struck and lost animals.

Intra-specific trauma is also a known source of injury and mortality. Disturbance events can cause walruses to stampede into the water and have been known to result in hundreds to thousands of 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.

Polar bears (*Ursus maritimus*)

Population Definition and Range

Polar bears are circumpolar in their distribution in the Northern Hemisphere. 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 sub-populations, or stocks, occur in Alaska: the Chukchi/Bering Sea population (CS), and the Southern Beaufort Sea population (SBS). The Chukchi/Bering Sea sub-population is also referred to the Alaska-Chukotka population. This EA primarily discusses the CS population. A detailed description of the CS and SBS polar bear stocks can be found in the Polar Bear (*Ursus maritimus*) Stock Assessment Reports at, *http://alaska.fws.gov/fisheries/mmm/stock/final_sbs_polar_bear_sar.pdf* and *http://alaska.fws.gov/fisheries/mmm/stock/final_cbs_polar_bear_sar.pdf*. A summary of the CS polar bear population is described below.

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. The northeastern boundary of the CS population is near the Colville Delta in the central Beaufort Sea (Garner *et al*.1990; Amstrup 1995; Amstrup *et al*. 2005) and the western boundary is near the Kolyma River in northeastern Siberian. The population's southern boundary is determined by the extent of annual sea ice in the Bering Sea. It is important to note that the eastern boundary of the CS population constitutes a large overlap zone with bears in the SBS population (Amstrup *et al*. 2004). In this large overlap zone, roughly north of Barrow, Alaska, it is thought that polar bears are approximately 50 percent from the CS population and 50 percent from the SBS population (Amstrup *et al*. 2004; Obbard *et al*. 2010). Currently, capture based studies are being conducted by the Service in the U.S. portion of the Chukchi Sea to provide updated information on population delineation and habitat use.

Population Status

The global population estimate of polar bears is approximately 20,000 to 25,000 individuals (Obbard *et al*. 2010). Polar bears typically occur at low densities throughout their circumpolar range (DeMaster and Stirling 1981). The status of the CS population, which was believed to have increased after the level of harvest in the United States was reduced in 1972, subsequent to passage of the MMPA, is now uncertain (Obbard *et al.* 2010). Polar bears in the CS population are currently classified as depleted under the MMPA and listed as threatened under the ESA. It has been difficult to obtain a reliable population estimate for this population due to the vast and inaccessible nature of the habitat, movement of bears across international boundaries, logistical constraints of conducting studies in Russian Federation territory, and budget limitations (Amstrup and DeMaster 1988; Garner *et a*l. 1992; Garner *et al*. 1998; Evans *et al*. 2003). The CS population is currently estimated at 2,000 animals, based on extrapolation of aerial den surveys (Lunn *et al*. 2002). Past estimates of the population have been derived from observations of dens and aerial surveys (Chelintsev 1977; Stishov 1991a; Stishov 1991b; Stishov *et al*. 1991); however, these estimates have wide confidence intervals and are considered to be of little value for management and cannot be used to evaluate status and trends for this population.

Reliable estimates of population size based upon traditional wildlife research methods such as capture-recapture or aerial surveys are not available for this region, and measuring the population size remains a research challenge (Evans *et al.* 2003). Ongoing and new research studies in the U.S. and Russian Federation are aimed at monitoring population status via ecological indicators (recruitment rates and body condition) and reducing uncertainty associated with estimates of survival and population size.

<u>Habitat</u>

Polar bears depend on the sea-ice dominated ecosystem for survival. Polar bears of the Chukchi Sea are subject to the movements and coverage of the pack-ice and annual ice as they are dependent on the ice as a platform for hunting, feeding, and mating. Historically, polar bears of the Chukchi Sea have spent most of their time on the annual ice in near-shore, shallow waters over the productive continental shelf, which is associated with the shear zone and the active ice adjacent to the shear zone. Sea ice and food availability are two important factors affecting the distribution of polar bears and their use of habitat. During the ice-covered season, bears use the extent of the annual ice. The most extensive north–south movements of polar bears are associated with the spring and fall ice movement. For example, during the 2006 ice-covered season, six bears radio-collared in the Beaufort Sea were located in the Chukchi and Bering seas as far south as the 59^{o} latitude, which was the farthest extent of the annual ice during 2006. In addition, a small number of bears sometimes remain on the Russian and Alaskan coasts during the initial stages of ice retreat in the spring.

Polar bear distribution during the open-water season in the Chukchi Sea, where maximum open water occurs in September, is dependent upon the location of the ice edge as well. The summer ice pack can be quite disjointed and segments can be driven great distances by wind carrying polar bears with them. Recent telemetry movement data are lacking for bears in the Chukchi Sea; however, an increased trend by polar bears to use coastal habitats in the fall during open-water and freeze-up conditions has been noted by researchers since 1992. Recently, during the minimum sea ice extents, which occurred in 2005 and 2007, polar bears exhibited this coastal movement pattern as observations from Russian biologists and satellite telemetry data of bears in the Beaufort Sea indicated that bears were found on the sea ice or along the Chukotka coast during the open-water period.

Changes in sea ice are occurring in the Chukchi Sea as a result of climate change (USFWS 2010). With sea ice decrease scientists are observing effects of climate change on polar bear habitat such as, an increased amount of open water for longer periods, a reduction in the stable, multi-year ice, and a retraction of sea ice away from productive continental shelf areas (USFWS 2010). Polar bears using the Chukchi Sea are currently experiencing the initial effects of changes in the sea ice conditions (Rode et al. 2007; Regehr et al. 2007) and would be vulnerable to seasonal changes in sea ice that could limit their access to prey.

As a measure to protect polar bears and their habitat from the effects of climate change, the Service designated critical habitat for polar bear populations in the United States effective January 6, 2011 (75 FR 76086; December 7, 2010). Critical habitat identifies geographic areas that contain features essential for the conservation of a threatened or endangered species, and that may require special management or protection. On January 13, 2013 the U.S. District Court for the District of Alaska issued an order (*Alaska Oil and Gas Association 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. Though the final rule has been vacated, the Service still has an obligation to consider the potential impacts of industry activities upon polar bear habitat.

Life History

Polar bears are specially adapted for life in the arctic and are distributed throughout most ice-covered seas of the circumpolar Northern Hemisphere (Amstrup 2003). 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 most abundant near the shore in shallow water areas, and in other areas where currents and ocean upwelling increase marine productivity and maintain some open water during the ice-covered season (Stirling and Smith 1975; Stirling *et al.* 1981; Amstrup and DeMaster 1988; Stirling 1990; Stirling and Øritsland 1995; Stirling and Lunn 1997; Amstrup *et al.* 2000; Amstrup 2003). Over most of their range, polar bears remain on the sea ice year-round, or spend only short periods on land (Amstrup 2003).

Denning and Reproduction

Female polar bears without dependent cubs breed in the spring. Females can produce their first litter of cubs at five to six years of age (Stirling *et al*. 1976; Amstrup 2003). Pregnant females typically enter maternity dens from November through December, and the young are usually born in late December or early January (Lentfer and Hensel 1980; Amstrup 2003). Only pregnant females den for an extended period during the winter; other polar bears may excavate temporary dens to escape harsh winter conditions, but otherwise remain active year-round (Amstrup 2003). From one to three cubs, two being average, is born. The average reproductive interval for a polar bear is three to four years, and a female polar bear can produce about eight to ten cubs in her lifetime. In healthy populations, 50 to 60 percent of the cubs may survive through their first year of life after leaving the den (Amstrup 2003). In late March or early April, the female and cubs emerge from their den. Polar bears have extended maternal care and most dependent young remain with their mother for approximately two to three years (Amstrup 2003). If the mother moves young cubs from the den before they can walk or withstand the cold, mortality of the cubs may result. Therefore, it is thought that successful denning, birthing, and rearing activities require a relatively undisturbed environment. Amstrup (2003) observed that polar bear females in a den can display remarkable tolerance for a variety of human disturbance. Reductions to the population, whether through disturbance of denning, excessive mortality, or other mechanisms, could take a long time for polar bears to recover from due to their low reproductive potential, long reproductive interval, and small litter sizes.

Radio and satellite telemetry studies indicate that denning can occur in multi-year pack ice and on land. Recent studies of the SBS population indicate that the proportion of dens on pack ice have declined from approximately 60 percent from 1985 to 1994 to 40 percent from 1998 to 2004 (Fischbach *et al.* 2007). In Alaska, areas of maternal polar bear dens of both the CS and SBS stocks appear to be less concentrated than stocks located in Canada and the Russian Federation. Though variation in denning occurs among polar bears from various stocks, there are significant similarities. A common trait of polar bear denning habitat is topographic features that accumulate enough drifted snow for females to excavate a den (Amstrup 2003; Durner *et al.* 2003; Durner *et al.* 2006). Certain areas, such as barrier islands (linear features of low elevation land adjacent to the main coastline that are separated from the mainland by bodies of water), river bank drainages, much of the North Slope coastal plain, and coastal bluffs that occur at the interface of mainland and marine habitat, receive proportionally greater use for denning than other areas by bears from the SBS population (Durner *et al.* 2003; Durner *et al.* 2006). Maternal denning occurs on tundra bearing barrier islands along the Beaufort Sea and also in the large river deltas, such as those of the Colville and Canning Rivers. Denning in the CS population occurs primarily on Wrangel and Herald Islands, and on the Chukotka coast in the Russian Federation. Though maternal denning habitat is found on the western coast of Alaska, denning on land for the U.S. portion of the CS stock is not common.

<u>Prey</u>

Ringed seals (*Pusa hispida*) are the primary prey of polar bears in most areas. Bearded seals (*Erignathus barbatus*) are also common prey for polar bears in the CS population. Pacific walrus calves are hunted occasionally, and walrus carcasses are scavenged at haulouts where trampling occurs. Polar bears will occasionally feed on bowhead whale (*Balaena mysticetus*) carcasses opportunistically wherever they may wash ashore and on remains at Point Barrow, Cross, and Barter Islands, which are areas where bowhead whales are harvested for subsistence purposes. There are also reports of polar bears killing beluga whales (*Delphinapterus leucas*) trapped in the ice.

Utilization of sea ice is a vital component of polar bear predatory behavior. Polar bears use sea ice as a platform to hunt seals, travel, seek mates, and to rest, among other things. They may hunt along leads, polynyas, and other areas of open water associated with sea ice. Polar bears employ a diverse range of methods and tactics to hunt prey. They may wait motionless for extended periods of time at a seal breathing hole, or may use scent to locate a seal lair then break through the roof (seals excavate lairs in snow drifts on top of the ice). Polar bears may ambush seals along an ice edge from the ice or from the water. Polar bears also stalk seals hauled out on the ice during warmer weather in the spring. These are just few examples of the predatory methods of polar bears. The common factor is the presence of sea ice in order for polar bears to access prey. Due to changing sea ice conditions, the area and time period of open water and proportion of marginal ice has increased. On average, ice in the Chukchi Sea is melting sooner and retreating farther north each year, and re-forming later. The annual period of time that sea ice is over the shallow more productive waters of the continental shelf is diminishing. This may limit seal availability to polar bears, as the most productive areas for seals appear to be over the shallow waters of the continental shelf.

On December 28, 2012, NMFS issued a final determination to list the ringed and bearded ice seal populations (77 FR 76706 and 77 FR 76740, respectively) that exist in U.S. waters as threatened under the ESA. The loss of ice and snow cover were the most significant conservation concerns in regards to the ice seals, and NMFS concluded that sea ice and snow cover will likely further decrease in the foreseeable future resulting in population declines that threaten the survival of both seal populations.

Mortality

Natural causes of mortality among polar bears are not well understood (Amstrup 2003). Polar bears are long lived (up to 30 years in captivity), have no natural predators, except other polar bears, and do not appear prone to death by diseases or parasites (Amstrup 2003). Accidents and injuries incurred in the dynamic and harsh sea ice environment, injuries incurred while fighting other bears, starvation, usually during extreme youth or old age, freezing, also more common during extreme youth or old age, and drowning are all known natural causes of polar bear mortality (Derocher and Stirling 1996; Amstrup 2003). Cannibalism by adult males on cubs and other adult bears is also known to occur; however, it is not thought that this is a common or significant cause of mortality. After natural causes and old age, the most significant source of polar bear mortality is from humans hunting polar bears (Amstrup 2003). Other sources of polar bear mortality related to human activities, though few and very rare, include research activities, euthanasia of sick or injured bears, defense-of-life kills, and activities of the oil and gas industry (Brower *et al.* 2002).

Distribution and Abundance in the Chukchi Sea

Polar bears are common in the Chukchi Sea and their distribution is influenced by the movement of the seasonal pack ice. Polar bears in the Chukchi Sea migrate seasonally with the pack ice but are typically dispersed throughout the region anywhere sea ice and prey may be found (Garner *et al.* 1990, Amstrup 2003). The distance between the northern and southern extremes of the seasonal pack ice in the Chukchi/Bearing Seas is approximately 807 mi (~1,300 km). There may be, however, significant differences year to year. Sea ice throughout the Arctic is changing rapidly and dramatically due to climate change (Douglas 2010). In May and June, polar bears are likely to be encountered over relatively shallow continental shelf waters associated with ice as they move northward from the northern Bering Sea, through the Bering Strait into the southern Chukchi Sea. During the fall and early winter period polar bears are likely to be encountered in the Chukchi Sea during their southward migration in late October and November. Polar bears are dependent upon the sea ice for foraging, and the most productive areas seem to be near the ice edge, leads, or polynyas where the ocean depth is minimal (Durner *et al.* 2004). In addition, polar bears may be present along the shoreline in this area as they will opportunistically scavenge on marine mammal carcasses washed up along the shoreline (Kalxdorff and Fischbach 1998).

C. ESA listed species

Pacific walrus (*Odobenus rosmarus divergens*)

In 2008, the Service was petitioned to list the Pacific walrus as endangered or threatened under the ESA. In 2011, the Service determined that listing was warranted, but precluded due to higher priority species (76 FR 7634, February 10, 2011). The Pacific walrus is currently a candidate for listing and the Service is required to confer on any intra-agency action that is likely to jeopardize the continued existence of the species. In addition, other Federal agencies often request consultations on their actions that may impact candidate species. The Service agreed to either remove the Pacific walrus from the candidate list or propose to list the subspecies by 2017.

Polar bears (*Ursus maritimus*)

The polar bear was listed as threatened, range wide, under the ESA due to loss of sea ice habitat caused by climate change (73 FR 28212, May 15, 2008). Additional stressors evaluated during the listing included impacts from activities such as industrial operations, subsistence harvest, contaminants, shipping, and tourism. None of these factors were considered significant threats to the polar bear in comparison to sea ice loss, but minimizing effects from these activities could become increasingly important as polar bears face potential increasing impacts associated with habitat loss.

D. Socio-Economic Environment

The Alaska Native Communities most likely to be impacted by the proposed activities are Barrow, Wainwright, Point Lay, Point Hope, Kivalina, Kotzebue, Shishmaref, Little Diomede, Gambell, and Savoonga. However, all communities that harvest Pacific walruses or polar bears in the Chukchi Sea Region could indirectly be affected by Industry activities. Pacific walruses and polar bears are harvested by Alaska Natives for subsistence purposes. The harvest of these species plays an important role in the culture and economy of many villages throughout northern and western coastal Alaska. Walrus meat is consumed by humans while the ivory is used to manufacture traditional handicrafts. Polar bears are hunted primarily for their fur, which is used to manufacture cold weather clothing and handicrafts. Polar bear meat is also sometimes consumed.

An exemption under section 101(b) of 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 articles of handicrafts and clothing, as long as the harvest is not done in a wasteful manner. Under the terms of the MMPA there are no restrictions on the number, season, or ages of walruses that can be harvested in Alaska. International treaties limit subsistence take of polar bears. Additionally, and similar to the exemption under the MMPA, section 10(e) of the ESA allows for the continued harvest of species listed as threatened or endangered in Alaska for subsistence purposes.

The sale of hand-made clothing and handicrafts made of walrus or polar bear parts is an important source of income in these remote Alaska Native Communities. Fundamentally, the production of handicrafts is not a commercial activity, but rather a continuation and adaptation to a market economy of an ancient Alaska Native tradition of making and then bartering handicrafts and clothing for other needed items. 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).

The Service collects information on the subsistence harvest of Pacific walruses and polar bears in Alaska through the Walrus Harvest Monitor Program (WHMP) and the Marking, Tagging and Reporting Program (MTRP). The WHMP is an observer based program focused on the harvest of Pacific walruses from the St. Lawrence Island communities Gambell and Savoonga. The MTRP program is administered through a network of “taggers” employed in subsistence hunting communities. Under the MMPA, subsistence hunters must report harvested walruses and polar bears to MTRP taggers within 30 days of the harvest. Taggers also certify (tag) specified parts (ivory tusks for walruses, hide and skull for polar bears) to help control illegal take and trade. Harvest levels of polar bears and walruses can vary considerably between years, presumably in response to differences in animal distribution, sea ice conditions, and hunter effort.

In 2010, the Native Villages of Gambell and Savoonga adopted local ordinances that limit the number of walruses harvested to four and five per hunting trip, respectively, which likely influences the total number of animals harvested each year. No Chukchi Sea villages have adopted anything similar, but they harvest relatively few walruses. Information on subsistence harvests of walruses and polar bears in selected communities derived from MTRP harvest reports from 2007 to 2011 is summarized in Table 2.

Table 2. Number of Pacific walruses and polar bears harvested 2007 to 2011 in 12 Alaska communities, as reported through the U.S. Fish and Wildlife Service (USFWS) Marking, Tagging, and Reporting Program (MTRP).

	Pacific Walrus	Polar Bear
Barrow	24	49
Gambell	3069	9
Kivalina	4	3
Kotzebue	2	3
Little Diomede	166	14
Nome	24	1
Point Hope	25	51
Point Lay	10	2
Savoonga	2918	16
Shishmaref	52	6
Wainwright	71	4
Wales	41	5

Pacific walrus (*Odobenus rosmarus divergens*)

Barrow

Barrow is the northernmost community within the geographical region being considered. Most walrus hunting from Barrow occurs in June and July when the landfast ice breaks up and hunters can access walruses by boat as they migrate north on the retreating pack ice. Walrus hunters from Barrow sometimes range up to 60 mi (~100 km) from shore; however, most harvests reported through the MTRP have occurred within 30 miles (~50 km) of the community.

Wainwright

Wainwright hunters have typically harvested more walruses than other mainland coastal subsistence communities on the North Slope. Walruses are thought to represent approximately 40 percent of the communities' annual subsistence diet of marine mammals. Wainwright residents hunt walruses from June through August as the ice retreats northward. Walruses can be plentiful in the pack ice near the village this time of year. Most of the harvest from Wainwright occurs in June and July. Most walrus hunting is thought to occur within 20 miles (~35 km) of the community, in all seaward directions.

Point Hope

Point Hope hunters typically begin their walrus hunt in late May and early June as walruses migrate north into the Chukchi Sea. The sea ice is usually well off shore of Point Hope by July and does not bring animals back into the range of hunters until late August and September. Most of the reported walrus harvest at Point Hope occurs in the months of June and September. Point Hope harvest occurs mostly within 5 miles (~3.5 km) of the coast, or near coastal haulout sites at Cape Lisburne.

Point Lay

Point Lay walrus hunting peaks in June and July. Historically, harvests have occurred primarily within 40 mi (~65 km) north and south along the coast from Point Lay and approximately 30 mi (~50 km) offshore. Beginning in 2010, walruses started hauling out on the barrier island about 4 miles (~6.5km) north of Point Lay in August and remain there until late September to early October. This provides Point Lay hunters with new opportunities to harvest walrus and reports indicate that from two to five animals are harvested at that time of year. Hunters harvest during the early stages of haulout formation and as it begins to dissipate to avoid creating a disturbance resulting in a large stampede.

St. Lawrence Island

St. Lawrence Island is located in the Bering Sea south of the Bering Strait. The two communities on the island are Gambell, on western tip, and Savoonga on the north central shore. These two subsistence hunting communities account for the majority of the Pacific walrus harvest in Alaska. Most of the walrus harvest from Gambell and Savoonga takes place in the Spring, but some harvest also takes place in the fall and winter, depending on ice and weather conditions. Hunters from Gambell typically use areas north and east of the island while hunters from Savoonga traditionally utilize areas north, west and south of the island. St. Lawrence Island hunters will typically travel from 40 to 60 miles (~65 to 100 km), and as much as 90 miles (~150 km), out to sea to find walruses. The consumption of traditional subsistence foods, such as marine mammals, and the economic value of marine mammal parts, such as walrus ivory, is thought to be more significant in Gambell and Savoonga than in communities on the mainland coast of Alaska.

Polar bears (*Ursus maritimus*)

Polar bears are harvested by Alaska Natives for subsistence and handicraft purposes. This species plays an important role in the culture and economy of many villages throughout western and northern coastal Alaska, where the polar bear figures prominently in Alaska Native stories, art, traditions, and cultural activities. In these northern and western coastal Alaskan Native Villages, the taking and use of the polar bear is a fundamental part of Alaska Native Culture. For Alaska Natives engaged in subsistence uses, the very acts of hunting, fishing, and gathering, coupled with the seasonal cycle of these activities and the sharing and celebrations which accompany them, are intricately woven into the fabric of their social, psychological and religious life (Pungowiyi 2000).

Polar bears are hunted primarily for their fur, which is used to manufacture cold weather clothing and a wide variety of handicrafts. Alaska Natives sew parkas, hats, gloves, and footgear to keep them warm, and they make carvings and decorations for their homes, as gifts for their friends and relatives, or to supplement their income. The meat of the polar bear is also sometimes consumed.

<u>Polar Bear Harvest Patterns in Alaska</u>

Six communities (Barrow, Point Hope, Savoonga, Gambell, Little Diomede, and Wainwright) account for the majority of all polar bears harvested in Alaska.

The following summary is excerpted from the *Report of the Scientific working group to the US-Russian Federation Polar Bear Commission (May 2010)*, which describes the history of the polar bear harvest during the last century. A more detailed description can be found at: *http://alaska.fws.gov/fisheries/mmm/polarbear/bilateral.htm*.

> "Prior to the 20th century Alaska's polar bears were hunted primarily by Alaska Natives for subsistence purposes although commercial sales of hides occurred primarily as a result of Yankee whaling and arctic exploration ventures. During the 20th century polar bears were harvested for subsistence, handicrafts, and recreational sport hunting. Based on records of skins shipped from Alaska for 1925 to 1953, the estimated annual statewide harvest averaged 120 bears and this take was primarily by Native hunters. Recreational hunting by non-Native sport hunters using aircraft became popular from 1951 to 1972, increasing the statewide annual harvest to 150 during 1951 to 1960 and to 260 during 1960 to 1972 (Amstrup *et al*. 1986). During the late 1960s and 1970s the size of the Beaufort Sea population declined substantially (Amstrup *et al.* 1986) due to excessive sport harvest. Hunting by non-Natives was prohibited in 1973 when provisions of the Marine Mammal Protection Act (MMPA) went into effect. The prohibition of non-Native sport hunting led to a reduction in the annual harvest of polar bears from the Alaska-Chukotka population from 189 to about 50 bears per year for the period 1961 to 1972 and 80 to about 54 bears per year for the period 1973 to 1984 (Amstrup *et al.* 1986; Figure 1). According to Service harvest records, from 1980 through the present, harvest of the Alaska-Chukotka population in the U.S. portion has declined. Reasons for a decline in the Alaska native subsistence harvest are currently unknown, but are currently being investigated. Possible causes include decreased hunter

effort, decreased polar bear numbers, changes in polar bear distribution, and environmental conditions that make polar bears less available to hunters."

Polar bears are harvested throughout the calendar year, depending on availability. Hunters in western Alaska, from Point Lay to St. Lawrence Island, usually harvest bears in winter, since bears moving southward with the advancing pack ice are more available in those areas later in the season. The number of polar bears harvested from Barrow is thought to be influenced by sea ice conditions as well as the number of people engaged in subsistence activities. Most polar bear harvests reported by Barrow occurred in February and March. Polar bears are harvested from Wainwright throughout much of the year, with peak harvest reported in May and December within ten miles (~16 km) of the community. Polar bears are typically harvested from Point Hope from January to April within ten miles of the community; however, Point Hope hunters reported taking polar bears as far away as Cape Thompson and Cape Lisburne.

Although relatively few people are thought to hunt specifically for polar bears, those that do, hunt primarily between October and March. Polar bears are often harvested coincidentally with beluga and bowhead whale harvests. Hunting areas for polar bears overlap strongly with areas of bowhead subsistence hunting; particularly the area from Point Barrow south to Walakpa Lagoon where walrus and whale carcasses are known to concentrate polar bears.

Harvest Management of Polar Bears in Alaska

The Service works through existing co-management agreements with Alaska Natives to address future actions that affect polar bears and polar bear hunting. This includes working with the

ANC, the NSB and its Native-to-Native Agreement with the Inuvialiut Game Council of Canada (Beaufort Sea region), and the Bilateral Commission formed with The Russian Federation under the Agreement between the United States of America and the Russian Federation on the Conservation and Management of the Alaska-Chukotka Polar Bear Population.

The ANC was formed in 1994 to represent the villages in North and Northwest Alaska on matters concerning the conservation and sustainable subsistence use of the polar bear. The mission of ANC is to "conserve Nanuuq and the Arctic ecosystem for present and future generations of Arctic Alaska Natives." The tribal council of each member village has passed a resolution to become a member and to authorize the ANC to represent them on matters concerning the polar bear at regional and international levels. Fifteen villages are currently members: Barrow, Wainwright, Kotzebue, Nuiqsut, Savoonga, Kaktovik, Point Lay, Point Hope, Brevig Mission, Shishmaref, Gambell, King Island, Wales, Little Diomede, and Kivalina.

Polar bears harvested from the communities of Barrow, Nuiqsut, Kaktovik, Wainwright, and Atqasuk are currently considered part of the SBS population and thus are subject to the terms of the Inuvialuit-Inupiat Polar Bear Management Agreement (Inuvialuit-Inupiat Agreement).

The Inuvialuit-Inupiat Agreement establishes quotas and recommendations concerning protection of denning females, family groups, and methods of harvest. Adherence to the quota is voluntary in the United States, and it has generally been followed since implementation of the Inuvialuit-Inupiat Agreement (Brower *et al.* 2002). Under the Inuvialuit-Inupiat Agreement, quotas are recommended by technical advisors on the basis of estimates of population size and age specific estimates of survival and recruitment. The current quota of 70 total bears per year was established in July 2010, and represents a decrease from the previous quota of 80 total bears per year (Brower *et al.* 2002). The quota is allocated to Canadian Inuvialuit and to Alaskan Inupiat, with 35 bears each. The Inuvialuit-Inupiat Agreement and its quotas are voluntary between the Inupiat and Inuvialuit, and are not enforceable by any law or authority of the governments of the United States or Canada.

Until recently, the United States and Russian Federation have managed the shared CS polar bear population independently. Now, the U.S and Russian Federation are working jointly to manage and better understand polar bears in the CS population. On September 21, 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," signed in Washington, DC, on October 16, 2000 (Bilateral Agreement). The purpose of the Bilateral Agreement is to improve polar bear conservation, and to safeguard the cultural and traditional use of polar bears by Native peoples. The Bilateral Agreement identifies the active involvement of Native people and their organizations in the management of this polar bear population. The U.S.–Russian Federation Polar Bear Commission (Commission), which functions as the bilateral managing authority, consists of a Native and Federal representative of each country. The Commission is advised by a 16 member Scientific Working Group (SWG); including experts on ice habitat, bear ecology and population dynamics, and traditional ecological knowledge. At a meeting of the Commission from June 7 to June 10, 2010, in Anchorage, Alaska, the Commission determined that no more than 58 polar bears per year may be taken from the Alaska–Chukotka polar bear population, of which no more than 19 animals (1/3) may be females. The taking limit is to be split evenly between Native subsistence hunters in Alaska and Chukotka, Russian Federation. Further, the Commission determined that the countries will work together to identify legal requirements and documents needed to implement the determined subsistence harvest limit, and that further discussion regarding implementation of harvest management plans would take place at the next Commission meeting in 2011. At the Commission meeting in July 2011, the Commission, based on recommendations from its SWG, reaffirmed the total allowable harvest of 58 polar bears from the Alaska-Chukotka population, and approved a recommendation that a multi-year quota system be introduced for an initial period of five years, consistent with the terms of the Bilateral Agreement. The fourth meeting of the Commission took place on June 25 to 27, 2012, in Anchorage, Alaska, USA. Based on the recommendation of the SWG, the Commission agreed that no change is necessary to the sustainable harvest level identified in 2010. The Commission adopted a five-year sustainable harvest level of 290 (58 ×5), with no more than one third as female, with the requirements that the five-year sustainable harvest level be allocated over the five year period using methods recognized by the SWG as biologically sound, and that these methods include the identification of annual sustainable harvest levels, for consideration by the Commission in setting annual taking limits. This cooperative management regime for the subsistence harvest of bears is key to both providing for the long term viability of the population as well as addressing the social, cultural, and subsistence interests of Alaska Natives and the native people of Chukotka.

Other Socio-Economic Activities

Oil and Gas Development

In 2008, the BOEM/BSEE completed Lease Sale 193 in the Chukchi Sea in the Alaska OCS area. Of the 5,354 total tracts offered (29,389,241 acres [11,893,403.8 hectares]), leases for 487 tracts were issued (2,758,377 acres [1,116,275.5 hectares]) generating $2.7 billion in lease revenues. According to the 2011 BOEM *Offshore Arctic Assessment Results for the Beaufort and Chukchi Seas*, the Beaufort Sea and Chukchi Sea Planning Areas hold most of the undiscovered petroleum potential in the Alaska OCS. The 2011 BOEM report estimated that the Chukchi Sea Planning Area holds approximately 15.38 billion barrels (bbl) of oil and 76.77 trillion cubic feet (ft^3) (2.17 trillion cubic meters [m^3]) of natural gas. The report predicts that due to the slow pace of activity in the Chukchi Sea Planning Area any exploration in the next few years may result in production a decade or more in the future. Current and anticipated OCS lease sales by the BOEM make continued offshore exploration and development likely through the mid-21st century (*http://www.boem.gov/5-year/2012-2017/*).

Current and anticipated OCS lease sales by the BOEM/BSEE make continued offshore development likely through the mid-21st century (*http://www.boem.gov/5-year/2012-2017/*). Recent studies to evaluate and mitigate potential impacts of oil and gas activities on polar bears include hypothetical oil spill assessments (Amstrup *et al.* 2006), mapping of maternal denning habitat in areas likely to experience hydrocarbon development (Durner *et al.* 2006), the development of methods to detect maternal dens, using tools such as Forward Looking Infrared (FLIR) imagery and scent trained dogs (Shideler and Perham 2008; Shideler and Perham 2009), and evaluations of post den emergence behavior and sensitivity to disturbance (Smith *et al.* 2007).

To minimize the disturbance of Pacific walruses and polar bears by Industry activities, the Service manages the Incidental Take Program. The Service implements ITRs under section 101(a)(5)(A) of the MMPA. Currently, the oil and gas industry has been the only "citizen group" to request incidental take authorization for Pacific walruses and polar bears. The Service administers the Incidental Take Program through LOAs that enable Pacific walrus and polar bear managers to work with oil and gas industry operators to minimize impacts of their activities on Pacific walruses and polar bears, and to ensure that activities have no more than a negligible impact on populations. The Service evaluates LOAs with special attention to mitigating impacts to Pacific walruses and polar bears, such as limiting industrial activities around areas important for polar bear denning, feeding, resting, and seasonal movements.

Incidental take regulations have been issued since 1993 in the Beaufort Sea. Similarly, the Service has issued ITRs for certain activities associated with oil and gas exploration in the Chukchi Sea beginning in 1991. The ITRs extend for a five year period; the current regulatory period for the Beaufort Sea is 2011 to 2016 and for the Chukchi Sea is 2008 to 2013. The five-year regulatory period is to allow the Service (with public review) to periodically assess whether the level of activity continues to have no more than a negligible impact on polar bears and their availability for subsistence uses.

Transboundary Effects

On July 1, 1997, the Council on Environmental Quality 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 (U.S., the Russian Federation, Greenland, Norway, and Canada) as well and the reasonably foreseeable impacts the issuance of ITRs 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 Chukchi Sea. For this reason, our transboundary analysis focused on the CS polar bear stock and the Pacific walrus population, both shared with the Russian Federation, and the SBS stock, shared with Canada.

In 1973, the Polar Bear Range States signed the *International Agreement on the Conservation of Polar Bears* (1973 Polar Bear Agreement). The 1973 Polar Bear Agreement calls for cooperative international management of polar bear populations based on sound conservation practices. Additionally, the 1973 Polar Bear Agreement prohibits polar bear hunting except by local people using traditional methods, calls for protection of females and denning bears, and bans use of aircraft and large motorized vessels to hunt polar bears. The 1973 Polar Bear Agreement is not self-implementing; each signatory nation has its own national legislation to implement the Agreement's terms, including individual harvest management practices. Polar bear management by each respective Range State has been described in detail (Schliebe *et al.*, 2005).

Consistent with Article III of the 1973 Polar Bear Agreement, the Range States, including the U.S. and now 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 encourage appropriate deterrence techniques. We find that the issuance of ITRs 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 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 as there are for polar bears, U.S. researchers work with colleagues in the Russian Federation to increase our understanding of Pacific walrus population trends, subsistence uses and impacts, and, in the Russian Federation, commercial use of the sub-species. 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 four percent of the population) based on total population and productivity estimates. Russian quota recommendations have generally been two 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 since 2003, where the annual subsistence quota was 3,000 walruses per year, 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, ITRs 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 ITRs 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.

Tourism

Other socioeconomic activity centered on polar bears, such as ecotourism or wildlife viewing, has been increasing in Alaska, particularly within the federally managed Arctic National Wildlife Refuge, as well as on non-Federal lands near the Native communities of Barrow and Kaktovik. To date, polar bear related tourism has been occurring at a relatively low level with little Federal oversight or consistency among guides and guiding companies. In 2009, the Service initiated development of guidelines for commercial polar bear viewing within its Refuge lands and waters; these guidelines are being implemented through the refuge permit process as of 2010. Additionally, the Service has been working with local communities, air taxi operators, and guiding companies to develop similar community based viewing guidelines for non-Federal lands, to ensure that activities remain both legal (no disturbance to bears) and safe for residents, visitors, and polar bears.

V. 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 five-year ITRs for oil and gas exploration activities in the Chukchi Sea and alternatives to that proposed action are presented.

A. Alternative 1: No Action Alternative

If this alternative is implemented no ITRs will be issued. Consequently, any incidental takes resulting from the proposed oil and gas exploration activities will not be authorized and those takes will be a violation of the MMPA. However, because the ITRs do not explicitly permit or prohibit oil and gas activities, Industry could continue to conduct exploration activities as planned without the benefit of mitigation measures proposed by the Service. In that event, the Service would have no formal means of communicating with Industry or have the ability to require monitoring and mitigation of specific activities and any form of "take" would be a violation of the Act.

Since polar bears are designated as threatened under the ESA, a No Action Alternative would complicate section 7 consultations for Federal agencies permitting certain Industry activities. Currently, issuance of an LOA also fulfills the requirement for an ESA Incidental Take Statement (ITS) to be issued, where compliance with the terms and conditions of the LOA ensures that the LOA holder is also in compliance with the ESA. Without MMPA ITRs, the consultation process for Industry activities under section 7 of the ESA regarding polar bears and Pacific walruses could become a more burdensome and slower process.

B. Alternative 2 (Preferred Alternative): Issuance of Five-Year Incidental Take Regulations with General Mitigation Measures and Additional Requirements

Under this alternative, the Service will promulgate ITRs for a five-year period that will address the proposed oil and gas exploration activities outlined in the petition. 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 regulations set forth requirements pertaining to the monitoring and reporting of such taking.

Additionally, the general mitigation measures described in section VI will be implemented to minimize potential adverse impacts from the proposed exploration activities, as well as provide data to continually improve our ability to evaluate the effects on Pacific walruses, polar bears, and the subsistence use of these resources. The general mitigation measures provide an "umbrella" set of guidelines which, when followed, allow the specified Industry activities to proceed after the Service has assessed whether such activities will potentially have an unmitigable impact on subsistence use or more than a negligible impact on polar bears and Pacific walruses. The specific LOAs will also 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 important subsistence hunting areas. Any mitigation measures addressing impacts to marine mammals identified in MMPA ITRs will supplement and if necessary, supersede, any such related mitigation measures in the relevant BOEM/BSEE permit.

1. Potential Impacts on Marine Mammals

The issuance of ITRs will authorize the incidental, but not intentional, taking of marine mammals for a five-year period. The primary impact of the regulations will be to impose requirements pertaining to the monitoring and reporting of such taking and to implement the general mitigation measures described in section VI to minimize potential adverse impacts to marine mammals from the proposed Industry activities.

This section will discuss the major proposed Industry activities and their impacts to marine mammals and how the issuance of ITRs with general mitigation measures will minimize potential adverse impacts to marine mammals.

A thorough discussion of the impacts of Industry activities in the Chukchi Sea on marine mammals is found in the Chukchi Sea EIS at, *http://www.boem.gov/uploadedFiles/BOEM/About_BOEM/BOEM_Regions/Alaska_Region/Environment/Environmental_Analysis/2007-026-Vol%20I.pdf* and the Chukchi Sea Final Supplemental EIS, Chukchi Sea Planning Area, Oil and Gas Lease Sale 193 at, *http://www.boem.gov/About-BOEM/BOEM-Regions/Alaska-Region/Environment/Environmental-Analysis/OCS-EIS/EA-BOEMRE-2011-041.aspx*.

Pacific Walrus

The proposed oil and gas exploration activities for the Chukchi Sea Region could result in disturbances to walruses. Potential effects of disturbances on walruses include: Insufficient rest, increased stress and energy expenditure, interference with feeding, the masking of sounds for communication, and hypothermia in calves that spend too much time in the water. Prolonged or repeated disturbances could displace individuals or herds from preferred feeding or resting areas.

Disturbances events may cause walrus groups to abandon land or ice haulouts. Severe disturbance events occasionally result in trampling injuries or cow-calf separations, both of which are potentially fatal. Calves and young animals at the perimeter of the herds appear particularly vulnerable to trampling injuries. Noise generated from exploration activities could potentially obstruct migratory pathways and interfere with the free movements of animals.

The response of walruses to disturbance stimuli is highly variable. 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.

Based upon previous aerial survey efforts (Johnson *et al.* 1982; Gilbert 1989; Gilbert *et al.* 1992), and exploration monitoring programs (Brueggeman *et al.* 1991), walruses are expected to be closely associated with seasonal pack ice during the proposed operating season. Therefore, in evaluating potential impacts of exploration activities, broken pack ice may serve as a reasonable predictor of walrus distribution. Activities occurring in or near sea ice habitats are presumed to have the greatest potential for impacting walruses. However, beginning in 2007 a new pattern of walrus distribution and movements has emerged. In five of the last six years (2007 to 2012), ice in the Chukchi Sea has completely melted and the ice edge retreated north of the continental shelf in mid-August to early-September. Walruses in the northeastern Chukchi Sea initially disperse in all directions, presumably seeking ice to rest on. Some venture into Arctic Basin waters where it is too deep to feed, but soon return to shallower waters, and some move west toward Wrangel Island (Jay *et al.* 2012). Walruses remaining in the northeastern Chukchi Sea appear to congregate to the south and over the HSWUA where they remain for one or two weeks before heading for the Alaska coast. In 2007 and 2009, relatively small groups (less than 4,000 individuals) hauled out at several coastal sites, but in 2010 and 2011 very large groups (20,000 to 30,000) hauled out about 4 miles (~6.5 km) north of Point Lay on a barrier island. In 2011, a number of tagged walruses were tracked moving between the HSWUA and Point Lay (Jay *et al.* 2012). In addition, acoustic monitoring data from 2010 is consistent with walruses moving between Point Lay and the HSWUA (Delarue *et al.* 2011). Industry activities that disturb walruses resting at Point Lay (or any other haulout), interfere with walruses transiting from Point Lay to the HSWUA, and disturb walruses feeding at or near the HSWUA have the potential to negatively impact walruses.

<u>Seismic/Noise</u>

Hearing sensitivity is assumed to be within the 13 Hz to 1,200 Hz range of their own (walrus) vocalizations (Kastelein *et al.* 2002). Seismic operations are expected to introduce substantial levels of noise into the marine environment. There are relatively few data available to evaluate the potential response of walruses to seismic operations. Although the hearing sensitivity of walruses is poorly known, source levels associated with Marine 3D and 2D seismic surveys are thought to be high enough to cause temporary hearing loss in other pinniped species. Therefore, it is possible that walruses within the 180-decibel (dB) (dB re 1 μPa) zone around a seismic pulse could suffer shifts in hearing thresholds and temporary hearing loss (Kastak *et al.* 2005). Adoption of mitigation measures that include monitoring a 180 dB ensonification exclusion zone (circle around a seismic pulse) is expected to minimize the potential for air-gun pulses to injure walruses during seismic operations. The ensonification zones are a proxy for the amount of sound or seismic disturbance that would be considered to rise to the level of biologically significant disturbance, i.e., Level B take. Furthermore, seismic surveys and high resolution site clearance surveys occur primarily in open water conditions, and away from the pack ice. This will minimize their interactions with large concentrations of walruses utilizing sea ice habitats. However, many walruses could be encountered if activities during the latter half of the open water season occur near walruses on land, at or near the HSWUA, or in areas used by walruses moving from a coastal haulout to the HSWUA to feed. Data from previous seismic monitoring programs indicate that seismic surveys do interact with small numbers of walruses swimming in open water. Potential adverse effects of seismic noise on swimming walruses can be reduced through the implementation of sufficient, practicable monitoring coupled with the mitigation measures as required.

Consequently, with the adoption of mitigation measures as described in section VI, the Service concludes that the only effect anticipated would be short term behavioral alterations by a small number of walrus in the vicinity of the proposed project areas, which are largely to the west of walrus concentration areas. In addition, marine mammal monitoring programs are expected to provide some insight into the response of walruses to various seismic operations from which future mitigation measures can be developed. In the Hanna Shoal area, we can reliably predict that many walruses will likely remain even after the ice melts for foraging purposes. Because of this, Industry activities that occur near coastal haulouts, within the HSWUA, or intersect travel corridors between haulouts and the HSWUA may require close monitoring and additional special mitigation procedures, such as seasonal restrictions (e.g., July to September) of Industry activities from Hanna Shoal and rerouting vessel traffic and aircraft flights around walrus travel corridors.

Vessel/Aircraft Disturbance

The reaction of walruses to vessel traffic appears to be dependent upon vessel type, distance, speed, and previous exposure to disturbances. Underwater noise from vessel traffic in the Chukchi Sea could “mask” ordinary communication between individuals. Ice management operations are expected to have the greatest potential for disturbances since these operations typically require the vessel to accelerate, reverse direction, and turn rapidly thereby maximizing propeller cavitations and resulting noise levels. In addition, ice floes that threaten drilling operations may have to be intercepted and moved with a vessel and those floes could be occupied by resting walruses. The potential for disturbance events to result in animal injuries, mortalities, or cow-calf separations is also of concern, and potential injuries increase with the size of affected walrus aggregations.

Previous monitoring efforts suggest that icebreaking activities can displace some walrus groups up to several miles (km) away; however most groups of hauled out walruses showed little reaction beyond 0.5 mi (~805 m) (Brueggeman *et al.* 1990). In addition, monitoring data and observations by icebreaker operators suggest that most walruses will leave ice floes long before they reach drilling rigs or ice management vessels intercept a floe that has to be deflected or broken up. Environmental variables such as wind speed and direction are also thought to contribute to variability in a walrus’s ability to detect activities and how they respond.

Reactions of walruses to aircraft are thought to vary with aircraft type, range, and flight pattern, as well as the age, sex, and group size of exposed individuals. Fixed wing 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 wing aircraft above 1,500 ft (~457 m).

The physical presence of vessels and aircraft engaged in seismic surveys, drilling, and support activities could also result in the disturbance of animals via visual or other cues. The most likely response of walruses in open water to acoustic and visual cues will be for animals to move away from the source of the disturbance. Because of the transitory nature of the proposed seismic surveys, impacts to walruses exposed to seismic operations are expected to be temporary in nature. However, drilling operations are less transitory but are site specific and involve a much smaller area. Therefore, the only effect anticipated would be relatively short term or site limited behavioral alterations by a small number of walrus in the vicinity of a proposed project area.

Although seismic surveys and well drilling are expected to occur in areas of open water away from the pack ice, support vessels and/or aircraft servicing these operations may encounter aggregations of walruses in the water and hauled out on sea ice. The sight, sound or smell of humans and machines could potentially displace these animals from ice haulouts. However, because seismic operations are expected to move throughout the Chukchi Sea and drilling is localized, impacts associated with support vessels and aircrafts are likely to be distributed in time and confined to the most direct routes. Therefore, the only effect anticipated would be short term behavioral alterations by a small number of walrus in the vicinity of the proposed project area. Furthermore, adoption of mitigation measures that include a 0.5 mi (~805 m) exclusion zone for marine vessels and aircraft around walrus groups will reduce the intensity of disturbance events and minimize the potential for severe disturbance or injuries to animals.

Offshore Drilling/Human Disturbance

Walrus hunters and researchers have noted that walruses tend to react to the presence of humans and machines at greater distances from upwind approaches than from downwind approaches, suggesting that odor is also a stimulus for a flight response. The visual acuity of walruses is thought to be less than for other species of pinnipeds.

Drilling operations are expected to occur at several offshore locations. Drilling operations are expected to range between 30 and 90 days per well site. Although drilling activities are expected to occur primarily during open water conditions, the dynamic movements of sea ice could transport walruses within range of drilling operations. Drilling operations are expected to involve drill ships attended by icebreaking vessels to manage incursions of sea ice. The monitoring program associated with the exploratory drilling operation in the Chukchi Sea in 1990 noted that 25 percent of walrus groups encountered in the pack ice during icebreaking responded by diving into the water, with most reactions occurring within 0.6 mi (~1 km) of the ship. The monitoring report, 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. The report concluded that effects of the drilling operations on walruses and polar bears were limited in time, geographical scale, and the proportion of population affected (Brueggeman *et al.* 1991). It is noted that the distribution and abundance of walruses in the Chukchi Sea is poorly understood. Without knowledge of the relative importance of various habitat areas it is impossible to make precise predictions about the number of animals likely to be impacted by drilling operations. However, mitigation measures including: requirements for ice scouting; surveys for walruses in the vicinity of active drilling operations; requirements for marine mammal observers onboard drill ships and ice breakers; and operational restrictions near walrus aggregations will reduce potential interactions between walruses and drilling operations. Nonetheless, ice floes that threaten drilling operations may need to be moved by ice handling vessels. In the unlikely event that an ice floe is occupied by walruses that do not abandon the ice then intentional takes may be authorized by the Service under a separate provision of the MMPA. Given the observations of Brueggeman *et al.* (1991) we expect this to be a rare event and involve only small numbers of animals.

Drilling operations will be supported by supply vessels and/or helicopters. Support missions could encounter aggregations of walruses on sea ice along their transportation route. Because drilling operations are expected to last from 30 to 90 days at a single location, walruses in the vicinity of drilling operations could be subjected to prolonged or repeated disturbances, and the most likely response will be for them to abandon the area. However, with adoption of mitigation measures that include identifying a 0.5 mi (~805 m) operational exclusion zone around groups of hauled out walruses, as well as other measures described in section VI, disturbances to walruses will be minimized. In the event that a prospective drill site occurs near important habitat areas, additional monitoring and mitigation measures will be required.

<u>Oil/Fuel Spills</u>

The potential also exists for oil/fuel spills to occur from Industry activities and the subsequent impacts on walruses are a major concern. Little is known about the effects of either on walruses as no studies have been conducted. Adult walruses may not be severely affected by either through direct contact, but they will be extremely sensitive to any disturbances created by spill response activities. In addition, due to the gregarious nature of walruses, a release of contaminants would most likely affect multiple individuals if it occurred in an area occupied by walruses. Walruses may repeatedly expose themselves to waste or oil that has accumulated at the edge of a shoreline or ice lead as they enter and exit the water.

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 presents another threat to marine mammals. In studies conducted on pinnipeds, pulmonary hemorrhage, inflammation, congestion, and nerve damage resulted after exposure to concentrated hydrocarbon fumes for a period of 24 hours. If the 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.

Adult and sub-adult walruses have thick skin and blubber layers for insulation and very little hair. Thus, 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.

Walrus calves are most likely to suffer the most from the effects of oil contamination simply because juvenile animals are more susceptible. Walrus calves can swim almost immediately after birth and will often join their mother in the water, increasing their risk of being oiled. It is possible that an oiled calf will be unrecognizable to its mother either by sight or by smell, and be abandoned. However, the greater threat may come from an oiled calf that is unable to swim away from the contamination and a mother that would not leave without the calf, resulting in the potential exposure of both animals.

Walruses are benthic feeders, and the fate of benthic prey contaminated by an oil spill is difficult to predict. In general, benthic invertebrates preferred by walruses (bivalves, gastropods, and polychaetes) may either decline or increase as the result of a spill (Sanders *et al.* 1980; Jacobs 1980; Elmgren *et al.* 1983; Jewett *et al.* 1999). Impacts vary among spills and species within a spill, but in general, benthic communities move through several successive stages of temporal change until the communities approach pre-disturbance conditions (Dauvin 1998), which may take 20 years. Much of the benthic prey contaminated by an oil spill or gas release, such as methane, may be killed immediately. Bivalve mollusks, a favorite prey species of the walrus, are not effective at processing hydrocarbon compounds, resulting in highly concentrated accumulations and long-term retention of the contamination within the organism. In addition, because walruses feed primarily on mollusks, they may be highly vulnerable to a loss of this prey species. However, epifaunal bivalves were one of the benthic community classes that increased following the *Exxon Valdez* spill in Alaska (Jewett *et al.* 1999).

Depending on the location and timing, oil spills could impact walruses in a number of ways. An offshore spill during open water may only impact a few walruses swimming through the affected area. However, spilled oil present along ice edges and ice leads in fall or spring during formation or breakup of ice presents a greater risk because of both the difficulties associated with cleaning oil in mixed, broken ice, and the presence of wildlife in prime feeding areas over the Continental Shelf during this period. Oil spills impacting areas where walruses and polar bears are concentrated, such as along off-shore leads, polynyas, preferred feeding areas, and along terrestrial habitat used for denning or haul outs would affect more animals than spills in other areas.

The potential impacts to Pacific walruses from a spill could be significant, particularly if subsequent cleanup efforts were ineffective. These potential impacts would be greatest when walrus are aggregated at coastal haulouts. For example, walrus would be most vulnerable to the effects of an oil spill at coastal haulouts if the oil comes within 40 mi (~60 km) of the coast (Garlich-Miller *et al.* 2011a). Spilled oil during the ice-covered season not cleaned up could become part of the ice substrate and be eventually released back into the environment during the following open water season. During spring melt, oil would be collected by spill response activities, but it could eventually contact a limited number of walruses.

In the unlikely event there is an oil spill and walruses are in the same area, mitigation measures, especially those to deflect and deter animals from spilled areas, may minimize the associated risks. Fueling crews have personnel that are trained to handle operational spills and contain them. If a small offshore spill occurs, spill response vessels are stationed in close proximity and respond immediately. A detailed discussion of oil spill prevention and response for walruses can be found at the following website:
http://www.fws.gov/Contaminants/FWS_OSCP_05/FWSContingencyTOC.htm.

Although fuel and oil spills have the potential to cause adverse impacts to walruses and possibly some prey species, operational spills associated with the proposed exploration activities are not considered a major threat. Operational spills would likely be of a relatively small volume, and occur in areas of open water where walrus densities are expected to be relatively low. The BOEM/BSEE operating stipulations, including oil spill prevention and response plans, reduce both the risk and scale of potential spills. For these reasons, any impacts associated with an operational spill are expected to be limited to a small number of animals.

A well blowout has greater potential to impact walruses. Following the *Deepwater Horizon* accident, blowout prevention technology will be required for all exploratory drilling operations in the Chukchi Sea by the permitting agencies, and the BOEM/BSEE considers the likelihood of a blowout occurring during exploratory drilling in the Chukchi Sea as negligible (OCS EIS/EA

MMS 2007-026). In addition, oil companies are taking greater precautions to prevent and contain a release of oil. For example, Shell has built in redundancies (two well casing pinchers) in their blowout preventers, a well cap in place around the casing at the surface, a second relief well drilling vessel, and containment equipment.

With adoption of mitigation measures that require both oil spill prevention and response plans, both the risk and scale of potential spills would be reduced. Therefore, the Service concludes that any impacts in the unlikely event of an operational spill are expected to be limited to a small numbers of animals.

Polar Bears

Polar bear distribution in the Chukchi Sea is closely associated with the distribution and extent of sea ice. Industry activity in the geographic area of these ITRs will take place during the open water period when sea ice is absent or minimal. Polar bears will have a limited presence in areas associated with Industry activities during the open water period. Additionally, polar bears are more frequently located along the Chukotka coastline in the Russian Federation during this time. Thus, the probability of major impacts on polar bears from offshore Industry activities in the Alaskan portion of the Chukchi Sea during the open water period is limited. Although polar bears have been observed in open water, miles (kilometers) from the ice edge or ice floes, it is a relatively rare occurrence.

Nevertheless, polar bears will be present in the region of activity and, therefore, oil and gas activities could impact polar bears in various ways during both offshore and onshore activities.

Impacts from: (1) offshore activities; (2) onshore activities; (3) human encounters; (4) effects on prey species; and (5) polar bear habitat are described below.

1. Offshore Activities

In the open water season, Industry activities will be limited to vessel based exploration activities, such as exploratory drilling and seismic surveys. These activities avoid ice floes and the multi-year ice edge; however, they could contact a limited number of bears in open water and on ice floes.

A. Vessel Activities

Vessel based activities, including operational support vessels, such as barges, supply vessels, oil spill response, and ice management vessels, in the Chukchi Sea could affect polar bears in a number of ways. Seismic ships, icebreakers, or the drilling rig may become physical obstructions to polar bear movements, although these impacts would be short term and localized. Likewise, noise, sights, and scents produced by exploration activities could disrupt their natural behavior by repelling or attracting bears to human activities.

Polar bears are curious and tend to investigate novel sights, scents, and noises. If bears are present, noises produced by offshore activities could elicit several different responses in individual polar bears. Certain noises may act as a deterrent to bears entering the area of operation, or other noises could potentially attract curious bears.

In general, little is known about the potential for seismic survey sounds to cause auditory impairment or other physical effects in polar bears. Researchers have studied the hearing sensitivity of polar bears to understand how noise can affect polar bears, but additional research is necessary to understand the potential negative effects of noise (Nachtigall *et al.* 2007; Owen and Bowles 2011). Polar bears swim predominantly with their heads above the surface, where underwater noises are weak or undetectable, and this behavior may naturally limit noise exposure to polar bears. There is no evidence that airgun pulses can cause serious injury or death to bears, even in the case of large airgun arrays. Additionally, the planned monitoring and mitigation measures include shutdowns of the airguns, which will reduce any such effects that might otherwise occur if polar bears are observed in the ensonification zones. Thus, it is doubtful that any single bear would be exposed to strong underwater seismic sounds long enough for significant disturbance, such as an auditory injury, to occur.

Though polar bears are known to be extremely curious and may approach sounds and objects to investigate, data from monitoring reports suggest that they also move away from sources of noise and the sight of vessels, icebreakers, aircraft, and helicopters. The effects of retreating from vessels or aircraft may be minimal if the event is short and the animal is otherwise unstressed; for example, retreating from an active icebreaker may produce minimal effects for a healthy animal on a cool day; however, on a warm spring or summer day, a short run to avoid an icebreaker may be enough to overheat a well-insulated polar bear.

As already stated, polar bears spend the majority of their time on pack ice during the open water season in the Chukchi Sea or along the Chukotka coast, which limits the potential of impacts from human and Industry activities in the geographic region. In recent years, the Chukchi Sea pack ice has receded off the Continental Shelf during the open water season. Although this poses potential foraging ramifications, by its nature the exposed open water creates a barrier between the majority of ice pack bound bears and human activity occurring in open water, thereby limiting potential disturbance to the population.

Conversely, while open water can act as a barrier, bears traversing large expanses of open water may be in a stressed condition. Researchers have recently documented that bears occasionally swim long distances during the open water period seeking either ice or land (Pagano *et al.* 2012; Monnett and Gleason 2006). They suspect that the bears may not swim constantly, but find solitary icebergs or ice remnants to haulout on and rest. Long-distance swimming events by polar bears appear to be rising and highlights the ice free environment that bears are being increasingly exposed to which requires increased energy demands. In one study (between 2004 through 2009) researchers noted that 52 bears embarked on long distance swim events (Pagano *et al.* 2012). In addition, they documented 50 swims that had an average length of 96 miles (~150 km). Although they noted that long distance swim events are still uncommon, 38 percent of collared bears (females) took at least one long distance swim.

The majority of vessels, such as seismic boats and barges, associated with Industry activities travel in open water and avoid large ice floes. Some, such as ice management vessels, operate in close proximity to the ice edge and unconsolidated ice during open water activities. Vessel traffic could encounter an occasional bear swimming in the open water. However, the most likely habitat where bears will be encountered during the open water season is on the pack ice edge or on ice floes in open water. During baseline studies conducted in the Chukchi Sea between 2008 and 2010, 14 of 16 polar bears encountered by a research vessel were observed on the ice, while the remaining two bears were observed in the water swimming (USFWS unpublished data).

If there is an encounter between a vessel and a polar bear, it would most likely result in temporary behavioral disturbance only. In open water, vessel traffic could result in short term behavioral responses to swimming polar bears through ambient noise produced by the vessels, such as underwater propeller cavitation, or activities associated with them, such as on-board machinery, where bears would most likely swim away from the vessel. Indeed, observations from monitoring programs report that when bears are encountered in open water swimming, bears have been observed retreating from the vessel as it passes (USFWS unpublished data).

Polar bears could be encountered if a vessel is operating in ice or near ice floes, where the response of bears on ice to vessels is varied. Bears on ice have been observed retreating from vessels, exhibiting little reactions, such as a cessation in activity or turning their head to watch the vessel, and exhibiting no perceived reaction at all to the vessel. Bears have also been observed approaching vessels in the ice.

B. Aircraft

Routine, commercial aircraft traffic flying at high altitudes (approximately 10,000 to 30,000 feet (3,050 to 9,150 m) above ground level (AGL) appear to have little to no effect on polar bears; however, extensive or repeated over-flights of fixed wing aircraft or helicopters could disturb polar bears.   A minimum altitude requirement of 1,500 feet (~4575 m) for aircraft associated with Industry activity will help mitigate disturbance to polar bears. Behavioral reactions of polar bears are expected to be limited to short term changes in behavior that would have no long term impact on individuals and no identifiable impacts on the polar bear population.

In summary, while offshore, open water seismic exploration activities could encounter polar bears in the Chukchi Sea during the latter part of the operational period; it is unlikely that exploration activities or other geophysical survey activity during the open water season will result in more than temporary behavioral disturbance to polar bears. Disturbances will most likely be visual and auditory in nature, and likely result in non-injurious deflection of bears from ship routes and result in minimal disturbance to bears. Seismic surveys are unlikely to cause serious impacts to polar bear hearing. Polar bears dive infrequently and they normally swim with their heads above the water surface, where noise produced underwater is weakened or inaudible. Ice management activities in support of the drilling operation have the greatest potential to disturb bears by flushing bears off ice floes when moving ice out of the path of the drill rig; however, such disturbances will likely very short term resulting in negligible impact to bears.

Monitoring and mitigation measures required for open water, offshore activities will include, but will not be limited to: (1) a 0.5 mile (~800 m) operational exclusion zone around polar bear(s) on land, ice, or swimming; (2) Marine Mammal Observers (MMOs) on board all vessels; (3) requirements for ice scouting; (4) surveys for polar bears in the vicinity of active operations and ice breaking activities; and (5) operational restrictions near polar bear aggregations. These mitigation measures are expected to further reduce the potential for interactions between polar bears and offshore operations.

2. Onshore Activities

While no large exploratory programs, such as drilling or seismic surveys, are currently being developed for onshore sites in the Chukchi Sea geographic area, land based support facilities, maintenance of the Barrow Gas Fields, and onshore baseline studies may encounter bears. Bear-human interactions at onshore activities are expected to occur mainly during the fall and ice covered season when bears come ashore to feed, den, or travel. Noise produced by Industry activities during the open water and ice covered seasons could potentially result in takes of polar bears at onshore sites. Noise disturbance could originate from either stationary or mobile sources. Stationary sources include support facilities. Mobile sources can include vehicle and aircraft traffic in association with Industry activities, such as ice road construction. The effects for these sources are described below.

A. Noise

Noise produced by onshore Industry activities could elicit several different responses from polar bears. The noise may act as a deterrent to bears entering the area, or the noise could potentially attract bears. Noise attracting bears to Industry activities, especially activities in the coastal or nearshore environment, could result in bear-human interactions, which could result in unintentional harassment, deterrence (under a separate authorization), or lethal take of the bear. Unintentional harassment (attraction of a curious bear to the noise or a noise causing a bear to move away) would likely be infrequent, short term, and temporary. Deterrence by non-lethal harassment to move a bear away from humans would be much less likely, infrequent, short term, and temporary. Lethal take of a polar bear from bear-human interaction related to Industry activity is extremely unlikely.

During the ice covered season, noise from onshore activities, under certain conditions, could deter females from denning in the surrounding area, although some polar bears have been known to den in proximity to industrial noise sources. Only a minimal amount of denning by polar bears has been recorded on the western coast of Alaska; however, onshore activities could impact potential den habitat and den site selection if they were located near facilities. However, because of limited onshore denning, impacts of proposed activities to onshore denning females are expected to be minimal.

Only a small percentage of the total active den locations are known in any year. Known polar bear dens in proximity to oil and gas activities are monitored by the Service, when practicable. Industry routinely coordinates with the Service to determine the proximity of Industry's activities to known dens and den habitat. Implementation of mitigation measures, such as the one mile (1600 m) operational exclusion area around known dens or the temporary cessation of Industry activities, would ensure that disturbance is minimized.

B. Aircraft

As with offshore activities, routine, commercial aircraft traffic flying at high altitudes (approximately 10,000 to 30,000 feet [3,050 to 9,150 m]) AGL appear to have little to no effect on polar bears; however, extensive or repeated over-flights of fixed wing aircraft or helicopters could disturb polar bears. Behavioral reactions of non-denning polar bears are expected to be limited to short term changes in behavior and would have no long term impact on individuals and no impacts on the polar bear population. A minimum altitude requirement of 1,500 feet (~457.5 m) AGL for aircraft associated with Industry activity will help mitigate disturbance to polar bears or areas of concern. Flight restrictions of 1,500 feet AGL or greater, depending on the conditions, around known polar bear dens, will be required, as appropriate, to reduce the likelihood that bears are disturbed by aircraft.

3. Human Encounters

While more polar bears transit through the coastal areas than inland, we do not anticipate many bear-human interactions due to the limited amount of human activity occurring on the western coast of Alaska. Near shore activities could potentially increase the rate of bear-human interactions, which could result in increased incidents of harassment of bears. However, Industry currently implements company policies, interaction plans, and conducts employee training to reduce and mitigate such encounters under the guidance of the Service. The long history of effective implementation of human-polar bear interaction plans demonstrates reduced interactions between polar bears and humans resulting in no injuries or deaths to humans since the implementation of ITRs.

Industry has developed and uses devices to aid in detecting polar bears, including human bear monitors, remote cameras, motion and infrared detection systems, and closed circuit TV systems. Industry also takes steps to actively prevent bears from accessing facilities using safety gates and fences. The types of detection and exclusion systems are implemented on a case-by-case basis with guidance from the Service.

Bear-human interactions will be mitigated through conditions in LOAs, which require the applicant to develop a polar bear interaction plan for each operation. These plans outline the steps the applicant will take, such as garbage disposal, attractant management, and snow management procedures, to minimize impacts to polar bears by reducing the attraction and effects of Industry activities on polar bears. Interaction plans also outline the chain of command for responding to a polar bear sighting and require notification of the Service for all sightings.

4. Effect on Prey Species

Ringed seals are the primary prey of polar bears and bearded seals are a secondary prey source. Both species are managed by the NMFS, which will evaluate the potential impacts of oil and gas exploration activities in the Chukchi Sea through their appropriate authorization process and will identify appropriate mitigation measures for those species, if a negligible finding is appropriate. Industry will mainly have an effect on seals through the potential for industrial noise disturbance and contamination (oil spills). The Service does not expect prey availability to be significantly changed due to Industry activities. Mitigation measures for pinnipeds required by BOEM and NMFS will reduce the impact of Industry activities on ringed and bearded seals. A detailed description of potential Industry effects on pinnipeds in the Chukchi Sea can be found in the NMFS biological opinion, "*Endangered Species Act – Section 7 Consultation, Biological Opinion; Issuance of Incidental Harassment Authorization under section 101(a)(5)(a) of the*

Marine Mammal Protection Act to Shell Offshore, Inc. for Exploratory Drilling in the Alaskan Chukchi Sea in 2012." (*http://www.nmfs.noaa.gov/pr/pdfs/permits/shell_chukchi_opinion.pdf*).

5. Polar Bear Habitat

Industry activities could have impacts to polar bear habitat resulting in impacts to bears. The proposed regulations may only authorize incidental take within a specified geographic area (Figure 1). For the EA, we analyzed three polar bear habitat types: 1) sea ice, used for feeding, breeding, denning and movements; 2) barrier island habitat, used for denning, refuge from human disturbance, and transit corridors; and 3) terrestrial denning habitat for denning. Industry activities may impact this described habitat as discussed below.

A. Sea Ice Habitat

The proposed regulations will only allow exploratory oil and gas activities to occur during the open water season. However, support activities can occur throughout the year and may interact with sea ice habitat on a limited basis. Ice reconnaissance flights to survey ice characteristics and ice management operations using vessels to deflect ice floes from drill rigs are two types of activities that have the potential to affect sea ice. Support activities outside of the open water season will be limited in scope and will likely have limited effects on sea ice habitat during the ice covered seasons within the time frame of the regulations.

B. Barrier Island Habitat

Proposed support activities near communities, such as Wainwright and Point Lay, for seismic, shallow hazard surveys, open water marine survey, or terrestrial environmental studies are the types of exploration activities requested that may impact barrier island habitat. Vessels associated with marine activities operating in the Chukchi Sea may use barrier island habitat to "wait out a storm." Bears using the islands to rest and travel may encounter temporarily beached vessels. Past observations reported to the Service indicate that bears will walk by such vessels, but may not rest near them. This is a temporary effect associated with the beached vessel and once the vessel is removed from the beach, the bears return to travelling or resting on the beach.

Aerial transport activities in support of Industry programs may also encounter barrier island habitat while transiting to and from communities. Air operations will have regulatory flight restrictions, but in certain circumstances, such as emergencies which require emergency landing or lower altitudes, flights could displace bears from barrier island habitat. Established mitigation measures described in the regulations, such as minimum altitude restrictions, wildlife observers and adherence to company polar bear interaction plans, will further limit potential disturbances.

C. Terrestrial Denning Habitat

In western Alaska, mainland support facilities for offshore activities may occur within coastal polar bear habitat. Staging activities, remote camps, construction of ice roads, and aerial transport to support projects all have the potential to occur in coastal areas in or near denning habitat. If necessary, proactive and reactive mitigation measures set forth in the regulations will minimize disturbance and/or impacts to denning habitat. The Service may require Industry to conduct den detection surveys in areas of denning habitat. At times industry may have to place ice roads or staging activities in coastal denning areas. Mitigation measures to minimize potential impacts include: establishment of the one mile (1600 meter) exclusion zone around known maternal dens and the reduction of activity levels until the natural departure of the bears. Currently, what little is known about the denning habits of the CS population suggests that the majority of maternal dens occur in the Russian Federation, predominantly on Wrangel Island (DeBruyn *et al.* 2010). While denning habitat exists in western Alaska, few confirmed polar bear dens have been recorded in western Alaska since 2006 (Durner *et al*. 2010). A more detailed description of den detection techniques required by the Service and employed by exploration activities to limit disturbance minimize impacts to maternal polar bear den sites has been discussed in the Service's Beaufort Sea regulations (76 FR 47010; August 3, 2011). The Service will implement these techniques if active polar bear dens are recorded during Industry activities.

Oil/Fuel Spills

Individual polar bears can potentially be affected by Industry activities through waste product discharge and oil spills. In 1980, Canadian scientists performed experiments that examined the effects to polar bears of exposure to oil. Oil effect on experimentally oiled polar bears (where bears were exposed to oil for specified periods of time) included acute inflammation of the nasal passages, marked epidermal responses, anemia, anorexia, biochemical changes indicative of stress, renal impairment, and death. Many effects of these did not become evident until several weeks after the experiment (Øritsland *et al.* 1981).

The oiling of a bear's fur causes a reduction in its insulative value. This results in a significant reduction to the thermoregulatory nature of the bear's fur. Irritation or damage to the skin by oil may further contribute to impaired thermoregulation. Experiments on live polar bears and pelts have shown that 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 during grooming.

Oil ingestion by polar bears through grooming, nursing, or consumption of contaminated prey may result in pathological effects, depending on the amount of oil ingested and the individual's physiological state. Øritsland *et al.* (1981) reported that polar bears ingested significant amounts of oil through grooming. While much of the ingested oil was eliminated by vomiting and in the feces; some oil was absorbed and later found in body fluids and tissues. Death may occur if a large amount of oil were ingested or if volatile components of oil were aspirated into the bear's lungs. Indeed, two of three bears died in the above experiment, and it was suspected that the ingestion of oil was a contributing factor to their deaths.

Ingestion of sub-lethal amounts of oil can have various physiological effects on a polar bear, 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 absorption.

Polar bears swimming in, or walking adjacent to, an oil spill could inhale petroleum vapors. 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.

Oil may also affect food sources of polar bears. Seals that die as a result of 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 to individual bears. A local reduction in ringed seal numbers as a result of 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 not using 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). Although it may be true that only small numbers of bears may be affected by an oil spill initially, the long term impact could be much greater. Long term oil effects could be substantial through interactions between natural environmental stressors and compromised health of exposed animals, and through chronic, toxic exposure as a result of bioaccumulation. Polar bears are biological sinks for pollutants because they are an apical predator of the Arctic ecosystem and are also opportunistic scavengers of other marine mammals. Additionally, their diet is composed mostly of high-fat seal skin and blubber, (Norstrom *et al.* 1988). The highest concentrations of persistent organic pollutants in Arctic marine mammals have been found in polar bears and seal-eating walruses near Svalbard, Norway (Norstrom *et al.* 1988; Andersen *et al.* 2001; Muir *et al.* 1999). As such, polar bears would be susceptible to the effects of bioaccumulation of contaminants associated with spilled oil, which could affect the bears' reproduction, survival, and immune systems. Sub-lethal, chronic effects of any oil spill may further suppress the recovery of polar bear populations due to reduced fitness of surviving animals.

In addition, subadult polar bears are more vulnerable than adults to environmental effects (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. Indeed, brown bear (*Ursus arctos*) researchers in Katmai National Park suspected that oil ingestion contributed to the death of two yearling brown bears in 1989 following the *Exxon Valdez* oil spill (Sellers and Miller 1999). They detected levels of naphthalene and phanathrene I in the bile of one of the bears. Because of the greater maternal investment in a weaned subadult, reduced survival rates of subadult polar bears have a greater impact on population growth rate and sustainable harvest than do reduced litter production rates (Taylor *et al.* 1987).

During the open water season (July to October), polar bears residing in the open water or on land may encounter and be affected by an oil spill; however, given the seasonal nature of the requested Industry activities, the potential for direct negative impacts to polar bears will be minimized. During the ice-covered season (November to May), onshore Industry activities have the greatest likelihood of exposing transiting polar bears to potential oil spills because those activities in the earlier season open-water locations will not be active. Although the majority of the CS polar bear population spends a large amount of time offshore on sea ice and along the Chukotka coastline, some bears could encounter oil from a spill regardless of the timing of the spill (season) or spill location within the geographic region.

Small spills of oil or waste products throughout the year by Industry activities on land 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, in the Beaufort Sea, approximately 5 nautical miles (9.3 km) northeast of Oliktok Point (Amstrup *et al.* 1989). The cause of death was determined to be poisoning by a mixture that included ethylene glycol and Rhodamine B dye. While industrial in origin, the source of the mixture causing the bears' death was unknown.

The major concern regarding large oil spills is the impact a spill would have on the survival and recruitment of the CS and southern SBS polar bear populations that use the region. Currently, the SBS bear population is approximately 1,500 bears and the CS bear population is unknown, but estimated at 2,000. While these populations may be able to sustain the additional mortality caused by a large oil spill if a small number of bears are killed, the additive effect of numerous bear deaths due to the direct or indirect effects from a large oil spill are more likely to reduce population recruitment and survival. Indirect effects may occur through a local reduction in seal productivity or scavenging of oiled seal carcasses and other potential impacts, both natural and human-induced. The removal of a large number of bears from either population would exceed sustainable levels, potentially causing a decline in bear populations and affecting bear productivity and subsistence use.

The greatest risk for impacts from an oil spill to polar bears would be during those times when spilled oil were to occur in shallow waters less that 1,000 ft (~300 m) deep over the continental shelf and in areas with greater than 50 percent ice cover (Durner *et al.* 2004). Spilled oil may also accumulate in leads and other openings in the ice that occur during spring break up and autumn freeze-up periods. Polar bears and their prey may be expected to occur in these habitats and could be exposed to spilled oil anywhere these conditions exist. Polar bears could also be exposed to oil by scavenging dead prey animals that were contaminated with oil. Furthermore, spilled oil that became trapped in or under sea ice, or was not recovered during clean-up operations in the season it was spilled, could remain from one season to the next. Any such remnant oil could expose polar bears and their prey at any time from one season to the next until the oil was removed, recovered or degraded via clean-up efforts or natural processes.

An evaluation of the potential impacts of Industry waste products and oil spills on bears, should they occur, suggest that individual bears could be impacted by this type of disturbance. Depending on the amount of oil or wastes involved, and the timing and location of a spill, impacts could be short term, chronic, or lethal. In order for bear population reproduction or survival to be impacted, a large-volume oil spill would have to take place. According to BOEM/BSEE, during exploratory activities, the probability of a large oil spill occurring throughout the duration of these proposed regulations (five years) is very small. In addition, protocols in project permits for controlling waste products will limit bears' exposure to waste products. Current management practices by Industry, such as requiring the proper use, storage, and disposal of hazardous materials, minimize the potential occurrence of such incidents. In the event of an oil spill, it is also likely that polar bears would be intentionally hazed to keep them away from the area, further reducing the likelihood of impacting the population. Oil spill contingency plans are authorized by project permitting agencies and, if necessary, will also limit the exposure of bears to oil.

2. Potential Impacts on the Physical Environment

The proposed area these regulations will cover is limited to the Chukchi Sea and the adjacent coastal area of western Alaska (see Figure 1). The proposed regulations will stipulate mitigation measures for Industry activities described in the petition. The majority of activities will occur in the marine environment, where large projects, such as seismic surveys and offshore drilling operations, have the potential to impact animals. A thorough discussion of impacts of oil and gas exploration on the physical environment is found in the Chukchi Sea EIS at, *http://www.boem.gov/uploadedFiles/BOEM/About_BOEM/BOEM_Regions/Alaska_Region/Environment/Environmental_Analysis/2007-026-Vol%20I.pdf* and the Chukchi Sea Final Supplemental EIS, Chukchi Sea Planning Area, Oil and Gas Lease Sale 193 at *http://www.boem.gov/About-BOEM/BOEM-Regions/Alaska-Region/Environment/Environmental-Analysis/OCS-EIS/EA-BOEMRE-2011-041.aspx*.

The geographic region contains lands that are managed under various owners (Federal, State of Alaska, Alaska Native and other private lands). 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 in regards to polar bears and walruses through a requested incidental take authorization, (the LOA process provided by these regulations).

With inclusion of all appropriate mitigation measures described in section VI, plus any additional measures incorporated into an LOA, the Service has determined that the proposed action will result in no significant impacts of the physical environment.

3. Potential Impacts on the Socio-economic Environment

Walruses and polar bear have cultural, economic, and subsistence significance to the Alaska Natives inhabiting the northern coast of Alaska. The Alaska Native Communities most likely to be impacted by the proposed activities are Barrow, Wainwright, Point Lay, Point Hope, Kivalina, Kotzebue, Shishmaref, Little Diomede, Gambell and Savoonga. However, all communities that harvest walruses or polar bears in the Chukchi Sea Region could indirectly be affected by Industry activities. The open water season for oil and gas exploration activities coincides with peak walrus hunting activities in several Native subsistence hunting communities. The subsistence harvest of polar bears can occur year round in the Chukchi Sea, depending on ice conditions, with peaks usually occurring in spring and fall.

Noise and disturbances associated with oil and gas exploration activities have the potential to adversely impact subsistence harvests of walruses and polar bears by displacing animals beyond the hunting range (60 to 100 mi [96.5 to 161 km] from the coast) of these communities. Disturbances associated with exploration activities could also heighten the sensitivity of animals to humans with potential impacts to hunting success. Little information is available to predict the effects of exploration activities on the subsistence harvest of walruses and polar bears. Hunting success varies considerably from year to year because of variable ice and weather conditions. Adoption of the following mitigation measures will minimize adverse impacts on subsistence uses: 1) a 25 mi (~40 km) coastal deferral zone which is expected to reduce the impacts of exploration activities on subsistence hunting; 2) the existing restrictions of industry vessels and aircraft from entering the Ledyard Bay Critical Habitat Unit (LBCHU), which extends seaward out approximately 40 miles (74 km) from the Point Lay walrus haulout site. Although the operating restrictions in the LBCHU are intended primarily to provide protection to spectacled eiders, they also effectively establish a protective buffer area from Industry activities at the Point Lay walrus haulout, and their migratory routes to offshore feeding areas; 3) restricting offshore seismic exploration to the period July 1 to November 30 to allow migrating marine mammals the opportunity to disperse from the coastal zone; and 4) a requirement that lessees consult with the local subsistence communities prior to submitting an operational plan for exploration activities. In addition to existing lease stipulations and mitigation measures, the Service has developed additional mitigation measures through ITRs (see section VI below).

4. Cumulative Effects

Cumulative effects 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 five-year period. At the end of five 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 as a result of climate change. Our analyses are based upon the best scientific information available at this time. However, the climate is changing in myriad unknown and unpredictable ways. With inclusion of the monitoring, reporting, and research components described in the mitigation measures in section VI, 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.

A cumulative impacts analysis was described in the proposed rule (78 FR1970-1973) and the following events have contributed to current environmental conditions in the Chukchi Sea and could also cumulatively affect Pacific walrus and polar bear population status in the next five years.

Commercial and Subsistence Harvest

Walruses have a low rate of reproduction and are thus limited in their capacity to respond to hunting exploitation. In the late 19th century, American whalers intensively harvested walruses in the northern Bering and southern Chukchi seas. Between 1869 and 1879, catches averaged more than 10,000 per year, with many more animals struck and lost. The population was substantially depleted by the end of the century, and the industry collapsed in the early 1900s. Since 1930, the combined walrus harvests of the United States and Russian Federation have ranged from 2,300 to 9,500 animals per year. Notable harvest peaks occurred during 1930 to 1960 (4,500 to 9,500 per year) and in the 1980's (5,000 to 16,000 per year). Commercial hunting continued in the Russian Federation until 1991 under a quota system of up to 3,000 animals per year. Since 1992, the harvest of Pacific walruses has been limited to the subsistence catch of coastal communities in Alaska and Chukotka. Harvest levels through the 1990s to present ranged from approximately 3,830 to 8,518 animals per year, which includes a stuck and lost adjustment of 42 percent. Although recent harvest levels are lower than historic highs, lack of information on current population size or trend precludes an assessment of the sustainability of current harvest rates. Harvest rates are highly variable but have declined by about two percent per year since 1991, but may be leveling off (MacCracken 2012).

After natural causes and old age, the most significant source of mortality for polar bears is human-caused mortality. Prior to passage of the MMPA in 1972, polar bears were taken by both sport hunters and residents in Alaska. Between 1960 and 1972, the average reported polar bear harvest in the Chukchi Sea was 189 bears per year. Seventy-five percent of these were males, as cubs and females with cubs were protected. Since passage of the MMPA in 1972, only Alaska Natives from coastal Alaskan villages have been allowed to hunt polar bears. From 1980 to 2005, the total annual harvest for Alaska averaged 101 bears: sixty-four percent from the CS and 36 percent from the SBS population. Other sources of mortality related to human activities include research activities, euthanasia of sick and or injured bears, and defense-of-life kills (Brower *et al.* 2002). Expanding human populations, industrial development, and tourism all increase the potential for bear-human interactions. A primary management concern is the potential for an increase in the number of nutritionally stressed bears on land due to retreating sea ice resulting in more human-bear interaction and an increase in the number of defense-of-life kills. Other potential anthropogenic stressors acting individually or in concert are: 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; and/or changing atmospheric and oceanic transport of contaminants into the region. Additional information on the cumulative effects of oil and gas development on polar bears can be found in the draft *Polar Bear Status Review* at, *http://alaska.fws.gov/fisheries/mmm/polarbear/issues.html*.

Climate Change

Analysis of long term environmental data sets indicates that substantial reductions in both the extent and thickness of the arctic sea ice cover have occurred over the past 40 years. Record minimum sea ice extent occurred in September 2007 with 2002, 2005, 2009, 2010, 2011, and 2012 ice extent close to the record low and substantially below the 20-year mean (NSIDC 2012). Walruses rely on suitable sea ice as a substrate for resting between foraging bouts, calving, molting, isolation from predators, and protection from storm events. The juxtaposition of sea ice over shallow shelf habitat suitable for benthic feeding is critically important to walruses. Recent trends in the Chukchi Sea have resulted in seasonal sea ice retreat off the continental shelf and over deep Arctic Ocean waters, presenting significant adaptive challenges to walruses in the region. Observed impacts to walruses as a result of diminishing sea ice cover include: a northward shift in range and declines in Bering Sea haulout use; an increase in the speed of the spring migration; earlier formation and longer duration of Chukchi Sea coastal haulout use; and increased vulnerability to predation and disturbance while at Chukchi Sea coastal haulouts, resulting in increased mortality rates among younger animals (MacCracken 2012). Postulated effects include premature separation of females and dependent calves, reductions in the prey base, declines in animal health and condition, increased interactions with development activities, general population decline, and the potential for the harvest to become unsustainable (MacCracken 2012). Future studies investigating walrus distributions, population status and trends, harvest sustainability, and habitat use patterns in the Chukchi Sea are critically important for responding to walrus conservation and management issues associated with changes in the sea ice environment.

Habitat loss due to changes in arctic sea ice has been identified as the primary threat to polar bear populations, where the decline of sea ice is expected to continue throughout the polar bears' range for the foreseeable future (73 FR 28212; May 15, 2008). Amstrup *et al.* (2007) projected that if current sea ice declines continue, the sea-ice retreat may eventually exclude bears from onshore denning habitat in the Polar Basin Divergent Region, where they have projected a 42 percent loss of optimal summer polar bear habitat by 2050. The SBS and CS polar bear populations inhabit this ecoregion and Amstrup *et al.* (2007) have projected that these populations will be extirpated within the next 45 to 75 years, if sea ice declines continue.

The effects of climate change are likely to have serious consequences for polar bears and their prey, ice seals. 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. 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. These effects will be compounded with the occurrence of any potential effects of oil and gas activities in the region (ACIA, 2004; Derocher, *et. al* 2004; NRC 2003).

The effects of climate change on sea ice are likely to limit access to and the available areas of denning habitat for polar bears. For bears moving from the sea ice to land, the timing of freeze-up and the distance from the pack ice are two factors that can affect the timing of den entrance by pregnant females. Access to terrestrial denning sites is dependent upon the location of the sea ice, amount of stable ice, ice consolidation, and the length of the melt season during the summer and fall (Fischbach e*t al*. 2007). Unstable sea ice can also limit denning success and survival of cubs when the denning substrate is sea ice. During the fall, when the sea ice is at its minimum extent, pregnant females begin to look for suitable denning sites in relatively close proximity to the sea ice edge. The closest terrestrial denning sites to the ice edge in the Chukchi Sea during the late fall are Wrangel Island, Russian Federation, and the northern coastline of the Chukotka Peninsula, Russian Federation. Polar bears from the CS population have typically used terrestrial den sites in the Russian Federation, although limited denning in Alaska has been observed. In the future, the distance between the Chukchi Sea ice edge and western Alaska is expected to increase due to changes in the sea ice characteristics from climate change.

Polar bears from the SBS population den on drifting pack ice, shore-fast ice, and land (Amstrup and Gardner 1994), while most other polar bear populations den only on land or shore-fast ice (Amstrup 2003). The distribution of maternal denning in the SBS appears to have changed in recent years. While Amstrup and Gardner (1994) observed that approximately 50 percent of maternal dens occurred on the pack ice, Fischbach *et al.* (2007) documented a decrease in pack ice denning over two decades, from 62 percent (1985 to 1994) to 37 percent (1998 to 2004). They concluded that the changes in the den distribution were in response to delays in the autumn freeze-up and a reduction in availability and quality of the more stable pack ice suitable for denning, due to increasingly thinner and less stable ice in fall (Fischbach *et al.* 2007). The location of terrestrial maternal dens is dependent upon a variety of factors, such as sea ice conditions, prey availability, and weather, all of which vary seasonally and annually. Stirling and Andriashek (1992) found that dens often occurred on land adjacent to areas that developed sea ice early in the autumn. Great distances of open water and delayed freeze-up can prohibit polar bear terrestrial denning. On Hopen, the most southern island of Svalbard, Norway, polar bears do not den when sea ice freezes too late (Derocher *et al.*2004), and terrestrial denning by polar bears is also restricted by greater distances of open water (Fischbach *et al.* 2007). In the southern Beaufort Sea changes in polar bear habitat use have also been associated with declines in sea ice extent (Fischbach *et al.* 2007; Durner *et al.* 2009).

In recent years, the East Siberian and Chukchi seas have exhibited some of the most significant changes in the Arctic, including pronounced warming and thinning of the sea ice (Rigor *et al.* 2002; Rodrigues 2008; Durner *et al.* 2009; Markus *et al.* 2009). Scientific data (Rigor and Wallace 2004) and local observations suggest that reductions in sea ice in the Chukchi Sea became significant starting at the end of the 1980s. Loss of sea ice was particularly high along the Alaskan and Chukotkan coasts. Markus *et al.* (2009) observed trends of earlier melt onset and later freeze up to be stronger in the Chukchi and Beaufort seas than any other region in the Arctic. The Chukchi Sea may be particularly vulnerable to rapid sea ice loss due to the influence of warmer waters of the Pacific Ocean (Woodgate *et al.* 2006), as well as regional effects of atmospheric circulation (Rigor *et al.* 2002; Maslanik *et al.* 2007). The fall sea ice extent in the Chukchi Sea has declined in recent years (Rodrigues 2008; Comiso *et al.* 2008; Durner *et al.* 2009; Markus *et al.* 2009).

Sea-ice conditions after den emergence can also be important for cub survival (Stirling *et al.* 1993; Stirling and Lunn 1997), as females typically take their cubs out on the sea ice as soon as the cubs can travel. Small size, limited mobility, and susceptibility to hypothermia from swimming in the cold arctic waters limit the ability of cubs-of-the-year to traverse extensive areas of broken ice and open water immediately following den emergence. If sea ice conditions become increasingly unstable and fragmented, and large areas of open water develop between the shore fast ice and the drifting pack ice, females with cubs-of-the-year may have to rely more heavily on shore fast ice to prevent cub mortality from hypothermia (Larsen 1985; Blix and Lentfer 1979).

Due to the changing ice conditions the Service anticipates that polar bear use of the Beaufort and Chukchi sea coasts 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, where the farther from shore the leading edge of the pack ice is, the more bears are observed onshore (Schliebe *et al.* 2005). 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 the attempt. An increased number of bears on land may increase human-bear interactions or conflicts during this time period.

The proposed Industry operations identified by the petitioners are likely to result in some incremental cumulative effects to polar bears through the potential exclusion or avoidance of polar bears from feeding, resting, or denning areas and disruption of important associated biological behaviors. Nevertheless, the impact analysis of the likely range of effects and the likelihood of exposures resulting in adverse behavioral effects supports a conclusion that the activities would result in no more than temporary disturbance effects to polar bears. The Service believes that with implementation of the proposed mitigation measures, which include an adaptive management component, the proposed actions will result in no more than temporary disturbance to polar bears.

Commercial Fishing and Marine Vessel Traffic

Available data suggest that presently walruses rarely interact with commercial fishing and marine vessel traffic (USFWS 2012). Walruses are normally 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 Northern Sea route may increase 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 (76 FR 7634; February 10, 2011).

Polar bears spend the majority of their time on pack ice during the open water season, which limits their interaction with vessel traffic of any kind. However, polar bears are known to retreat from noise sources and the sight of vessels. The effects of fleeing may be minimal if the event is short and the animal is otherwise unstressed, but a short run on a warm spring or summer day could overheat a polar bear. Vessels may also deflect bears from their preferred course when they are moving on ice or swimming in the water. Alternatively, bears may become attracted to vessels traffic and move towards ships if curious. The potential for interactions with bears and vessels can either occur with bears using ice floes in unconsolidated ice or swimming to ice or land. As with the walrus, 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 (Pagano *et al.* 2012). 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, a vessel interaction with swimming bears has the potential to impact animals to a greater extent than do vessels coming in proximity to bears on ice floes. The energetic expenditure of a bear swimming to avoid a vessel is assumed to be higher than that of a bear retreating from a vessel on an ice floe.

Icebreaking by vessels is a concern to a portion of the public, where this activity could detrimentally affect walrus or polar bear ice habitat. However, according to the National Snow and Ice Data Center at (http://nsidc.org/arcticseaicenews/faq/#icebreakers): "When icebreakers travel through sea ice, they leave trails of open water in their wake. Dark open water does not reflect nearly as much sunlight as ice does, so sometimes people wonder if icebreakers speed up or exacerbate sea ice decline. In summer, the passages created by icebreakers do increase *local* summertime melting because the ships cut through the ice and expose new areas of water to warm air. The melt caused by an icebreaker is small and localized. Channels created by icebreakers are quite narrow and few in number compared to natural gaps in the ice. In winter, any openings caused by icebreakers will quickly freeze over again. Scientists do not think that icebreakers play a significant role in accelerating the decline in Arctic sea ice." More information on this topic is available at (http://nsidc.org/icelights/2012/04/12/are-icebreakers-changing-the-climate/).

For activities in the Chukchi Sea, industry ice management would consist of actively pushing the ice off its trajectory with the bow of the ice management vessel, but some ice-breaking could be required for the safety of property and assets, such as a drill rig. For our analysis we determined that the only ice breaking that would occur is if a large floe needed to be deflected from industry equipment (including ships and drilling platforms), and whether it would be more efficient to break up that floe. For example, in 2012, ice management was required during a total of 7 days between 31 August to 13 September, and was limited to 9 discrete isolated events. Of those 9 events, ice was broken apart only two times. Further, if ice floes are too large, the drill rig will cease operations and move from the site until the floe has passed. This occurred in 2012 at the Burger A prospect, where the presence of a large ice floe caused the drill ship to be moved off-site for 10 days.

Past Offshore Oil and Gas Related Activities—Oil and gas related activities have been conducted in the Chukchi and Beaufort seas since the late 1960s. However, much more oil and gas related activity has occurred in the Beaufort Sea than in the Chukchi Sea OCS. Pacific walruses do not normally range far into the Beaufort Sea, and documented interactions between oil and gas activities and walruses have been minimal (76 FR 47010; August 3, 2011). The Chukchi Sea OCS has previously experienced some oil and gas exploration activity, but no development or production. Because of the nonpermanent, transitory nature of past oil and gas activities in the region, we do not think that any of these earlier activities had lasting effects on individuals or groups of walruses (76 FR 47010; August 3, 2011).

The Chukchi Sea OCS experienced oil and gas exploration activity in the 1980s and early 1990s, where exploratory drilling occurred. These activities did not result in any known population level impacts to walruses, polar bears or unmitigable adverse impacts to the subsistence use of these resources. Exploration of the Chukchi shelf was discontinued after 1991 until 2006.

Between 2006 and 2011, 16 offshore projects were issued incidental take authority for polar bears. They included seven seismic surveys, four shallow hazards and site clearance surveys, and five environmental studies, including ice observation flights and onshore and offshore environmental baseline surveys. During this time, 47 polar bear observations were recorded involving 62 individual bears. These observations and bear responses are discussed below.

The majority of the bears were observed on land (50 percent; 31 of 62 polar bears). Twenty-one bears (34 percent) were recorded on the ice, mainly in unconsolidated ice on ice floes; and ten bears (16 percent) were observed swimming. Fifty-seven percent of the polar bears (35 of 62 bears) were observed from vessels, while 35 percent (22 of 62 bears) were sighted from aerial surveys and 8 percent (5 of 62 bears) from ground based observations.

Of the 62 polar bears documented, 32 percent (20 of 62 bears) of the observations were recorded as Level B harassment takes, where the bears exhibited short term, temporary reactions to the conveyance (vessel, plane, or vehicle), by moving away from the conveyance. No polar bears were deterred through intentional take. Sixty-five percent of the bears (40 of 62 bears) exhibited no behavioral reactions to the conveyance, while the reactions of 3 percent of the bears (2 of 62 bears) were unknown.

Most polar bears were observed during secondary or support activities, such as aerial surveys or transiting between project areas. These activities were associated with a primary project, such as seismic operations. No polar bears were observed during active seismic operations.

Additionally, other activities have occurred in the Chukchi Sea region and have reported polar bear sightings associated with them. Seven polar bear observations (16 bears) were recorded during the University of Texas at Austin's marine geophysical survey performed by the U.S. Coast Guard (USCG) Cutter *Healy* in 2006. All bears were observed on the ice between July 21 and August 19. The encounter distances to the *Healy* ranged from 853 yards [yd] to 1.5 mi (~780 m to 2.5 km). Another bear was observed approximately 628.8 yd (575 m) from a helicopter conducting ice reconnaissance. Four of the bear groups exhibited possible reactions to the, conveyance where they retreated from the helicopter or vessel. This suggests that disturbances from offshore vessel operations can be short term and limited to minor changes in behavior.

In 2007, at the Intrepid exploration drilling site, located on the Chukchi Sea coast south of Barrow, a female bear and her cub were observed approximately 110 yd (~100 meters) from a pad. No interaction occurred as the bear did not appear concerned about the pad or associated activity. The bear simply changed her direction of travel and left the area.

In summary, while only a minimal number of polar bears have been observed during interactions, there is no indication that these interactions resulted in more than a temporary change in behavior of animals and did not cause a disruption in normal behavioral patterns.

Summary of Cumulative Effects

For both polar bears and Pacific walrus, hunting pressure, climate change, and the expansion of commercial activities into their habitat, all have the potential to result in negative impacts to the species. Combined, these factors are expected to present significant challenges to future conservation and management efforts. The success of future management efforts will rely in part on continued investments in research investigating population status and trend and habitat use patterns. Research by the U.S. Geological Survey (USGS) and the Chukotka Branch of the Pacific Fisheries Station (ChukotTINRO) examining walrus habitat use patterns in the Chukchi Sea is beginning to provide useable results (Jay *et al.* 2012). In addition, the Service is beginning to develop and test methods for a genetic mark-recapture project to estimate Pacific walrus population size and trends and demographic parameters. 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 in the evaluation of proposed activities and as more information on polar bear and Pacific walrus population status becomes available.

The Service and collaborators initiated a study in 2008 to provide scientific data on the status of the polar bear population using the Chukchi Sea environment. The objectives of this study are: 1) to identify the best methodology to estimate survival rates, breeding rates, and population size; 2) to develop an initial understanding of population dynamics (the sex and age structure of the population); 3) to evaluate the condition, health, and feeding ecology of polar bears in the region; and 4) to understand the distribution of polar bears and their potential response to environmental changes. Data collected from 2008 to 2011 provided sufficient sample sizes to begin analyzing feeding ecology, body condition, and population dynamics. In addition, the Service is experimenting with new techniques for collecting movement data. In 2011, the Service deployed 17 Global Positioning System (GPS) satellite radio-collars on adult females, which will drop off after one year using an automatic release device. They also deployed 14 glue-on satellite transmitters (applied just behind the shoulder) and ten ear-mounted satellite transmitters on adult males and sub-adults of both sexes. The Service will continue to conduct polar bear studies in the Chukchi Sea Region. Polar bears are long-lived animals that live in a variable and rapidly changing environment; long term studies are necessary to understand interannual variation, and to monitor population trends.

Contribution of Proposed Activities to Cumulative Impacts

Proposed seismic surveys and exploratory drilling operations identified by the petitioner are likely to result in some incremental cumulative effects to polar bears and walruses through exclusion or disturbance, potentially disrupting important associated biological behaviors. However, relatively few polar bears and walruses are likely to interact with exploration activities in open sea conditions where most of the proposed activities are expected to occur. Industry activities that occur near coastal haulouts, near the HSWUA, or intersect travel corridors between haulouts and the HSWUA will need close monitoring and special mitigation procedures. Required monitoring and mitigation measures, designed to minimize interactions between authorized projects and walruses or polar bears, are expected to limit significant behavioral responses that could disrupt normal behavioral patterns. Therefore, we conclude that the proposed exploration activities, as mitigated through the regulatory process, will contribute only a negligible increase to the current effects exhibited on Pacific walruses and polar bears that are reasonably likely to occur within the five-year period covered by the regulations.

VI. MITIGATION

We consider the mitigation, monitoring and reporting measures included in the final regulations rule are effective in ensuring the "least practicable adverse impact" from oil and gas exploration activities to polar bears and Pacific walruses in the Chukchi Sea. Similar mitigation, monitoring and reporting measures in prior incidental take regulations for both the Chukchi and Beaufort seas have proven highly effective at eliminating or mitigating adverse impacts to polar bears and Pacific walruses. In addition, the mitigation measures in the final regulations were updated with the best available scientific evidence, and in some instances made more conservative or rigorous. Below we discuss mitigation measures developed by the Service, as well as stipulations developed by other regulatory agencies that benefit our trust species by minimizing impacts in the environment.

The BOEM/BSEE Lease Sale 193 Lease Stipulations include several mitigation measures that benefit pacific walrus and polar bears and which apply to all exploration activities in the Chukchi Sea Lease Sale 193 EIS. We describe those stipulations that benefit walruses and polar bears below, but all stipulations can be found in detail at: *http://www.boem.gov/uploadedFiles/BOEM/About_BOEM/BOEM_Regions/Alaska_Region/Environment/Environmental_Analysis/2007-026-Vol%20I.pdf* and the Chukchi Sea Final Supplemental EIS, Chukchi Sea Planning Area, Oil and Gas Lease Sale 193 at, *http://www.boem.gov/About-BOEM/BOEM-Regions/Alaska-Region/Environment/Environmental-Analysis/OCS-EIS/EA-BOEMRE-2011-041.aspx*.

BOEM/BSEE Mitigation Measures for Exploration Permits

Seven lease stipulations were selected by the Secretary of the Interior in the Final Notice of Sale for Lease 193. These are: Stipulation 1) Protection of Biological Resources; Stipulation 2) Orientation Program; Stipulation 3) Transportation of Hydrocarbons; Stipulation 4) Industry Site Specific Monitoring Program for Marine Mammal Subsistence Resources; Stipulation 5) Conflict Avoidance Mechanisms to Protect Subsistence Whaling and Other Marine Mammal Subsistence Harvesting Activities; Stipulation 6) Pre-Booming Requirements for Fuel Transfers; and 7) Measures to Minimize Effects to Spectacled and Steller's Eiders during Exploration Activities. Lease stipulations that will directly support minimizing impacts to walruses, polar bears and the subsistence use of those animals include Stipulations 1, 2, 4, 5, 6, and 7.

Stipulation 1. Protection of Biological Resources.

Stipulation 1 allows BOEM/BSEE to require the lessee to conduct biological surveys for previously unidentified biological populations or habitats to determine the extent and composition of the population or habitat.

Stipulation 2. Orientation Program.

An orientation program will be developed by the lessee to inform individuals working on the project the importance of environmental, social, and cultural resources, including how to avoid disturbing marine mammals and endangered species. The program will also be designed to increase personnel sensitivity and understanding to community values, lifestyles and customs within the area of operation.

Stipulation 4. Site Specific Monitoring Program for Marine Mammal Subsistence Resource. Site specific monitoring programs provide information about the seasonal distributions of Pacific walruses and polar bears. This information is used to further evaluate the threat of harm to the species and provides immediate information about their activities, and their response to specific events. This stipulation is expected to help reduce potential effects of exploration activities on walruses and polar bears and the subsistence use of these resources. This will also provide information to ongoing Pacific walrus and polar bear research and monitoring efforts.

Stipulation 5. Conflict Avoidance Mechanisms to Protect Subsistence Harvesting Activities. This lease stipulation will help reduce potential conflicts between subsistence hunters and proposed oil and gas exploration activities, by reducing noise and other disturbance conflicts from oil and gas operations during specific periods, such as peak hunting seasons. It requires that the lessee meet with local communities and subsistence groups to resolve potential conflicts. The consultations required by this stipulation ensure that the lessee, including contractors, consult and coordinate both the timing and sighting of events with subsistence users. This stipulation has proven to be effective in the Beaufort Sea Planning Area in mitigating exploration activities through the development of the annual oil/whaler agreement between the Alaska Eskimo Whaling Commission and oil companies.

Stipulation 6. Pre-Booming Requirements for Fuel Transfers.

In compliance with 30 CFR 254, Oil- spill- Prevention and Response Plans and contingency actions must be prepared by lessees to address the prevention, detection, and cleanup of fuel and oil spills associated with exploration operations. Stipulation 6 will limit the potential of fuel spill into the environment by requiring the fuel barge to be surrounded by an oil spill containment boom during fuel transfer.

Stipulation 7. Measures to Minimize Effects to Spectacled and Steller's Eiders from Exploration Drilling

While Stipulation 7 is intended to minimize effects to Spectacled and Steller's Eiders during exploration activities, Condition a2b discusses vessel traffic in the Ledyard Bay Critical Habitat Area. Vessel traffic restrictions in this area between July 1 to November 15 will help minimize impacts to walruses, where the Ledyard Bay Critical Habitat Area and the high use areas of Pacific walruses overlap, for example along the barrier islands and surrounding waters of the Point Lay haulout..

U.S. Fish and Wildlife Service Mitigation Measures Associated with Incidental Take Regulations

In addition to the mitigation measures identified in the BOEM/BSEE issued exploration permits, the following mitigation, monitoring and reporting stipulations are required as conditions of a Service MMPA incidental take LOA:

A. Mitigation Requirements

Holders of an LOA must use methods and conduct activities in a manner that minimizes, to the greatest extent practicable, adverse impacts on Pacific walruses and polar bears, their habitat, and on the availability of these marine mammals for subsistence uses. Dynamic and adaptive management approaches, such as temporal or spatial limitations in response to the presence of marine mammals in a particular place or time, or the occurrence of marine mammals engaged in a particularly sensitive activity (such as feeding), must be used to avoid or minimize interactions with polar bears, walruses and subsistence users of these resources.

(1) Operating conditions for operational and support vessels.

(i) Operational and support vessels must be staffed with dedicated marine mammal observers (MMO) to alert crew of the presence of walruses and polar bears and initiate adaptive mitigation responses.

(ii) 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 within a 0.5 mi (~805 m) radius of walruses or polar bears observed on ice. Under no circumstances, other than an emergency, should any vessel approach within 1 mi (~1,610 m) of groups of walruses observed on land or within a 0.5 mi (~805 m) radius of polar bears observed on land.

(iii) 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 0.5 mi (805 m) operational exclusion zone around groups of 12 or more walruses encountered in the water. We note that we reviewed the data on industry encounters with walruses during 1989, 1990, and 2006-2012 and calculated the average size of groups of walruses which was 16 in 1989, 13 in 1990, and 7 from 2006-2012, resulting in a mean of 12. Udevitz *et. al* (2009) determined that one observed walrus resting on an ice floe can represent as many as five to six walruses underwater. Therefore, we believe it is appropriate to prescribe the mitigation measure for a grouping of 12 observed walruses as this may represent as many as 70 total walruses in the vicinity.

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.

(iv) The transit of operational and support vessels through the specified geographic region is not authorized prior to July 1 or later than November 30. 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. Variances 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.

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

(2) Operating conditions for aircraft.

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

(ii) Under no circumstances, other than an emergency, should fixed wing aircraft operate at an altitude lower than 1,500 ft (457 m) within a 0.5 mi (805 m) of walrus groups observed on ice, or within 1 mi (1,610 m) of walrus groups observed on land. Under no circumstances, other than an emergency, should rotary winged aircraft (helicopters) operate at an altitude lower than 3,000 ft (914 m) within 1 mi (1,610 m) of walrus groups observed on land. In past regulations the altitude associated with rotary-winged aircraft was 1,500 ft. However, we have determined that walruses at land-based haul-outs are more susceptible to disturbance and have increased the height restriction which in turn should decrease the possibility of disturbance.

Under no circumstances, other than an emergency, should aircraft operate at an altitude lower than 1,500 ft (457 m) within 0.5 mi (805 m) of polar bears observed on ice or land. Helicopters may not hover or circle above such areas or within 0.5 mile (805 m) of such areas. When weather conditions do not allow a 1,500 ft (457 m) flying altitude, such as during severe storms or when cloud cover is low, aircraft may be operated below the required altitudes stipulated above. However, when aircraft are operated at altitudes below 1,500 ft (457 m) 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 0.5 mile (805 m) of these areas.

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

(3) Additional mitigation measures for offshore exploration activities.

(i) Offshore exploration activities will only be authorized during the open water season, defined as the period July 1 to November 30. Variances to the specified open water season 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.

(ii) To avoid significant additive and synergistic effects from multiple oil and gas exploration activities on foraging or migrating walruses, operators must maintain a minimum spacing of 15 mi (~24 km) between all active seismic source vessels and/or exploratory drill rigs during exploration activities. This does not include support vessels for these operations.

(iii) No offshore exploration activities will be authorized within a 40 mi (~65 km) radius of the communities of Barrow, Wainwright, Point Lay, or Point Hope, unless provided for in a Service-approved, site specific Plan of Cooperation.

(iv) Aerial monitoring surveys or an equivalent monitoring program acceptable to the Service may be required to estimate the number of walruses and polar bears in a proposed project area.

(v) Holders of LOAs must have an approved polar bear and/or walrus interaction plan on file with the Service and onsite, and polar bear awareness training will be required of certain personnel. Interaction plans must include:

- (A) The type of activity and, where and when the activity will occur, (a plan of operation);
- (B) A food and waste management plan;
- (C) Personnel training materials and procedures;
- (D) Site at-risk locations and situations;
- (E) Walrus and bear observation and reporting procedures;
- (F) Bear and walrus avoidance and encounter procedures.

(vi) Hanna Shoal Walrus Use Area (HSWUA). The HSWUA is a high use area for Pacific walruses (Figure 2). Due to the large numbers of walruses that could be encountered in the HSWUA from July through September, additional mitigation measures, on a case-by-case basis, may be applied to activities within the HSWUA. These mitigation measures include but may not be limited to: seasonal restrictions, reduced vessel traffic, or rerouting of vessels. To the maximum extent practicable, aircraft supporting exploration activities shall avoid operating below 1,500 feet ASL over the HSWUA between July 1 and September 30.

(4) Any offshore seismic surveys expected to include the production of pulsed underwater sounds with sound source levels greater than or equal to 160 dB re 1 μPa will be required to establish and monitor acoustic exclusion and disturbance zones and implement adaptive mitigation measures as follows.

(i) Establish and monitor with trained MMOs an acoustically verified exclusion zone for walruses surrounding seismic airgun arrays where the received level would be greater than or equal to 180 dB re 1 μPa; an acoustically verified exclusion zone for polar bear surrounding seismic airgun arrays where the received level would be greater than or equal to 190 dB re 1 μPa; and an acoustically verified walrus disturbance zone ahead of and perpendicular to the seismic vessel track where the received level would be greater than or equal to 160 dB re 1 μPa.

(ii) Ramp-up procedures. For all seismic surveys, including airgun testing, use the following ramp-up procedures to allow marine mammals to depart the exclusion zone before seismic surveying begins:

(a) Visually monitor the exclusion zone and adjacent waters for the absence of polar bears and walruses for at least 30 minutes before initiating ramp-up procedures. If no polar bears or walruses are detected, you may initiate ramp-up procedures. Do not initiate ramp-up procedures at night or when you cannot visually monitor the exclusion zone for marine mammals.

(b) Initiate ramp-up procedures by firing a single airgun. The preferred airgun to begin with should be the smallest airgun, in terms of energy output (dB) and volume (in^3) (cm^3).

(c) Continue ramp-up by gradually activating additional airguns over a period of at least 20 minutes, but no longer than 40 minutes, until the desired operating level of the airgun array is obtained.

(iii) Powerdown/Shutdown. Immediately power down or shut down the seismic airgun array and/or other acoustic sources whenever any walruses are sighted approaching close to or within the area delineated by the 180 dB re 1 µPa walrus exclusion zone, or polar bear are sighted approaching close to or within the area delineated by the 190 dB re 1 µPa polar bear exclusion zone. If the power down operation cannot reduce the received sound pressure level to 180 dB re 1 µPa (walrus) or 190 dB re 1 µPa (polar bears) the operator must immediately shut down the seismic airgun array and/or other acoustic sources.

(iv) Emergency shutdown. If observations are made or credible reports are received that one or more walruses and/or polar bears are within the area of the seismic survey and are in an injured or mortal state, or are indicating acute distress due to seismic noise, the seismic airgun array will be immediately shut down and the Service Incidental Take Coordinator contacted. The airgun array will not be restarted until review and approval has been given by either the Service Incidental Take Coordinator or their designee.

(v) Adaptive response for walrus aggregations. Whenever an aggregation of 12 or more walruses are detected within an acoustically verified 160 dB re 1 µPa disturbance zone ahead of or perpendicular to the seismic vessel track, the holder of this LOA must:

(a) Immediately power down the seismic airgun array and/or other acoustic sources to ensure sound pressure levels at the shortest distance to the aggregation do not exceed 160 dB re 1 μPa;

(b) Not proceed with powering up the seismic airgun array until it can be established that there are no walrus aggregations within the 160 dB zone based upon ship course, direction and distance from last sighting.

(5) Additional mitigation measures for onshore exploration activities.

(i) Polar Bear Interaction Plan. Holders of LOAs will be required to develop and implement a Service-approved, site specific, polar bear interaction plan. Polar bear awareness training will also be required of certain personnel. Polar Bear Interaction Plans will include:

(a) A description of the locations and types of activities to be conducted (a Plan of Operation);

(b) A food and waste management plan;

(c) Personnel training materials and procedures;

(d) Site at-risk locations and situations;

(e) A snow management plan;

(f) Polar bear and walrus observation and reporting procedures;

(g) Polar bear and walrus avoidance and encounter procedures.

(ii) Polar Bear Monitors. If deemed appropriate by the Service, holders of an LOA may be required to hire and train polar bear monitors to alert crew of the presence of polar bears and initiate adaptive mitigation responses.

(iii) Efforts to minimize disturbance around known polar bear dens. Holders of an LOA must take efforts to limit disturbance around known polar bear dens.

(iv) Efforts to locate polar bear dens. Holders of an LOA seeking to carry out onshore exploration activities in known or suspected polar bear denning habitat during the denning season (November to April) must make efforts to locate occupied polar bear dens within and near proposed areas of operation, utilizing appropriate tools, such as, forward looking infrared (FLIR) imagery and/or polar bear scent trained dogs. All observed or suspected polar bear dens must be reported to the Service's Incidental Take Coordinator or their designee prior to the initiation of exploration activities.

(v) Exclusion zone around known polar bear dens. Operators must observe a 1 mi (1.6 km) operational exclusion zone around all known polar bear dens during the denning season (November to April, or until the female and cubs leave the area). Should previously unknown occupied dens be discovered within one mile of activities, work in the area must cease immediately and the Service Incidental Take Coordinator contacted for guidance within 12 hours. 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. The holder of the authorization must comply with any additional measures specified.

(6) Mitigation measures for the subsistence use of walruses and polar bears.

(i) Limit Impacts. Holders of LOAs 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.

(ii) 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 50 CFR §18.114 (c)(4) for details). If community concerns suggest that the proposed activities may 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.

(iii) Plan of Cooperation. Where prescribed, holders of LOAs will be required to develop and implement a Service approved Plan of Cooperation.

(a) The Plan of Cooperation must include:

(1) A description of the procedures by which the holder of the LOA will work and consult with potentially affected subsistence hunters;

(2) 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.

(b) The Service will review the Plan of Cooperation to ensure that any potential adverse effects on the availability of the animals are minimized. The Service will reject Plans of Cooperation 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.

B. Monitoring Requirements

Depending on the sighting, timing, and nature of proposed activities, holders of LOAs will be required to:

(1) Maintain trained, Service approved, on site observers to carry out monitoring programs for polar bears and walruses necessary for initiating adaptive mitigation responses.

(i) Marine Mammal Observers will be required on board all operational and support vessels to alert crew of the presence of marine mammals and initiate adaptive mitigation responses identified in section (A), and to carry out specified monitoring activities identified in the Marine Mammal Monitoring and Mitigation Plan (4MP) (see below) necessary to evaluate the impact of authorized activities on walruses, polar bears, and the subsistence use of these subsistence resources. MMOs must have successfully completed an approved marine mammal observer training course appropriate for the Chukchi Sea region.

(ii) Polar bear monitors. Polar bear monitors will be required under the monitoring plan if polar bears are known to frequent the area or known polar bear dens are present in the area. Monitors will act as an early detection system in regards to proximate bear activity to Industry facilities.

(2) Develop and implement a site specific, Service approved, Marine Mammal Monitoring and Mitigation Monitoring Plan (4MP) to monitor and evaluate the effects of authorized activities on polar bears, walruses and the subsistence use of these resources. The 4MP must enumerate the number of walruses and polar bears encountered during specified exploration activities, estimate the number of incidental takes that occurred during specified exploration activities (document immediate behavioral responses as well as longer-term when possible), and evaluate the effectiveness of prescribed mitigation measures. Applicants must fund an independent peer review of proposed monitoring plans and draft reports of monitoring results. This peer review will consist of independent reviewers who have knowledge and experience in statistics, marine mammal behavior, and the type and extent of the proposed operations. The applicant will provide the results of these peer reviews to the Service for consideration in final approval of monitoring plans and final reports. The Service will distribute copies of monitoring reports to appropriate resource management agencies and co-management organizations.

(3) Cooperate with the Service and other designated Federal, State, and local agencies to monitor the impacts of oil and gas exploration activities in the Chukchi Sea on Pacific walruses or polar bears.

(i) Where additional information would further inform our analysis of the effects of activities on walruses, polar bears, and the subsistence use of these resources, holders of LOAs may be requested to participate in monitoring and/or research efforts that ensure the least practicable impact occurs to these resources. As an example, operators may be allowed to test new technologies during their activities that would be beneficial in minimizing disturbance to animals as long as efforts employ rigorous study designs, sampling protocols, and monitoring. In one case a seismic operation was allowed to conduct a pilot study on the effectiveness of FLIR imagery to detect animals on ice. Information needs in the Chukchi Sea include, but are not limited to:

(a) Distribution, abundance, movements, and habitat use patterns of walruses and polar bears in offshore environments;

(b) Patterns of subsistence hunting activities by the Native Villages of Kivalina, Point Hope, Point Lay, Wainwright, and Barrow for walruses and polar bears;

(c) Immediate and longer term (when possible) behavioral and other responses of walruses and polar bears to seismic airguns, drilling operations, vessel traffic, and fixed wing aircraft and helicopters (see (2) above);

(d) Contaminant levels in walruses, polar bears, and their prey;

(e) Cumulative effects of multiple simultaneous operations on walruses and polar bears;

(f) Oil spill risk assessment for the marine and shoreline environment of walruses, polar bears, their prey, and important habitat areas (coastal haulouts and den sites).

C. Reporting Requirements

Holders of LOAs must report the results of specified monitoring activities to the Service.

(1) In-season monitoring reports.

(i) Activity progress reports. Operators must keep the Service informed on the progress of authorized activities by:

(a) Notifying the Service at least 48 hours prior to the onset of activities;

(b) Providing weekly progress reports of authorized activities noting any significant changes in operating state and or location;

(c) Notifying the Service within 48 hours of ending activity.

(ii) Walrus observation reports. The operator must report weekly all observations of walruses during any Industry operation. Information within the observation report will include, but is not limited to:

(a) Date, time and location of each walrus sighting;

(b) Number, sex, and age of walruses (if determinable);

(c) Weather, visibility and ice conditions at the time of observation;

(d) Estimated range at closest approach;

(e) Industry activity at time of sighting and throughout the encounter. For a seismic survey, record the estimated radius of the zone of ensonification;

(f) Behavior of animals at initial sighting, any change in behavior during the period and distance from the observers associated with those behavioral changes;

(g) Description of the encounter;

(h) Duration of the encounter;

(i) Duration of any behavioral response (time and distance of a flight response);

(j) Observer name, company name, vessel name or aircraft number, LOA number and contact information;

(k) Actions taken.

(iii) Polar bear observation reports. The operator must report within 24 hours all observations of polar bears during any Industry operation. Information within the observation report will include, but is not limited to:

(a) Date, time, and location of observation;

(b) Number, sex, and age of polar bears (if determinable);

(c) Observer name, company name, vessel name, LOA number, and contact information;

(d) Weather, visibility, and ice conditions at the time of observation;

(e) Estimated closest point of approach for bears from personnel and facilities;

(f) Industry activity at time of sighting, and possible attractants present;

(g) Bear behavior;

(h) Description of the encounter;

(i) Duration of the encounter;

(j) Actions taken.

(iv) Notification of incident report. The operator must report any incidental lethal take or injury of a polar bear or walrus; and observations of walruses or polar bears within prescribed mitigation monitoring zones to the Service within 24 hours. Reports should include all information specified under the species observation report, as well as a full written description of the encounter and actions taken by the operator.

(2) After-action monitoring reports.

(i) The 4MP reporting requirements. The results of monitoring efforts identified in the 4MP must be submitted to the Service for review within 90 days of completing the year's activities. Results must include, but are not limited to the following information:

(a) A summary of monitoring effort including: total hours, total distances, and distribution through study period;

(b) Analysis of factors affecting the visibility and detectability of walruses and polar bears by specified monitoring;

(c) Analysis of the distribution, abundance and behavior of walrus and polar bear sightings in relation to date, location, ice conditions and operational state;

(d) Estimates of take based on the number of animals encountered/kilometer of vessel and aircraft operations by behavioral response (no response, moved away, dove, etc.), and animals encountered per day by behavioral response for stationary drilling operations;

(e) Raw data in electronic format (Excel spreadsheet) as specified by the Service in consultation with industry representatives.

VII. CONCLUSIONS

Based on the information contained in the BOEM/BSEE Chukchi Sea Lease Sale 193 EIS, the Chukchi Sea Final Supplemental EIS, Chukchi Sea Planning Area, Oil and Gas Lease Sale 193, the best available scientific information, and information contained in this document, the Service has determined that the impact of Industry exploration work as defined herein will result in Level B harassment of small numbers of polar bears and Pacific walruses, relative to their population sizes. Moreover, the appropriate manner in which to mitigate these impacts is to promulgate ITRs. While incidental harassment of polar bears and walrus is reasonably likely or can be reasonably expected to occur as a result of proposed activities, the overall impact will be negligible on polar bear and Pacific walrus populations. In addition, we find that the anticipated takes will be limited to disturbances affecting a relatively small number of animals and those disturbances will be relatively short term in duration. No significant behavioral responses are likely to occur that will cause a disruption in normal activities. Furthermore, we do not expect the anticipated level of harassment from these proposed activities to affect the rates of recruitment or survival of Pacific walrus and polar bear populations. Once promulgated, the ITRs will provide mitigation measures to limit the impacts of Industry to Pacific walruses and polar bears. In addition, given the mitigation measures provided by the ITRs and the additional operational mitigation measures stipulated by the BOEM/BSEE, we conclude that the specified activity will not have an unmitigable adverse impact on the availability of walruses or polar bears for subsistence uses. In summary, the effects of the rule are not significant because it only authorizes incidental take of small numbers that will have only negligible impacts on trust species populations and no unmitigable impact on subsistence use of those species.

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VIII. AGENCIES/PERSONS CONSULTED
Persons and Agencies consulted included the following:

NON-GOVERNMENTAL ORGANIZATIONS

Audubon Alaska

Arctic Connections

Alaska Eskimo Whaling Commission

Alaska Nanuuq Commission

Center for Biological Diversity

Defenders of Wildlife

Earthjustice

Eskimo Walrus Commission

Friends of Animals

Greenpeace

Indigenous People's Council for Marine Mammals

Northern Alaska Environmental Center

North Slope Borough, Department of Wildlife Management

National Wildlife Federation

Polar Bears International

Sierra Club Alaska Chapter

Trustees for Alaska

Wilderness Society

World Wildlife Fund Alaska

NATIVE CORPORATIONS

Ukpeagvik Inupiat Corporation

Brevig Mission Native Corporation

Diomede Native Corporation

Elim Native Corporation

Sivuqaq Incorporated

Golovin Native Corporation

Kaktovik Inupiat Corporation

Little King Island Native Corporation

Kikiktagruk Inupiat Corporation

Koyuk Native Corporation

Sitnasuak Native Corporation

Kuukpik Native Corporation

Tigara Village Corporation

Cully Village Corporation

Kukulget, Inc.

Savoonga Village Corporation

Shaktoolik Native Corporation

Shishmaref Native Corporation

Stebbins Native Corporation

Solomon Native Corporation

Unalakleet Native Corporation

Wainwright Olgoonik Corporation

Wales Native Corporation

White Mountain Native Corporation

Arctic Slope Regional Corporation

Bering Straits Native Corporation

NANA Regional Corporation, Inc.

NATIVE TRIBES/COMMUNITIES

Native Village of Barrow Inupiat Traditional Council

Native Village of Kotzebue

Native Village of Point Hope IRA

Native Village of Savoonga IRA

Native Village of Brevig Mission

King Island Native Community IRA

Native Village of Wales IRA

Native Village of Kivalina

Native Village of Elim

Native Village of Koyuk

Nome Eskimo Community

Native Village of St. Michael

Native Village of Shaktoolik IRA

Native Village of Solomon

Stebbins Community Association

Native Village of Teller

Native Village of Unalakleet

Native Village of White Mountain

Native Village of Deering

Noorvik Native Community

Native Village of Selawik

Native Village of Gambell

Additional Agencies and Groups Consulted

Alaska Oil and Gas Association

ConocoPhillips Alaska, Incorporated

Marine Mammal Commission

National Marine Fisheries Service

Shell Offshore, Incorporated

U.S. Bureau of Ocean Energy Management

U.S. Bureau of Safety and Environmental Enforcement

U.S. Geological Survey, Alaska Science Center

IX. REFERENCES

ACIA. 2004. Impacts of a Warming Arctic: Arctic Climate Impact Assessment. Cambridge, UK: Cambridge University Press.

Amstrup, S.C., I. Stirling, and J.W. Lentfer. 1986. Past and present status of polar bears in Alaska. Wildlife Society Bulletin 14: 241-254.

Amstrup, S.C., and D.P. DeMaster. 1988. Polar bear, *Ursus maritimus*. Pages 39-45, *in* J.W. Lentfer, *ed.* Selected Marine Mammals of Alaska: Species Accounts with Research and Management Recommendations. Marine Mammal Commission, Washington, D.C.

Amstrup, S.C., C. Gardner, K. C. Myers, and F. W. Oehme. 1989. Ethylene glycol (antifreeze) poisoning in a free-ranging polar bear. Veterinary and Human Toxicology 31: 317-319.

Amstrup, S.C., and C. Gardner. 1994. Polar bear maternity denning in the Beaufort Sea. Journal of Wildlife Management 58: 1–10.

Amstrup, S.C. 1995. Movements, distribution, and population dynamics of polar bears in the Beaufort Sea. Ph.D. Dissertation. University of Alaska Fairbanks. Fairbanks, Alaska, 299 pages.

Amstrup, S.C., G.M. Durner, I. Stirling, N.J. Lunn, and F. Messier. 2000. Movements and distribution of polar bears in the Beaufort Sea. Canadian Journal of Zoology 78: 948–66.

Amstrup, S.C. 2003. Polar bear, *Ursus maritimus*, *in* Wild Mammals of North America: Biology, Management, and Conservation, edited by G.A. Feldhamer, B.C. Thompson, and J.A. Chapman. Baltimore. John Hopkins University Press.

Amstrup, S.C., T.L. McDonald, and G.M. Durner. 2004. Using satellite radio-telemetry data to delineate and manage wildlife populations. Wildlife Society Bulletin 32: 661-679.

Amstrup, S.C., G.M. Durner, I. Stirling, and T.L. McDonald. 2005. Allocating harvests among polar bear stocks in the Beaufort Sea. Arctic 58: 247-259.

Amstrup, S.C., G.M. Durner, T.L. McDonald, and W.R. Johnson. 2006. Estimating potential effect of hypothetical oil spills on polar bears. USGS report final report for MMS, March 2006. Anchorage, AK: USGS, Alaska Science Center. 56 pp.

Amstrup, S.C., B.G. Marcot, and D.C. Douglas. 2007. Forecasting the Rangewide Status of Polar Bears at Selected Times in the 21st Century. Administrative Report. Reston, VA. U.S Geological Survey.

Andersen, L.W., E.W. Born, I. Gjertz, O. Wiig, L.E. Holm, and C. Bendixen. 1998. Population structure and gene flow of the Atlantic walrus (*Odobenus rosmarus rosmarus*) in the eastern Atlantic arctic based on mitochondrial DNA and microsatellite variation. Molecular Ecology 7: 1323-1336.

Andersen, M., E. Lie, A.E. Derocher, S.E. Belikov, A. Bernhoft, A.N. Boltunov, *et al*. 2001. Geographic variation of PCB congeners in polar bears (*Ursus maritimus*) from Svalbard east to beaches of the Chukchi Sea in Alaska following a mortality event, September 2009. United State Geological Survey, Open-file Report 2009-1291, Reston, VA.

Belikov, S., A.N. Boltunov and Y. Gorbunov. 1996. Distribution and migration of polar bears, Pacific walruses, and gray whales depending on ice conditions in the Russian arctic. Polar Biology 9: 263-274.

Blix, A.S. and J.W. Lentfer. 1979. Modes of thermal protection in polar bear cubs: at birth and on emergence from the den. American Journal of Physiology 236: R67–74.

BOEM (Bureau of Ocean Energy Management). 2012. Alaska Annual Studies Plan. U.S. Department Of The Interior, Bureau Of Ocean Energy Management, Alaska Outer Continental Shelf Region. Anchorage, Alaska, http://www.boem.gov/uploadedFiles/BOEM/Environmental_Stewardship/Environmental_Studies/Alaska_Region/Alaska_Studies_Plan/2013AlaskaStudiesPlan.pdf.

BOEMRE (Bureau of Ocean Energy Management, Regulation and Enforcement). 2011. Chukchi Sea Planning Area: Oil and Gas Lease Sale 193 in the Chukchi Sea, Alaska. Anchorage, AK: U.S Department of the Interior, BOEMRE, Alaska OCS Region. Publication OCS EIS/EA BOEMRE 2011-041.

Born, E.W., S. Rysgaard, G. Ehlme, M. Sejr, M. Acquarone, and N. Levermann. 2003. Underwater observations of foraging free-living Atlantic walruses (*Odobenus rosmarus rosmarus*) and estimates of their food consumption. Polar Biology 26: 348-357.

Boveng, P.L., J.L. Bengtson, T.W. Buckley, M.F. Cameron, S.P. Dahle, B.A. Megrey, J.E. Overland, and N.J. Williamson. 2008. Status review of the ribbon seal (*Histriophoca fasciata*). Nation. Oceanic Atmospheric Administration, Technical Memorandum, NMFS-AFSC-191.

Bowen, D., and D.B. Siniff. 1999. Distribution, population biology, and feeding ecology of marine mammals. Pages 423-484, i*n* J.E. Reynolds, III and S.A. Rommel, *eds.* Biology of Marine Mammals. Smithsonian Press, Washington, D.C. 579 pages.

Brower, C.D., A. Carpenter, M.L. Brainpan, W. Calvert, T. Evans, A.S. Fischbach, J.A. Nagy, S. Schliebe, and I. Stirling. 2002. The Polar bear management agreement for the Southern Beaufort Sea: An evaluation of the first ten years of a unique conservation agreement. Arctic 55(4): 362-372.

Brueggeman, J.J., C.I. Malmoe, R.A. Grotefendt, D.P. Volsen, J.J. Burns, D.G. Chapman, D.K. Ljungblad, and G.A. Green. 1990. 1989 Walrus Monitoring Program: The Klondike, Burger, and Popcorn Prospects in the Chukchi Sea. Report from Ebasco Environmental, Bellevue, WA, for Shell Western E&P, Inc. Houston, TX. 62 pages.

Brueggeman, J.J., D.P. Volsen, R.A. Grotefendt, G.A. Green, J.J. Burns, D.K. Ljungblad. 1991. Final Report Shell Western E&P Inc. 1990 Walrus Monitoring Program: The Popcorn, Burger, and Crackerjack Prospects in the Chukchi Sea. Rep. from Ebasco Environmental, Bellevue, WA, for Shell Western E&P, Inc. Houston, TX. 54 pages.

Burns, J.J. 1970. Remarks on the distribution and natural history of pagophilic pinnipeds in the Bering and Chukchi Seas. J. Mamm. 51 (3): 445-454.

Burns, J.J., L.H. Shapiro and F.H. Fay. 1981. Ice as marine mammal habitat in the Bering Sea. Pages 781-797, *in*: Hood D. W. and J.A. Calder (*Eds*). The eastern Bering Sea shelf: Oceanography and resources. U.S Department of Commerce, National Oceanic and Atmospheric Association, Office of Marine Pollution Assessment, Juneau, AK.

Carey, A. G. 1991. Ecology of North American Arctic continental shelf benthos: A review. Continental Shelf Research 11: 865-883.

Charrier, I., 2011. Social vocal communication in captive Pacific walruses *Odobenus rosmarus divergens.* Mammalian biology: Zeitschrift für Säugetierkunde, 76: 622-627.doi: 10.1016/j.mambio.2010.10.006

Chelintsev, N.G. 1977. Determination of the absolute number of dens based on the selective counts. Pages 66-85, *In* Uspenski, S.M., *ed*. The polar bear and its conservation in the Soviet Arctic. Moscow, Central Laboratory on Nature Conservation. (in Russian with English summary).

Comiso, J.C., C.L. Parkinson, R. Gersten, and L. Stock. 2008. Accelerated decline in the Arctic sea ice cover. Geophysical Research Letters 35 (L01703): 1-6.

Cooper, L.W., C.J. Ashjian, S.L. Smith, L.A. Codispoti, J.M. Grebmeier, R.G. Campbell and B. Sherr. 2006. Rapid seasonal sea-ice retreat in the Arctic could be affecting Pacific walrus (*Odobenus rosmarus divergens*) recruitment. Aquatic Mammals 32: 98-102.

Cronin, M.A., S. Hills, E.W. Born and J.C. Patton. 1994. Mitochondrial DNA variation in Atlantic and Pacific walruses. Canadian Journal of Zoology 72: 1035-1043.

Dauvin, J.C. 1998. The fine sand Abra alba community of the Bay of Morlaix twenty years after the Amoco Cadiz oil spill. Marine Pollution Bulletin. 36: 669−676.

DeBruyn, T.D., Evans, T.J., Miller, S., Perham, C., Regehr, E., Rode, K., Wilder, J., and Leirheimer, L.J. 2010. Polar Bear Conservation in the United States, 2005–2009. Pages 179-198, *in* M.E. Obbard, G.W. Thiemann, E. Peacock, and T.D. DeBruyn (*eds.*) Polar Bears: Proceedings of the 15th Working Meeting of the IUCN/SSC Polar Bear Specialist Group, Copenhagen, Denmark, 29 June to 3 July 2009. Gland, Switzerland and Cambridge, UK: IUCN.

Dehn, L.A., G.G. Sheffield, E.H. Follmann, L.K. Duffy, D.L. Thomas, and T.M. O'Hara. 2007. Feeding ecology of phocid seals and some walrus in the Alaskan and Canadian Arctic as determined by stomach contents and stable isotope analysis. Polar Biology 30: 167-181.

Delarue, J., B. Martin, X. Mouy, J. MacDonnell, D. Hannay, and N.E. Chorney. 2011. Chukchi Sea Joint Acoustic Monitoring Program 2009 and 2010. Seattle, WA: JASCO Applied Sciences. Technical report prepared for ConocoPhillips Company, Shell Exploration and Production Company, and Statoil USA E&P, Inc. Draft Report Version 1.0.

DeMaster, D.P., and I. Stirling. 1981. Ursus maritimus. Mammalian Species: 1-7. Publication of The American Society of Mammalogists.

Derocher, A.E., and I. Stirling. 1996. Aspects of survival in juvenile polar bears. Canadian Journal of Zoology 74: 1246–52.

Derocher, A.E., N.J. Lunn, and I. Stirling. 2004. Polar Bears in a Warming Climate. Integrative and Comparative Biology 44: 163-176.

Douglas, D.C. 2010. Arctic sea ice decline: Projected changes in timing and extent of sea ice in the Bering and Chukchi Seas: U.S. Geological Survey Open-File Report 2010-1176. 32 pages.

Dunton, K. C. Ashjian, R. Campbell, L. Cooper, J. Grebmeier, R. Harvey, B. Konar, D. Maidment, S. Schonberg, J. Trefry, and T. Weingartner. 2013. An Integrated Ecosystem Field Study of Hanna Shoal, Northern Chukchi Sea, Alaska. AK. Mar. Sci. Symp., http://www.alaskamarinescience.org/documents/AMSS_Book_of_Abstracts_2013.pdf.

Durner G.D., S.C. Amstrup, A.S. Fischbach. 2003. Habitat characteristics of polar bear terrestrial maternal den sites in northern Alaska. Arctic 56: 55-62.

Durner G.M., S.C. Amstrup, R. Nielson, T. McDonald. 2004. Using discrete choice modeling to generate resource selection functions for female polar bears in the Beaufort Sea, *in* S. Huzurbazar (Ed.), Resource Selection Methods and Applications: Proceedings of the 1st International Conference on Resource Selection, 13 to 15 January 2003, Laramie, WY. Pages 107-120.

Durner G.M., S.C. Amstrup., K.J. Ambrosius. 2006. Polar bear maternal den habitat in the Arctic National Wildlife Refuge, Alaska. Arctic 59: 31-36.

Durner, G.M., D.C. Douglas, and S.C. Amstrup. 2009. Polar bear habitat in Alaska: inland extent of maternity denning and graphics showing observed and predicted changes in offshore optimal habitat. Administrative Report to the U.S. Fish and Wildlife Service. U.S. Department of the Interior, U.S. Geological Survey, Anchorage, Alaska. 9pp.

Durner, G.M., A.S. Fischbach, S.C. Amstrup., and D.C. Douglas. 2010. Catalogue of polar bear (*Ursus maritimus*) maternal den locations in the Beaufort Sea and neighboring regions, Alaska, 1910–2010: U.S. Geological Survey Data Series 568-268, 14 pp.

Dyke, A.S., J. Hooper, C.R. Harington and J.M. Savelle. 1999. The late Wisconsinan and Holocene record of walrus (*Odobenus rosmarus*) from North America: A review with new data from Arctic and Atlantic Canada. Arctic 52: 160-181.

Elliott, H.W. 1882. A monograph of the seal-islands of Alaska. Government Printing Office, Washington, D.C. 250 pages.

Elmgren, R., S. Hasson, U. Larsen, B.B. Sundelin, and P.D. Boehm. 1983. The *Tesis* oil spill: Acute and long-term impact on the benthos. Marine Biology 73: 51-65.

Evans, T.J., A. Fischbach, S. Schliebe, B. Manly, S. Kalxdorff, and G. York. 2003. Polar aerial survey in the Eastern Chukchi Sea: A Pilot Study. Arctic 56(4): 359-366.

Fay, F.H. and C. Ray. 1968. Influence of climate on the distribution of walruses, *Odobenus rosmarus* (Linnaeus). I. Evidence from thermoregulation behavior. Zoologica 53: 1-18.

Fay, F.H. and B.P. Kelly. 1980. Mass natural mortality of walruses (*Odobenus rosmarus*) at St. Lawrence Island, Bering Sea, autumn 1978. Arctic 33: 226-245.

Fay, F.H. 1982. Ecology and Biology of the Pacific walrus, *Odobenus rosmarus divergens* Illiger. North American Fauna No. 74.

Fay, F.H., G.C. Ray and A. Kibal'chich. 1984. Time and location of mating and associated behavior of the Pacific walrus, *Odobenus rosmarus divergens*, Illiger. Pages 89-99, *in:* Fay, F.H. and G.A. Fedoseev, (*Eds*) Soviet-American cooperative research on marine mammals. Volume 1 - pinnipeds. U.S Department of Commerce, National Ocean and Atmospheric Association, Anchorage, AK.

Fay, F.H and J.J. Burns. 1988. Maximal feeding depth of walruses. Arctic 41: 239-240.

Fay, F.H., B.P. Kelly, and J.L. Sease. 1989. Managing the exploitation of Pacific walruses: A tragedy of delayed response and poor communication. Marine Mammal Science 5: 1–16.

Fay, F.H., L.L. Eberhardt, B.P. Kelly, J.J. Burns and L.T. Quakenbush. 1997. Status of the Pacific walrus population, 1950-1989. Marine Mammal Science 13: 537–565.

Fedoseev, G.A. 1984. Present status of the population of walruses (*Odobenus rosmarus*) in the eastern Arctic and Bering Sea. Pages 73-85, *in* V.E. Rodin, A.S. Prelove, A.A. Bedzin, G.M. Gavril, A.I. Shevchenko, N.S. Faded, and E.B. Kucheriavenko (EDS.), Marine Mammals of the Far East. TINRO, Vladivostok.

Fischbach, A.S., S.C. Amstrup, and D. Douglas. 2007. Landward and Eastern Shift of Alaska Polar Bear Denning Associated with Recent Sea Ice Changes. Polar Biology 30: 1395–1405.

Fisher, K.I., and R.E.A. Stewart. 1997. Summer foods of Atlantic walrus, *Odobenus rosmarus rosmarus*, in northern Foxe basin, Northwest Territories. Canadian Journal of Zoology 75: 1166-1175.

Freitas, C., K.M. Kovacs, R.A. Ims, M.A. Fedak, and C. Lydersen. 2009. Deep into the ice: Overwintering and habitat selection in male Atlantic walruses. Marine Ecology Progress Series 375: 247-261.

Frost, K.J., L.F. Lowry and J.J. Burns. 1983. Distribution of marine mammals in the coastal zone of the Bering Sea during summer and autumn. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Juneau, Alaska.

Garlich-Miller, J.L. and C. Pungowiyi. 1999. Proceedings of a workshop concerning walrus harvest monitoring in Alaska and Chukotka. U.S. Fish and Wildlife Service, Marine Mammals Management, Anchorage, AK, 59 pp.

Garlich-Miller, J.L. and CV. Jay, *eds*. 2000. Proceedings of a workshop concerning walrus survey methods. U.S. Department of the Interior, U.S. Fish and Wildlife Service, Marine Mammals Management, Technical Report MMM 00-2, Anchorage, AK. 97 pages.

Garlich-Miller, J.L., L.T. Quakenbush and J.F. Bromaghin. 2006. Trends in age structure and Productivity of Pacific walruses Harvested in the Bering Strait region of Alaska, 1952– 2002. Marine Mammal Science 22: 880–896.

Garlich-Miller, J., J. MacCracken, J. Snyder, R. Meehan, M. Myers, J. Wilder, E. Lance, and A. Matz. 2011a. Status Review of the Pacific Walrus (*Odobenus rosmarus divergens*). Anchorage, AK, and Fairbanks, AK: U.S. Department of Interior, U.S Fish and Wildlife Service.

Garlich-Miller, J., W. Neakok, and R. Stimmelmayr. 2011b. Field report: walrus carcass survey, Point Lay, Alaska September 11-15, 2011. U.S. Fish and Wildlife Service, Marine Mammals Management, Anchorage, AK. 16 pages.

Garner, G.W., S.T. Knick, and D.C. Douglas. 1990. Seasonal movements of adult female polar bears in the Bering and Chukchi seas. International Conference of Bear Research and Management 219-226.

Garner, G.W., L.L. McDonald, D.S. Robson, D.P. Young Jr., and S.M. Arthur. 1992. Literature review: Population estimation methodologies applicable to the estimation of abundance of polar bears. Internal Report, USFWS. 102 pages.

Garner, G.W., M.S. Stishov, Ø. Wiig, A. Boltunov, G.I. Belchansky, D.C. Douglas, L.L. McDonald, D.M. Mulcahy, and S. Schliebe. 1998. Polar bear research in western Alaska, eastern and western Russia 1993-1996, pp. 125-129. In A.E. Derocher, G. Garner, N. Lunn, and Ø. Wiig (*eds*.), Proceedings of the Twelfth Working Meeting of the IUCN/SSC Polar Bear Specialist Group. 3-7 February, 1997. Oslo, Norway. IUCN, Gland, Switzerland, and Cambridge, U.K. v + 159 pages.

Gehnrich, P.H. 1984. Nutritional and behavioral aspects of reproduction in walruses. Unpubl.

Gilbert, J.R. 1989. Aerial census of Pacific walrus in the Chukchi Sea, 1985. Marine Mammal Science 5(1): 17-28.

Gilbert, J.R., G.A. Fedoseev, D. Seagars, E. Razlivalov, and A. LaChugin. 1992. Aerial census of Pacific walrus, 1990. USFWS R7/MMM Technical Report 92-1 33 pages.

Gilbert, J.R. 1999. Review of previous Pacific walrus surveys to develop improved survey designs. In: Garner, G.W., S.C. Amstrup, J.L. Laake, B.F.J. Manly, L.L. McDonald.

Gingras, M.K., I.A. Armitage, S.G. Pemberton and H.E. Clifton. 2007. Pleistocene walrus herds in the Olympic Peninsula area: trace-fossil evidence of predation by hydraulic jetting. Palaios 22: 539–545.

Grebmeier, J.M., L.W. Cooper, H.M. Feder and B.I. Sirenko. 2006. Ecosystem dynamics of the Pacific-influenced Northern Bering and Chukchi seas in the Amerasian Arctic. Progress in Oceanography 71: 331-361.

Hannay, D.E., X. Mouy, B. Martin, and J. Delarue. 2012. Acoustic detection of Pacific walrus in the northeastern Chukchi Sea, September 2007-July 2011. Page 50, *in* J. Duffy-Anderson, *ed.* 2012 Alaska marine science symposium book of abstracts. NOAA Alaska Fisheries Science Center, Seattle, WA. 252 pages.

Harrington, C.R. 2008. The evolution of arctic marine mammals. Ecological Applications 18: 23-40.

Heptner, V., K. Chapskii, V. Arsen'ev and V. Sokolov e*ds.* 1976. Pinnipeds and toothed whales: Pinnipedia and odontoceti. Mammals of the Soviet Union. Vysshaya Shkola, Moscow. 20 pages.

Hills, S. and J.R. Gilbert. 1994. Detecting Pacific walrus population trends with aerial surveys: A review. Transactions of the fifty-ninth North American wildlife and natural resources conference 59: 201-210.

Insley, S.J., A.V. Phillips, I. Charrier. 2003. A review of social recognition in pinnipeds. Aquat. Mamm. 29: 181–201.

Ireland, D., R. Rodrigues, D. Funk, W. Koski, and D. Hannay, *eds*. 2009. Marine Mammal Monitoring and Mitigation during Open Water Seismic Exploration by Shell Offshore Inc. in the Chukchi and Beaufort seas, July-October 2008: 90-Day Report. LGL Report P1049-1 prepared by LGL Alaska Research Associates, Inc., Anchorage AK, LGL Ltd. Environmental Research Associates, King City Ont., CA, and Jasco Research Ltd., Victoria, B.C. for Shell Offshore Inc., Houston TX, National Marine Fisheries Service, Silver Springs, MD, and U.S. Fish and Wildlife Service, Anchorage, AK.

Jacobs, R.P.W.M. 1980. Effects of the *Amoco Cadiz* oil spill on the seagrass community at Roscoff with special reference to the benthic infauna. Marine Ecology Progress Series 2: 207-212.

Jay, C.V., S.D. Farley and G.W. Garner. 2001. Summer diving behavior of male walruses in Bristol Bay, Alaska. Marine Mammal Science 17: 617–631.

Jay, C.V. and S. Hills. 2005. Movements of walruses radio-tagged in Bristol Bay, Alaska. Arctic 58: 192-202.

Jay, C.V. and A.S. Fischbach. 2008. Pacific walrus response to Arctic Sea-ice losses. U.S. Department of the Interior, U.S., Geological Survey, Alaska Science Center, Fact sheet 2008-3041, Anchorage, AK. 1 page.

Jay, C.V., P.M. Outridge and J.L. Garlich-Miller. 2008. Indication of two Pacific walrus stocks from whole tooth elemental analysis. Polar Biology 31: 933-943.

Jay, C.V., M.S. Udevitz, R. Kwok, A.S. Fischbach and D.C. Douglas. 2010. Divergent movements of walrus and sea-ice in northern Bering Sea. Marine Ecology Progress Series. Vol. 407: 293–302, 2010.

Jay, C.V., A.S. Fischbach, and A.A. Kochnev. 2012. Walrus areas of use in the Chukchi Sea during sparse sea ice cover. Marine Ecology Progress Series Vol. 468: 1–13, 2012.

Jefferson, T.A., M.A. Webber and R.L. Pitman. 2008. Walrus- *Odobenus rosmarus*. Pages 549-568, *in* Marine Mammals of the World. Academic Press, San Diego.

Jewett, S.C., H.M. Feder and A. Blanchard. 1999. Assessment of the Benthic Environment Following Offshore Placer Gold Mining in the Northeastern Bering Sea. Marine Environmental Research. 48: 91-122.

Johnson, A.M., J. Burns, W. Dusenberry, and R. Jones. 1982. Aerial survey of pacific walrus, 1980, U.S. Fish and Wildlife Service, Anchorage, Alaska. 32 pages.

Kalxdorff, S.B. and A. Fischbach. 1998. Distribution and abundance of marine mammal carcasses on beaches in the Bering, Chukchi, and Beaufort seas, Alaska 1995-1997.

Unpublished Report MMM 98-1, U.S. Fish and Wildlife Service, Marine Mammals Management, Anchorage, Alaska. 27 pages.

Kastak, D., B.L. Southall, R.J. Schusterman and C.R. Kastak. 2005. Underwater temporary threshold shift in pinnipeds: effects of noise level and duration. J. Acoust. Soc. Am. 118 (5): 3154–3163.

Kastelein, R.A., P. Mosterd, B. van Santen, M. Hagedoorn, and D. de Haan. 2002. Underwater audiogram of a Pacific walrus (*Odobenus rosmarus divergens*) measured with narrow-band frequency-modulated signals. J. Acoust. Soc. Am. 112(5): 2173-2182.

Kavry, V.I., Kochnev, A.A., Nikiforov, V.V., and Boltunov, A.N., 2006, Cape Vankarem – nature-ethnic complex at the Arctic coast of Chukotka (northeastern Russia). Pages 227-230, *in* Collection of Scientific Papers from the Marine Mammals of the Holarctic Marine Mammals of the Holarctic IV, St. Petersburg, September 10-14, 2006.

Kavry, V.I., A.N. Boltunov and V.V. Nikiforov. 2008. New coastal haulouts of walruses (*Odobenus rosmarus*) – response to the climate changes. Pages 248-251, *in:* Collection of scientific papers from the Marine Mammals of the Holarctic V Conference, Odessa, Ukraine.

Kelly, B.P. 2001. Climate change and ice breeding pinnipeds. Pages 43-55, *in* Walther, G., C.A. Burga, and P.J. Edwards *eds.* Fingerprints of climate change. Kluwer Academic/Plenum Publishers, New York, NY.

Klaus, A.D., J.S. Oliver, and R.G. Kvitek. 1990. The effects of gray whale, walrus, and ice gouging disturbance on benthic communities in the Bering Sea and Chukchi Sea, Alaska. National Geographic Research 6: 470-484.

Kochnev, A.A., 1999. Pacific walrus in coastal waters of Wrangell Island (1991-1994). (Translated from Russian by Marina Bell) News of the Pacific Fisheries Research Center 126, p. 447- 464.

Kochnev, A.A. 2004. Warming of eastern Arctic and present status of the Pacific walrus (*Odobenus rosmarus divergens*) population. Marine Mammals of the Holarctic. Marine Mammal Commission (Russia), Moscow.

Kochnev, A.A. 2005. Development of the Pacific walrus aerial survey methodology. Ministry of Agriculture of the Russian Federation, Federal Fisheries Agency, Moscow.

Kochnev, A.A., 2006. Coastal haulout of Pacific walruses (Odobenus rosmarus divergens) on Kolyuchin Island, the Chukchi Sea. Pages 266-274, *in* Collection of Scientific Papers from the Marine Mammals of the Holarctic Marine Mammals of the Holarctic IV, St. Petersburg, September 10-14, 2006

Kovacs, K.M. and C. Lydersen. 2008. Climate change impacts on seals and whales in the North Atlantic Arctic and adjacent shelf seas. Science Progress 91: 117-150.

Labelle J.C., J.L. Wise, R.P. Voelker, R.H. Schulze, and G.M Wohl. 1983. Alaska marine ice atlas. Arctic Environmental Information Data Center, University of Alaska, Anchorage, AK. Page 302.

Larsen, T. 1985. Polar bear denning and cub production in Svalbard, Norway. Journal of Wildlife Management 49: 320–26.

Laver, P.N., and M.J. Kelly, 2008. A critical review of home range studies. Journal of Wildlife Management 72: 290–298.

Lentfer, J.W., and R. J. Hensel. 1980. Alaskan polar bear denning. International Conference on Bear Research and Management 4: 101–8.

Levermann, N., A. Galatius, G. Ehlme, S. Rysgaard, and E. W. Born. 2003. Feeding behaviour of free-ranging walruses with notes on apparent dextrality of flipper use. BMC Ecology 3(9): 1-13.

Lindqvist, C., L. Bachmann, L.W. Andersen, E.W. Born, U. Arnason, K.M. Kovacs, C. Lydersen, A.V. Abramov and Ø. Wiig. 2009. The Laptev Sea walrus *Odobenus rosmarus laptevi*: An enigma revisited. Zoologica Scripta 38: 113-127.

Lunn, N.J., S. Schliebe, and E.W. Born, *eds*. 2002. Polar bears: Proceedings of the 13th working meeting of the IUCN/SSC Polar Bear Specialist Group. IUCN, Gland, Switzerland, and Cambridge, U.K. vii +153 pages.

MacCracken, J.G. 2012. Pacific Walrus and climate change: observations and predictions. Ecology and Evolution 2: 2072–2090.

Markus, T., J.C. Stroev, and J. Miller. 2009. Recent changes in Arctic sea ice melt onset, freezeup, and melt season length. Journal of Geophysical Research. 114(C12024): 1-14.

Maslanik, J., S. Drobot, C. Fowler, W. Emery, and R. Barry. 2007. On the Arctic climate paradox and the continuing role of atmospheric circulation in affecting sea ice conditions. Geophysical Research Letters 34(L03711): 1-4.

Miller, E.H. 1985. Airborne acoustic communication in the Walrus *Odobenus rosmarus,* NGR, Winter. Pages 124-145.

Monnett, C., and J.S. Gleason. 2006. Observations of mortality associated with extended open-water swimming by polar bears in the Alaskan Beaufort Sea. Polar Biol. 29(8): 681–687.

Mouy, X., D. Hannay, M. Zykov. 2012. Tracking of Pacific Walruses in the Chukchi Sea Using a Single Hydrophone. J Acoust Soc Am. 31(2): 1349-58.

Muir, D., B. Braune, B. DeMarch, R. Norstrom, R. Wageman, L. Lockhart, *et al*. 1999. Spatial and Temporal Trends and Effects of Contaminants. Pages 351–352, *in* 2 D.C.G. Muir *et al*. 2005. Science of the Total Environment, 1–3 the Canadian Arctic marine ecosystem: A Review. Sci Total Environ. 230: 83– 144.

Mulcahy, D., T. Fischbach, D. Monson, C. Jay, K. Oakley, J. Garlich-Miller, J. Snyder, D. Rippeto, E. Marek, C. Goertz, J. Prewitt, L. Polasek, R. Suydam, C. George, T. Sformo, B. Adams, and H. Aguvluk. 2009. Preliminary findings: Pacific walrus mortality event, Icy Cape region, Alaska, September, 2009. U.S. Fish and Wildlife Service, Marine Mammals Management, Anchorage AK, 4 pages.

Mymrin, N.I., G.P. Smirnov, A.S. Gaevskiy and V.E. Kovalenko. 1990. Seasonal distribution and abundance of walruses in the Gulf of Anadyr of the Bering Sea. Zoological Journal 3: 105-113.

Nachtigall, P.E., A.Y. Supin, M. Amundin, B. Röken, T. Møller, T.A. Mooney, K.A. Taylor, and M.E. Yuen. 2007. Polar bear (*Ursus maritimus*) hearing measured with auditory evoked potentials. Journal of Experimental Biology 210: 1116-1122.

NAMMCO (North Atlantic Marine Mammal Commission). 2004. Report of the NAMMCO workshop on hunting methods for seals and walrus. North Atlantic Marine Mammal Commission, Copenhagen, Denmark. 60 pages.

NMFS (National Marine Fisheries Service). 2013. Effects of Oil and Gas Activities in the Arctic Ocean Supplemental Draft Environmental Impact Statement. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Office of Protected Resources, Silver Spring, MD, http://www.nmfs.noaa.gov/pr/permits/eis/arctic_sdeis.pdf.

Norstrom, R.J., M. Simon, D.C.G. Muir and R. Schweinsburg. 1988. Organochlorine contaminants in Arctic marine food chains: Identification, geographical distribution and temporal trends in polar bears. Environ Sci. Technol. 22: 1063–1071.

NRC (National Research Council of the National Academies). 2003. Cumulative Environmental effects of Oil and Gas Activities on Alaska's North Slope. The National Academies press, Washington, D.C., USA. 288 pp.

NSIDC. (National Snow and Ice Data Center) 2012. Arctic sea ice news and analysis. Available at: *http: //nsiD.C.org/arcticseaicenews/*. Downloaded 10/10/2012 3: 18: 33 PM.

Obbard, M.E., Thiemann, G.W., Peacock, E., and DeBruyn, T.D. *eds*. 2010. Polar Bears: Proceedings of the 15th Working Meeting of the IUCN/SSC Polar Bear Specialist Group, Copenhagen, Denmark, 29 June to 3 July 2009. Gland, Switzerland and Cambridge, UK: IUCN. vii + 235 pages.

Oliver, J.S., P.N. Slattery, E.F. O'Conner, and L.F. Lowery. 1983. Walrus, *Odobenus rosmarus* feeding in the Bering Sea: a benthic perspective. Fishery Bulletin 81: 501-512.

Øritsland, N.A., F.R. Engelhardt, F.A. Juck, R.J. Hurst, and P.D. Watts. 1981. Effect of Crude Oil on Polar Bears. In *Environmental Studies* 24. Ottawa: Indian and Northern Affairs Canada.

Ovsyanikov, N.G., L.L. Bove and A.A. Kochnev. 1994. Causes of mass mortality of walruses on coastal haulouts. Zoological Journal 73: 80-87.

Ovsyanikov, N.G., I.E. Menyushina and A.V. Bezrukov. 2007. Unusual walrus mortality at Wrangel Island in 2007. Wrangel Island State Nature Reserve, Chukotskyi AO, Russia.

Owen, M.A., And A.E. Bowles. 2011. Auditory Psychophysics And The Management Of A Threatened Large Carnivore, The Polar Bear (Ursus Maritimus). International Journal Of Comparative Psychology 24: 244-254.

Pagano, A.M., G.M. Durner, S.C. Amstrup, K.S. Simac, G.S. York. 2012. Long-distance swimming by polar bears (Ursus maritimus) of the southern Beaufort Sea during years of extensive open water. Canadian Journal of Zoology 90(5): 663-676.

Peterson C.H., S.D. Rice, J.W. Short, D. Esler, J.L. Bodkin, B.E. Ballachey and D.B. Irons. 2003. Long-term ecosystem response to the Exxon Valdez oil spill. Science 302: 2082–2086.

Powell R.A. (2000). Animal home ranges and territories and home range estimators. Pages 65−110, *in* Boitani L, Fuller TK (*eds*) Research techniques in animal ecology. Columbia University Press, New York, NY.

Pungowiyi C. 2000. Testimony at the Oversight Hearing on the Marine Mammal Protection Act (Sections 118 and 119), April 6, 2000, i*n* Subcommittee on Fisheries Conservation Wildlife and Oceans *ed*. Washington D.C. Pages 178-194.

Ray, C.E. 1971. Polar bear and mammoth on the Pribilof Islands. Arctic 24: 9-19.

Ray, G.C., and W.A. Watkins. 1975. Social function of underwater sounds in the walrus *Odobenus rosmarus*. Pages 524-526, *in* K. Roland and A.W. Mansfield, *eds*. Biology of the seal. Rapports et Procès-verbaux des Réunions Volume 169. Conseil International Pour L'exploration de la Mer, Charlottenlund Slot, Denmark.

Ray, G.C., J. McCormick-Ray, P. Berg, and H. E. Epstein. 2006. Pacific walrus: Benthic bioturbator of Beringia. Journal of Experimental Marine Biology and Ecology 330(1): 403-419.

Ray, C.G., J.W. Overland, and G.L. Hufford. 2010. Seascape an organizing principle for evaluating walrus and seal sea ice habitat in Beringia. Geophys. Res. Lett. 37: 1-6.

Reeves, R.R. 1978. Atlantic walrus *Odobenus rosmarus rosmarus*: A literature survey and status report. U.S. Department of the Interior, U.S. Fish and Wildlife Service, Washington D.C.

Regehr, E.V., C.M. Hunter, H. Caswell, C.S. Amstrup, and I. Stirling. 2007. Polar Bears in the Southern Beaufort Sea I: Survival and Breeding in Relation to Sea Ice Conditions, 2001-2006. Reston, VA: U.S. Department of Interior, U.S. Geological Survey.

Richard, P.R. 1990. Habitat description and requirements. Pages 21-26 *in*: F. H. Fay, B. P. Kelly and B.A. Fay e*ds*. The ecology and management of walrus populations - report of an international workshop. Final report NTIS PB91-100479, Marine Mammal Commission, Bethesda, MD.

Richardson, W.J., J. C.R. Greene, C.I. Malme and D.H. Thomson. 1995. Marine mammals and noise. Academic Press, San Diego, CA.

Rigor, I.G., J.M. Wallace, and R.L. Colony. 2002. Response of sea ice to the Arctic Oscillation. Journal of Climate 15: 2648-2663.

Rigor I.G. and J.M. Wallace. 2004. Variations in the age of Arctic sea ice and summer sea ice extent. Geophysical Research Letters 31: L09401.

Rode, K.D., C.S. Amstrup, and E.V. Regehr. 2007. Polar Bear in the Southern Beaufort Sea III: Status, Mass, and Cub Recruitment in Relationship to Time and Sea Ice Extent Between 1982 and 2006. Administrative Report. Reston, VA: U.S. Department of the Interior, U.S. Geological Survey.

Rodrigues, J. 2008. The rapid decline of the sea ice in the Russian Arctic. Cold Regions Science and Technology 54: 124-142.

Samuel, M.D., D.J. Pierce, and E.O. Garton. 1985. Identifying areas of concentrated use within the home range. J. Anim. Ecol. 54:711-719.

Sanders, H.L., J.F. Grassle, G.R. Hampson, L.S. Morse, S. Garnerprice, and C.C. Jones. 1980. Anatomy of an Oil Spill: Long-Term Effects from the Grounding of the Barge *Florida* off West Falmouth, Massachusetts. Journal Of Marine Research 38: 265-380.

Schliebe, S., T.J. Evans, S. Miller, C.J. Perham, J.M. Wilder, and L.J. Lierheimer. 2005. Polar Bear Management in Alaska, 2000-2004. Anchorage, AK. USFWS. 25 pages.

Scribner, K.T., S. Hill, S.R. Fain and M.A. Cronin. 1997. Population genetics studies of the polar bear (*Ursus maritimus*): a summary of available data and interpretation of results and research needs. Pages 173-184, *in*: Dizon, A.E., S.J. Chivers, and W.F. Perrin (*Eds*). Molecular Genetics of Marine Mammals. The Society for Marine Mammalogy, Special Publication 3. Sea coast in 2007. Poster, society for Marine Mammalogy annual meeting, Quebec City, Quebec, Canada.

Sease, J.L., and D.G. Chapman. 1988. Pacific Walrus, *Odobenus rosmarus divergens*, Pages 17-38, *in* J.W. Lentfer, *ed.* Selected Marine Mammals of Alaska, Species Accounts with Research and Management Recommendations. Marine Mammal Commission, Washington, D.C.

Sell, S., and E. Weiss. 2010. Walrus Islands State Game Sanctuary. Annual Management Report. 68 pages.

Sellers, R.A. and S.D. Miller. 1999. Population Dynamics of Brown Bears after the *Exxon Valdez* oil spill. Ursus 11: 73–78.

Sheffield, G., F. H. Fay, H. Feder, and B. P. Kelly. 2001. Laboratory digestion of prey and interpretation of walrus stomach contents. Marine Mammal Science 17: 310-330.

Sheffield, G. and J. M. Grebmeier. 2009. Pacific walrus (*Odobenus rosmarus divergens*): differential prey digestion and diet. Marine Mammal Science 25: 761-777.

Shideler, R.T. and C.J. Perham. 2008. Survey of maternal polar bear den habitat between Kaktovik and the KIC Well No. 1, February 2008. Unpubl. rept. to Marsh Creek, LLC, Anchorage, Alaska. 11 pages.

Shideler, R.T. and C.J. Perham. 2009. Survey of maternal polar bear den habitat between Atigaru Point and Kogru River Dew line Site, National Petroleum Reserve, Alaska, March 2009. Unpubl. rept. to Jacobs Field Services, Anchorage, Alaska. 11 pages.

Sjare, B. and I. Stirling. 1996. The breeding behavior of Atlantic walruses, *Odobenus rosmarus rosmarus*, in the Canadian High Arctic. Canadian Journal of Zoology 74: 897-911.

Sjare, B., I. Stirling, C. Spencer. 2003. Structural variation in the songs of Atlantic walruses breeding in the Canadian high Arctic. Aquat. Mamm 29: 297–318.

Smith, T.S., S.T. Partridge, S.C. Amstrup, and S. Schliebe. 2007. Post-den Emergence Behavior of Polar Bears (*Ursus maritimus*) in Northern Alaska. Arctic 60: 187–194.

Smith, M.A. 2011. Place-based Summary of the Arctic Marine Synthesis. Audubon Alaska Anchorage, Alaska, http://ak.audubon.org/sites/default/files/documents/place-based_summary_of_the_arctic_marine_synthesis_final.pdf.

Speckman, S.G., V. Chernook, D.M. Burn, M.S. Udevitz, A.A. Kochnev, A. Vasilev, and C.V. Jay. 2010. Results and evaluation of a survey to estimate Pacific walrus population size, 2006. Marine Mammal Science 27: 514–553DOI: 10.1111/j.1748-7692.2010.00419.x.

State of Alaska regulations (5 AAC 92.066), Permit for access to Walrus Islands State Game Sanctuary. Downloaded on June 5, 2013 from webpage:

http://www.legis.state.ak.us/basis/folioproxy.asp?url=http://wwwjnu01.legis.state.ak.us/cgi-bin/folioisa.dll/aac/query=[JUMP:'5+aac+92!2E066']/doc/{@1}?firsthit.

Stirling, I., and T. G. Smith. 1975. Interrelationships of Arctic Ocean mammals in the sea ice habitat. Circumpolar Conference on Northern Ecology 2: 129–36.

Stirling, I., A. M. Pearson, and F. L. Bunnell. 1976. Population ecology studies of polar and grizzly bears in northern Canada. Transactions of the North American Wildlife and Natural Resources Conference 41: 421–30.

Stirling, I., H. Cleator, and T. G. Smith. 1981. Marine mammals. Pages 44–58, *in* I. Stirling and H. Cleator, *eds*. Polynyas in the Canadian Arctic (Occasional Paper No. 45). Canadian Wildlife Service, Ottawa.

Stirling, I, W. Calvert and H. Cleator. 1983. Underwater Vocalizations as a Tool for Studying the Distribution and Relative Abundance of Wintering Pinnipeds in the High Arctic. Arctic 36(3): 262-274.

Stirling, I., Calvert, W., Spencer, C. 1987. Evidence of stereotyped underwater vocalizations of male Atlantic walruses (Odobenus rosmarus rosmarus). Can. J. Zool. 65: 2311–2321.

Stirling, I. 1990. Polar bears and oil: Ecological perspectives. Pages 223–34 *in* J. R. Geraci and D. J. St. Aubin, *eds*. Sea mammals and oil: Confronting the risks. Academic Press, San Diego, CA.

Stirling, I. and D. Andriashek. 1992. Terrestrial maternity denning of polar bears in the eastern Beaufort Sea area. Arctic 45: 363–66.

Stirling, I., and N. A. Øritsland. 1995. Relationships between estimates of ringed seal (*Phoca hispida*) and polar bear (*Ursus maritimus*) populations in the Canadian Arctic. Canadian Journal of Fisheries and Aquatic Sciences 52: 2594–2612.

Stirling, I., and N. J. Lunn. 1997. Environmental fluctuations in Arctic marine ecosystems as reflected by variability in reproduction of polar bears and ringed seals. Pages 167–81, *in* S. J. Woodin and M. Marquiss, *eds*. Ecology of arctic environments. Blackwell, Oxford.

Stishov, M.S., G.W. Garner, S.M. Arthur, and V.G.B. Barnes Jr. 1991. Distribution and relative abundance of maternal polar bear dens in the Chukotka Peninsula region, USSR. Page. 67, *in* Abstracts, Ninth Biennial Conference on the Biology of the Marine Mammals, 5-9 December 1991, Chicago, Illinois, USA.

Stishov, M.S. 1991a. Results of aerial counts of the polar bear dens on the arctic coast of the extreme Northern Asia. Pages 90-92, *in* Amstrup, S.C., and Wiig, Ø. (*eds*.), Polar Bears: Proceedings of the Tenth Working Meeting of the IUCN/SSC Polar Bear Specialist Group. IUCN, Gland, Switzerland, and Cambridge, U.K.

Stishov, M.S. 1991b. Distribution and number of polar bear maternity dens on Wrangel and Herald islands, in 1985-1989. Pages 91-115, *in* Amerirkhavov, A.M., *ed*. Population and Communities of Mammals on Wrangel Island. Moscow, CNIL Glavokhhoty RSFSR. (in Russian).

Taylor, M.K., D.P. DeMaster, F.L. Bunnell, and R.E. Schweinsburg. 1987. Modeling the Sustainable harvest of female polar bears. J. Wildl. Manage. 51: 811-820.

Thomas, T.A., W.R. Koski, D.S. Ireland, D.W. Funk, M. Laurinolli and A.M. Macrander. 2009. Pacific walrus movements and use of terrestrial haul-out sites along the Alaskan Chukchi Sea coast in 2007. Poster, society for Marine Mammalogy annual meeting, Quebec City, Quebec, Canada.

Truett J.C. and S.R. Johnson. 2000. The natural history of an Arctic oil field: Development and biota. Academic Press, New York, NY.

Udevitz, M.S., J.R. Gilbert and G.A. Fedoseev. 2001. Comparison of method used to estimate numbers of walruses on sea-ice. Marine Mammal Science 17: 601–616.

Udevitz, M.S., C.V. Jay, A.S. Fischbach, and J.L. Garlich-Miller. 2009. Modeling haul-out behavior of walruses in Bering Sea-ice. Canadian Journal of Zoology 87: 1111-1128.

USFWS (U.S. Fish and Wildlife Service). 2010. Polar Bear (*Ursus maritimus*): Chukchi/Bering Sea Stock Assessment Report. U.S. Department of Interior, U.S. Fish and Wildlife Service, http: //alaska.fws.gov/fisheries/mmm/stock/final_cbs_polar_bear_sar.pdf.

USFWS (US Fish and Wildlife Service). 2010a. Pacific Walrus (*Odobenus rosmarus divergens*): Chukchi/Bering Sea Stock Assessment Report. US Department of Interior, US Fish and Wildlife Service, http://alaska.fws.gov/fisheries/mmm/stock/final_cbs_polar_bear_sar.pdf.

USFWS (U.S. Fish and Wildlife Service). 2011. Final 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. Final Environmental Assessment. Marine Mammals Management Office, Anchorage, AK.

USFWS (U.S Fish and Wildlife Service). 2012. Pacific Walrus (*Odobenus rosmarus divergens*): Alaska stock. U.S. Fish and Wildlife Service, Marine Mammals Management, Anchorage, AK.

USFWS (U.S. Fish and Wildlife Service). 2013. Administrative Report, R7/MMM 13-1. Workshop on Assessing Pacific Walrus Population Attributes from Coastal Haul-Outs. Workshop Proceedings Compiled and Edited By: Martin Robards and & Joel Garlich-Miller. p, 94.

Vishnevskaia, T.I and V.A. Bychkov. 1990. The Laptev walrus. Pages 155-176, *in* F.H. Fay, B.P. Kelly and B.A. Fay, *eds*. The ecology and management of walrus populations - report of an international workshop. U.S. Marine Mammal Commission, Bethesda, MD.

Wacasey, J.W. and E. G. Atkinson. 1987. Energy values of marine benthic invertebrates from the Canadian Arctic. Marine Ecology Progress Series 39: 243-250.

Winfree M. 2009. Marine mammal haulout use in Bristol Bay and southern Kuskokwim Bay, Alaska, Dillingham, AK: United States Fish and Wildlife Service, Togiak National Wildlife Refuge.

Woodgate, R.A., K. Aafaard, and T.J. Weingartner. 2006. Interannual changes in the Bering Strait fluxes of volume, hear, and freshwater between 1991 and 2004. Geophysical Research Letters. 33 (L15609): 1-5.

Wozencraft, W.C. 2005. Order carnivora. Pages 532–628, *in*: D.E. Wilson and R.E.A. Stewart *eds*. Mammal species of the world. Johns Hopkins University Press, Baltimore, MD.

RESPONSE TO COMMENTS ON THE DRAFT EA

During the public comment period for the draft EA and the proposed rule, which occurred from January 9, 2013 through February 8, 2013, the Service received comments on both documents. All comments received were influential in guiding our re-analysis of the environmental impacts of each alternative, and our subsequent revision of the EA. However, in this section we are only responding to comments specifically directed at the EA. Responses to comments directed at the proposed rule are contained within the final ITRs, which are being published in the Federal Register.

Summary of and Responses to Comments and Recommendations:

During the public comment period, we requested written comments from the public in order to ensure that any final action, including this EA, be as accurate and as effective as possible. The comment period on the proposed ITRs, and our draft EA opened on January 9, 2013 (78 FR 1942), and closed on February 8, 2013. During that time, we received 15 submissions from the public; these included comments on the proposed rule as well as the draft EA.

The Service received comments from the Marine Mammal Commission, State of Alaska, private companies, trade and environmental organizations, and the general public. We reviewed all comments received for substantive issues, new information, and recommendations regarding this EA and the ITRs. The comments on the draft EA , aggregated by subject matter, are summarized and addressed below, and were incorporated into our decision making process as appropriate.

Response to Comments

1. Comment: The Draft EA included the Service's definition for "small numbers" that was invalidated by the Ninth Circuit Court of Appeals. This inadvertent reference should be eliminated and, instead, the Draft EA should recite the definition of "small numbers" that was presented in the Proposed Rule.

Response: We have addressed your comment by deleting the inadvertent reference to the invalidated regulatory definition of small numbers. As explained in the final regulations, we did not rely on the invalidated regulatory definition in our analysis; rather, we evaluated whether small numbers of marine mammals are likely to be taken relative to the overall population.

2. Comment: All (not "most") of the anticipated takes, taken collectively, will affect only a small number of polar bears and walruses. This statement in the Draft EA should be corrected to accurately reflect the Service's findings and analyses as contained in the Proposed Rule.

Response: We agree with this comment and have revised the Draft EA accordingly.

3. Comment: The final EA should emphasize that the effects of the Proposed Rule are not significant because the proposed regulations only authorize incidental take that has a negligible impact and no unmitigable impact on subsistence.

Response: We agree with the comment.

4. Comment: The question whether the Service must issue a FONSI or prepare an EIS does not depend on whether the proposed action is a "major Federal action." As addressed above, and as detailed in the Proposed Rule, the proposed action will not significantly affect the human environment and, therefore, a FONSI is appropriate.

Response: We agree with the comment.

5. Comment: The Draft EA should more comprehensively document the effectiveness of the monitoring and mitigation measures.

Response: We believe our description of the effectiveness of monitoring and mitigation measures in the EA is adequate; however, we have added additional text to provide greater clarity regarding the effectiveness of monitoring and mitigation measures.

6. Comment: The number of industry activities should be specified in the EA in accordance with the estimates in the Proposed Rule.

Response: We agree with the comment and have revised the text accordingly.

7. Comment: The Service should restate its past findings regarding the overall "beneficial" effects of issuing MMPA incidental take regulations in this context.

Response: We have added text to clarify that the regulations provide effective mitigation, monitoring, and reporting requirements which would not exist if the regulations were not adopted.

8. Comment: Given the potential for litigation, we recommend elaborating upon and providing references to at least some of the supporting information in the Draft EA.

Response: The final EA is based on our analysis of the existing literature and is fully referenced as appropriate.

9. Comment: The Service should provide additional discussion in the Draft EA by incorporating by reference and summarizing the extensive cumulative impacts analysis included in the Proposed Rule.

Response: We have added text into the EA incorporating by reference the discussion of cumulative effects analysis in the proposed rule, Section, *Analysis of Impacts of the Oil and Gas Industry on Pacific Walruses and Polar Bears in the Chukchi Sea*.

10. Comment: The Service has not taken the requisite hard look at important ecological areas such as Hanna Shoal and the potential impacts to polar bears and walruses in those areas.

Response: We have added additional text to the EA to address the impacts in the Hanna Shoal area.

11. Comment: The EA lacks any detailed site-specific analysis on which to base a finding of no significant impact (FONSI).

Response: The EA contains an adequate site specific analysis of industry activities for which LOAs could be granted pursuant to the regulations. The EA describes the different types of activities for which LOAs could be granted, and concludes that the LOAs, collectively, would authorize the take of only small numbers of polar bears and walruses, would have only a negligible impact on the stock, and would not affect the availability of the animals for subsistence. This site-specific analysis is based on the best available information at this time about the nature and location of projected activities. However, as individual LOAs are requested and more specific information about the nature, location, and extent of particular activities is provided, additional site specific analysis will be conducted to determine whether the activities fall within the scope of the activities analyzed in the regulations and what, if any, additional mitigation measures may be necessary. If the activities fall outside the scope of the activities analyzed in the regulations, no authorization will be granted.

12. Comment: The Service must also describe a true "no action" alternative that represents the absence of industry activities without MMPA authorization.

Response: The action being considered is the issuance of incidental take regulations. Therefore, the "no action" alternative would be not to issue incidental take regulations. However, Section 101(a)(5)(A) of the Marine Mammal Protection Act (MMPA) (16 U.S.C. 1371(a)(5)(A)) states that the Secretary of the Interior (Secretary), shall allow the incidental, but not intentional, taking of small numbers of marine mammals in response to requests by U.S. citizens engaged in a specified activity (other than commercial fishing) in a specified geographic region if the Secretary finds that the total of such taking 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, if a citizen petitions the Service to promulgate regulations, we are required to initiate the process and make the appropriate findings. If there is an absence of industry activities, as stated by this commenter, there would be no request for incidental take regulations and consequently, there would be no need for any analysis, including alternatives. In addition to the no action and preferred alternative, we considered, but eliminated from further analysis other alternatives, which we considered not feasible or practicable.

13. Comment: The Service should consider an alternative that would prohibit serious injury.

Response: The regulations would allow MMPA authorization for activities that would result in only nonlethal incidental, but not intentional, take of Pacific walruses or polar bears. The Service anticipates that the majority of takes will be Level B harassment. Level B harassment is defined as an event that has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns and does not include potential to injure.

14. Comment: The Service should consider an alternative that would not authorize take incidental to operations over the Hanna Shoal, or between the Hanna Shoal area and the mainland.

Response: The preferred alternative adequately analyzes potential impacts to walruses in the Hanna Shoal area and notes that the Service may prescribe additional mitigation measures, including seasonal restrictions to any proposed seismic or drilling operations within the Service's HSWUA. We have incorporated additional text into the EA that discusses potential impacts to walruses from industry activities in the HSWUA.

15. Comment: The Service should consider an alternative approach with seismic survey exclusion zones based on the levels at which received sound begins to disrupt walrus and polar bear behavior patterns, as opposed to actually causing physiological injury in the EA.

Response: The Service is not in a position to develop an alternative approach with exclusion zones based on the levels at which received sound begins to disrupt walrus and polar bear behavior patterns. This would be very hard, if not impossible, to determine for animals in the wild. Testing of captive animals in a zoo is not relevant for behavioral change as aquaria conditions are unique and confined. The Service assumes that the majority of walruses exposed to anthropogenic sounds will leave the area. In fact, we specify seismic ramp-up procedures to clear an area of animals before potential injury producing surveys can occur. Research suggests that behavioral responses can be observed in seals exposed to 160 dB levels. However, not all animals are disturbed at this level. In addition, these behavioral responses are generally not biologically significant in terms of altering the survival or reproductive potential of the individual or the population.

Figure 1. The geographic area of the Chukchi Sea and onshore coastal areas covered by the requested incidental take regulations.

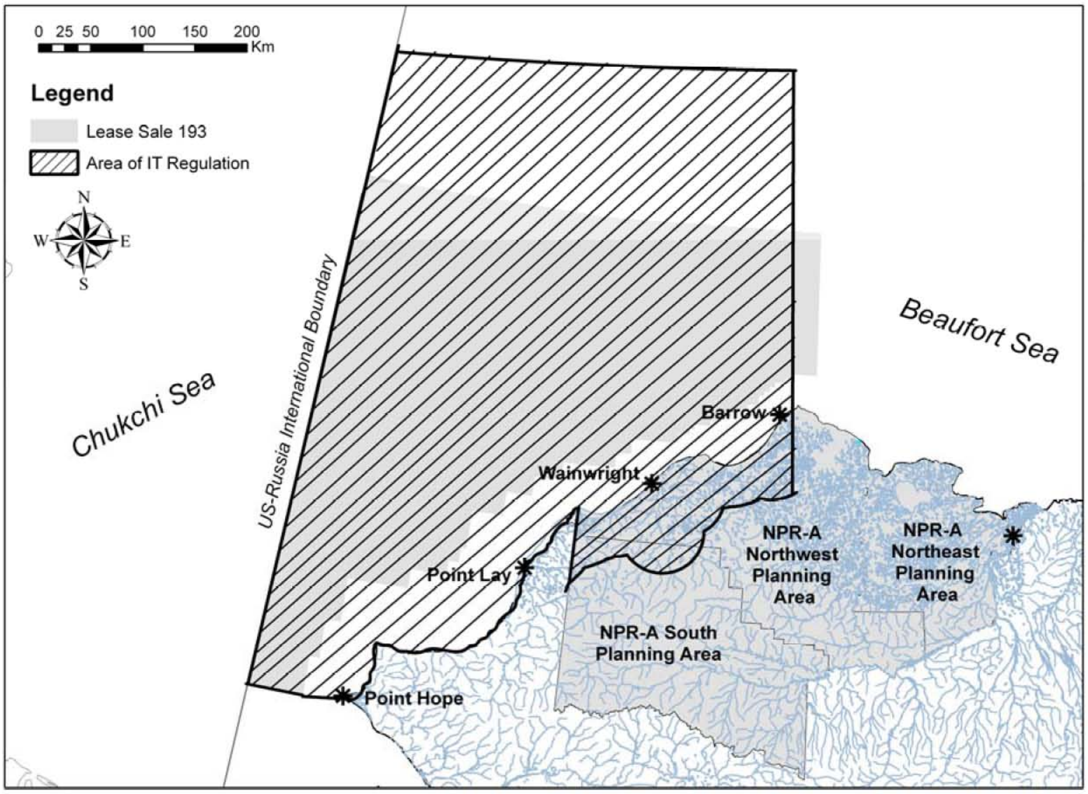


Figure 2. Distribution of Pacific walruses.

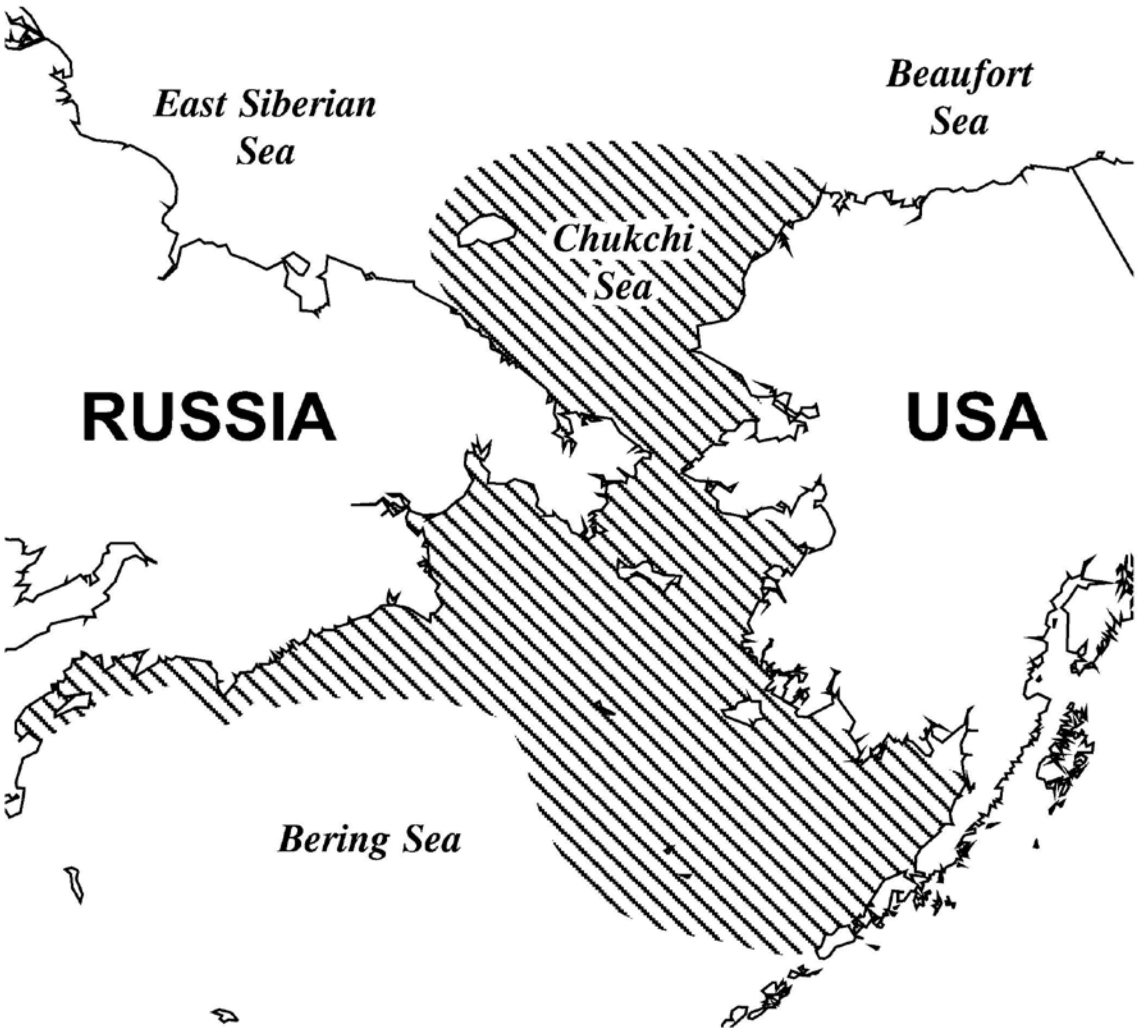


Figure 3. The combined Pacific walrus foraging and occupancy 50% utilization distribution polygon for the Hanna Shoal region that define the Hanna Shoal Walrus Use Area (HSWUA) based on Jay et al. (2012) in relation to the Lease Sale 193 and the geographic region of the incidental take regulations.

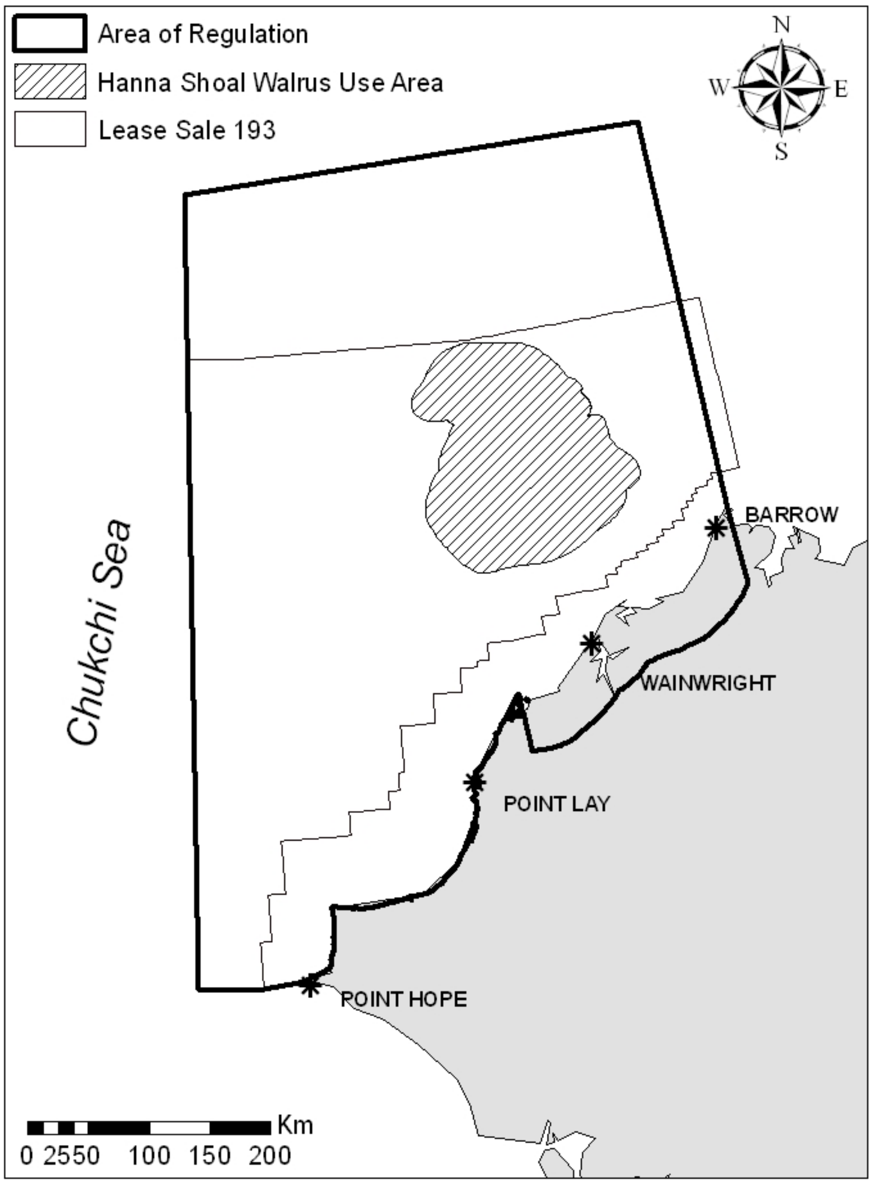
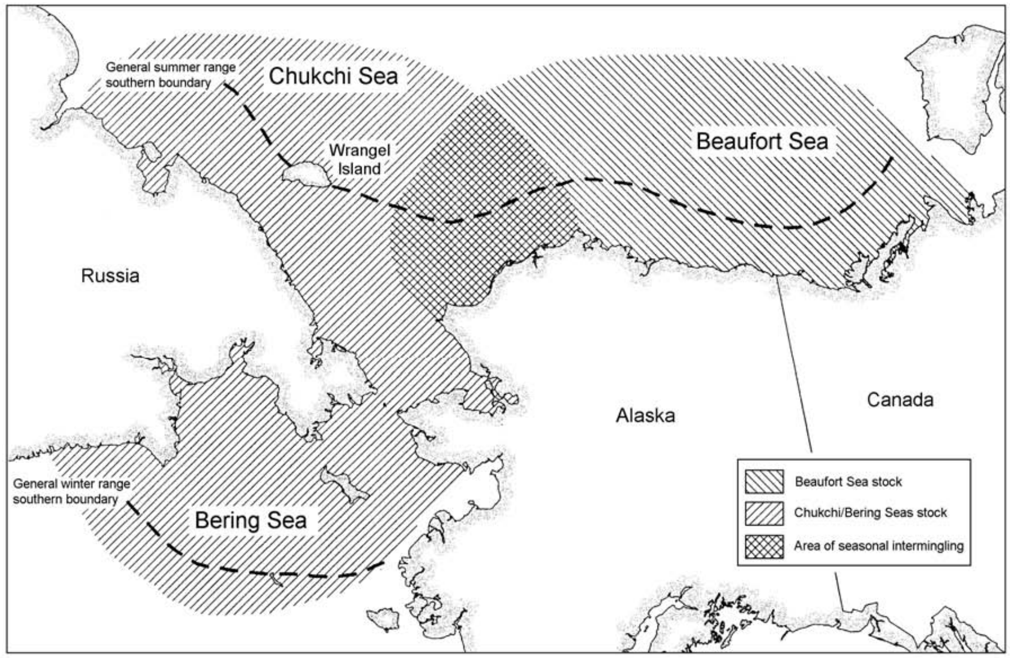


Figure 4. Population boundaries for polar bears in Alaska.



Attachment 1

Detailed Descriptions of Activities Authorized by the ITR

Excerpted from the *Petition for Incidental Take Regulations for Oil and Gas Activities in the Chukchi Sea and Adjacent Lands in 2013 to 2018 Chukchi Sea, AK* (AOGA, January 2012, 15375-02/11-192 Rev. 1). This petition can be viewed in its entirety at: http://alaska.fws.gov/fisheries/mmm/Chukchi_Sea/Petitions/AOGA%20Chukchi%20Sea%20ITR%20Petition.pdf.

Types of Oil and Gas Activities Expected in 2013 to 2018

The types of exploration activities that may be conducted in the Chukchi Sea Region from 2013 to 2018 are described in the following sections. All of these types of oil and gas exploration activities have been previously conducted in accordance with past and current ITRs applicable to the Chukchi and Beaufort seas and adjacent coastal areas. Analyses of potential impacts from these activities have been conducted by Industry and regulatory agencies over an extended period of years, and the types of reasonably anticipated effects are well documented.

The levels of activities expected to occur from 2013 to 2018 are described below. The scheduling and execution of oil and gas exploration activities in the Chukchi Sea Region will be influenced by numerous factors, including economics, regulatory constraints, political considerations, judicial/regulatory delays, and weather and ice conditions. In addition, a company's exploration strategy could require significant modification on the basis of results of exploration activities. For these reasons, the following estimates of activities should be viewed as the expected amount of activity overall and not necessarily the expected activity for any given year.

Exploration Drilling

All exploration drilling expected to occur within the Chukchi Sea Region from June 11, 2013, to June 11, 2018, would take place offshore on leases in Federal waters of the OCS. Detailed descriptions of offshore exploration drilling programs can be found in exploration plans submitted for approval to BOEM/BSEE (ConocoPhillips 2011; Shell 2011). In addition to the drilling itself, activities associated with exploration drilling include ice management, vertical seismic profiles, and logistical support for crew change and resupply. Equipment includes a drilling unit, ice management vessels, oil spill response vessels, a helicopter, a fixed wing aircraft, and limited shore-based facilities.

Because of the water depths at lease holdings and within future lease sale areas, it is likely that all exploration drilling in the Chukchi Sea Region in 2013 to 2018 will be conducted from either a floating drilling unit such as a drillship or conical drilling unit, or a jack up drilling platform. All five historical exploration wells in the Chukchi Sea Region were drilled with a drillship (*Explorer III*). Pending exploration drilling programs will employ drillships (*Discoverer*) and jack ups (*Gusto MSC CJ50*).

Exploration drilling with these types of drilling units would occur during the open water drilling season – generally July to November – when the presence of ice is at a minimum. The drilling units and any support vessels would enter the Chukchi Sea at the beginning of the season and exit the sea at the end of the season. Drillships are generally self-propelled, whereas jack up rigs must be towed to the drill site. The *Discoverer*, *Explorer III* and most other drillships (as well as the *Kulak 2*) that could be used in the Chukchi Sea are stabilized at the drill site with 8 to 12, 7-ton to 8-ton anchors. A support vessel, called an anchor handler, is used to set the anchors in place, which is generally within a radius of about 2,000 to 3,000 ft (610 to 914 m) from the drilling unit for water depths at current Chukchi Sea Region OCS leases. Jack ups have retractable legs that are raised for transit and lowered to the seafloor for stabilization at the drill site. These drilling units are largely self-contained with accommodations for the crew, including quarters, galleys, and sanitation facilities. Some waste streams will likely be discharged to the Chukchi Sea as allowed under the current EPA National Pollutant Discharge Elimination System (NPDES) general permit. Discharged waste streams may include water based drilling fluids, drill cuttings, domestic and treated sanitary wastewater, excess cement, bilge water, ballast water, and deck drainage.

Ice Management

All current OCS leases and planned lease sales in the Chukchi Sea Region are within areas characterized by active sea ice movement. Per regulations at 30 CFR 250.220, operators of exploration drilling programs in the Chukchi Sea Planning Area are required to have BOEM/BSEE approved emergency plans and critical operations and curtailment procedures that may include ice management plans. Ice management is expected to be required for only a small portion of the drilling season, if at all, given the lack of sea ice observed over most current lease holdings in the Chukchi Sea Region in recent years. Most ice management would consist of actively pushing the ice off its trajectory with the bow of the ice management vessel, but some icebreaking could be required.

Vertical Seismic Profiles

Geophysical surveys, referred to as vertical seismic profiles (VSPs), will likely be conducted at many of the Chukchi Sea Region drill sites where and when an exploration well is being drilled. The purpose of the survey is to ground truth existing seismic data with geological information from the wellbore. A small airgun array is deployed at a location near or adjacent to the drilling unit, and receivers are placed (temporarily anchored) in the wellbore. The discharge volume of airgun arrays used for VSPs typically does not exceed 760 in^3 (12,500 cm^3) and a typical receiver string contains up to four receivers spaced about 50 ft (16 m) apart. The sound source (airgun array) is fired repeatedly, and the reflected sonic waves are recorded by the receivers (geophones) located in the wellbore. The geophones, typically a string of them, are then raised up to the next interval in the wellbore and the process is repeated until the entire wellbore has been surveyed. The duration of a normal VSP survey is about 10 to 14 hours per well, depending on the depth of the well and the number of anchoring points.

Onshore Support Bases, Re-supply, and Crew Changes

Many exploration activities, including most seismic surveys, shallow hazard surveys, bathymetric surveys, and offshore geotechnical surveys, are conducted from self-sufficient vessels and require little or no support from onshore facilities in the Chukchi Sea Region. Exploration drilling programs may entail both air support facilities, where aircraft serving crew changes, search and rescue, or re-supply functions would be housed, and marine support facilities from which vessels may access the shoreline.

For exploration drilling programs during the specified time period, operators will likely use extant facilities such as airports and airstrips, hotels and office buildings, and camps in North Slope villages for onshore support facilities. These existing facilities will likely be augmented with small, temporary camps that are placed on previously developed land. It is also possible that some operators may elect to use onshore support facilities located outside the Chukchi Sea Region.

The crews on mobile offshore drilling units are usually rotated every 21 to 30 days by aircraft or vessels. In the Chukchi Sea Region, all crew changes would likely be effected by helicopter. Helicopters would transport crew members directly between the drilling unit and either: 1) a community with a hub airport (such as Barrow); or 2) a smaller community with an airstrip, and then by fixed wing to the hub. Given the crew sizes and staggered rotation intervals, it is likely that one to two helicopter trips per day would be required.

Re-supply is required for offshore drilling operations, as the drilling units cannot carry all supplies for the entire drilling season. Most re-supply of drilling operations in the Chukchi Sea Region would be carried out using offshore supply vessels that bring the supplies in from support infrastructure located outside the Chukchi Sea Region. One or two such vessels would carry out the re-supply, making several trips in and out of the Chukchi Sea Region.

Seismic Surveys

Seismic surveys are conducted to gather information about subsurface geology to identify potential geologic traps that may hold or act as reservoirs of oil and natural gas. The interpreted data can be used to map the deep sub-seafloor to depths of 20,000 ft (6,100 m) or more below the seafloor depending on the survey design, sound source, and local geology.
Seismic survey equipment includes sound energy sources (airguns) and receivers (hydrophones / geophones). The airguns store compressed air that upon release forms a bubble that expands and contracts in a predictable pattern, emitting sound waves as it does. The sound energy from the source penetrates the seafloor and is reflected back to the surface where it is recorded and analyzed to produce graphic images of the subsurface features. Differences in the properties of the various rock layers found at different depths reflect the sound energy at different positions and times. This reflected energy is received by the hydrophones housed in submerged streamers towed behind the survey vessel.

The two general types of offshore seismic surveys, 2D and 3D surveys, use similar technology but differ in survey transect patterns, number of transects, number of sound sources and receptors, and data analysis. The primary difference between the survey types is that a 3D survey has a denser grid for the transect pattern; both emit relatively similar sound levels. All seismic surveys in the 2013 to 2018 timeframe would be expected to occur offshore in Federal waters of the OCS.

Seismic surveys are conducted with vessels capable of towing one or more seismic cables deployed in parallel to record data suitable for interpretation of structures beneath the sea bed.

There is usually a single survey vessel towing the airgun array and streamers that is supported by one or two similar sized support vessels (chase vessels or marine mammal monitoring vessels). The survey vessel may tow up to 12 cables, or streamers, of up to 5.0 mi (8.0 km) in length, spaced 164 to 492 ft (50 to 150 m) apart. The hydrophones are deployed at regular intervals within each streamer. This set up allows airguns and recording cables to be on the same vessel. The airgun array and streamers can be deployed at different depths, depending on the configuration of the survey and the regional geography. Seismic surveys in the Chukchi Sea Region may employ one or more airgun arrays, each with a series of airguns totaling 3,000 to 4,000 in^3 (49,161 to 65,548 cm^3) operated at about 2,000 pounds per square inch (psi) (13,789.5 kilopascal [kPa]). The positions of the sound source and each hydrophone group are used to accurately calculate where subsurface features are located. Positioning accuracy is required and can be achieved using a combination of acoustic networks and different geographical positioning systems.

Shallow Hazards Surveys

All shallow hazards surveys in the Chukchi Sea Region conducted between June 11, 2013, and June 11, 2018, which includes the entire "open water seasons" of 2013 to 2018, are expected to be conducted on OCS leases in the Chukchi Sea Planning Area. Shallow hazards surveys, also known as site clearance or high resolution surveys, are conducted to collect bathymetric data and information on the shallow geology to depths of about 5,446 ft (305 m) below the seafloor at areas identified as potential well or drill sites. The resulting data are then interpreted and used to identify potential hazards in the area. Shallow hazards surveys must be conducted at all exploration drill sites in the OCS before drilling can be approved by BOEM/BSEE. Specific requirements for these shallow hazards surveys are presented in BOEM/BSEE's Notice to Lessee (NTL) 05-A01. Potential hazards may include shallow faults, shallow gas, permafrost, and hydrates. Any archaeological features such as shipwrecks would also be identified. Drilling operations can then be permitted and conducted at a location that avoids or minimizes any risks of encountering these types of features.

A number of shallow hazards surveys have occurred in the Chukchi Sea in the last 30 years and it is reasonable to assume a number of these surveys will be conducted from 2013 to 2018. Equipment used in past surveys included sub-bottom profilers, multi beam bathymetric sonar, side scan sonar, high resolution seismic (airgun array or sparker), and magnetometers. Equipment to be used in future surveys in 2013 to 2018 would be expected to be these types of equipment as they are required by the above referenced BOEM/BSEE NTL, but would not necessarily be limited to this list.

Shallow hazards surveys are conducted from vessels during the summer or open water season along a series of transects with different line spacing depending on the proximity to the proposed drill site and geophysical equipment to be used. Generally, a single vessel is required to conduct the survey, but in the Chukchi Sea an additional vessel is often used as a marine mammal monitoring platform. The geophysical equipment is either hull mounted or towed behind the vessel, and sometimes is located on an autonomous underwater vehicle (AUV). Site clearance or shallow hazards surveys allow the preparation of detailed maps of the seafloor surface (side scan sonar, multi beam bathymetry) and shallow subsurface below (sub-bottom profiler and high resolution seismic). Small airgun arrays (compared to those used for 3D seismic surveys) with a total volume of40 in^3 (258 cm^3) and pressured to about 2,000 psi (13,789.5 kPa) have been used as the energy source for past high resolution seismic survey and would be expected to be used in future surveys in 2013 to 2018, but larger or smaller airguns under more or lesser pressure may be used. Sparkers have also been used in the Chukchi Sea in the past and may be used in the future. The magnetometer is used to locate and identify any ferrous (iron) objects (human made) that might be on the seafloor.

Other Geophysical Surveys

Other types of geophysical surveys that have been conducted recently in the Chukchi Sea as part of the ongoing exploration effort, and are expected to continue, from 2013 to 2018, include ice gouge surveys, strudel scours surveys, and other bathymetric surveys (platform and pipeline surveys). These surveys use the same types of remote sensing geophysical equipment used in shallow hazards surveys, but they are conducted for different purposes in different areas and often lack a seismic (airgun) component. Each of these types of surveys is briefly described below.

Ice Gouge Surveys

Ice gouging is the creation of troughs and ridges on the seafloor caused by the contact of the ice keels on moving ice floes with unconsolidated sediments on the seafloor. Oil and gas operators conduct surveys of these features to gain an understanding of the distribution, frequency, size, and orientation of ice gouging in the areas of interest in order to predict the location, size, and frequency of future ice gouging. The surveys may be conducted from June through October when the area is sufficiently clear of ice and weather permits. Equipment to be used in ice gouge surveys during this time period may include, but will not necessarily be limited to, sub-bottom profilers, multi beam bathymetric sonar, and side scan sonar.

Strudel Scour Surveys

Strudel scours are formed in the seafloor during a brief period in the spring when river discharge commences the breakup of the sea ice. The ice is bottom fast, with the river discharge flowing over the top of the ice. The overflow spreads offshore and drains through the ice sheet at tidal cracks, thermal cracks, stress cracks, and seal breathing holes. Oil and gas operators conduct surveys to identify locations where this phenomenon occurs and to understand the process.

Strudel scour surveys are done in two steps. Nearshore areas (State waters) by the larger rivers are first surveyed from the air with a helicopter at the same time rivers are discharging on to the sea ice (typically in May), to identify any locations where the discharge is moving through the ice. The identified areas are revisited by vessel during the open water season (typically July to October) and bathymetric surveys are conducted along a series of transects over the identified areas. Equipment to be used in the surveys in 2013 to 2018 will likely include but not necessarily be limited to multi beam bathymetric sonar, side scan sonar, and single beam bathymetric sonar.

Bathymetry Surveys

As part of exploration, some surveys will likely be conducted to determine the feasibility of future development. This effort will include such things as pipeline and platform surveys. These surveys target areas where platforms or pipelines may be sited in the future. Similar to the aforementioned shallow hazards surveys, ice gouge surveys, and strudel scour surveys, they use geophysical equipment to delineate the bathymetry/seafloor relief and characteristics of the surficial seafloor sediments, which would subsequently be used for engineering purposes. The surveys are conducted from vessels along a series of transects. Equipment deployed on the vessel for these surveys will likely include but not necessarily be limited to sub-bottom profilers, multi beam bathymetric sonar, side scan sonar, and magnetometers.

Geotechnical Surveys

All geotechnical surveys are expected to occur within the Chukchi Sea Region between June 11, 2013, and June 11, 2018, which includes the entire "open water seasons" of 2013 to 2017, and would take place offshore on leases in federal waters of the OCS, and potentially onshore. Geotechnical site investigations are performed to collect detailed data about seafloor sediments, onshore soil, and shallow geologic structures. During site investigations, boreholes are drilled to depths sufficient to characterize the soils within the zone of influence. The borings, cores, or cone penetrometer (CPT) data collected at the site define the stratigraphy and geotechnical properties at that specific location. Data from the cores may also be integrated with seismic data to develop a regional model for predicting soil conditions in areas that have not been sampled. These data are analyzed and used in determining optimal facility locations, for example, cores are needed to show whether soil will support a jack up rig or other oil and gas exploration infrastructure. Site investigations that include archaeological, biological, and ecological data assist in the development of foundation design criteria for any planned structure.

Methodology for geotechnical surveys may vary between those conducted offshore and onshore. Onshore geotechnical surveys would likely be conducted in winter when the tundra is frozen.

Rotary drilling equipment would be wheeled, tracked, or sled mounted. Offshore geotechnical studies would be conducted from dedicated vessels or support vessels associated with other operations such as drilling. The geotechnical data may be collected by gravity or drop cores, vibracores, rotary drilling, or CPT.

Environmental Studies

In addition to the aforementioned exploration drilling and geophysical and geotechnical surveys, there has been extensive research and monitoring over the past 40 years in a variety of disciplines, including but not limited to: geomorphology (soils, ice content, permafrost); archaeology and cultural resources; vegetation mapping; analysis of fish, avian, and mammal species and their habitat; hydrology; and various other freshwater, marine, and terrestrial studies of the arctic coastal and offshore regions. Many studies are performed in cooperation with scientists from consulting companies; Federal, State, and local agencies; universities; nonprofit organizations; and other local community stakeholders. Some of these studies are discussed below. Some research programs are multiyear efforts with objectives to collect baseline data or to answer specific research questions.

Many government agencies, science groups, Industry, academic institutions, and marine mammal co-management groups have coordinated ongoing studies for the Chukchi Sea Region.

The BOEM Environmental Studies Program manages approximately 60 ongoing studies in the Alaska OCS Region. The world class, scientific research is to inform policy decisions regarding leasing and development of OCS energy and mineral resources (BOEMRE 2011a; BOEMRE 2011b).

Many of the current Chukchi Sea leaseholders participated in the Joint Industry Monitoring Program Exploration and Production (E&P) Sound and Marine Life, initiated in early 2005. One of the studies implemented under this program in 2006 and completed in 2009 was the Oil Spill Contingency for Arctic and Ice covered Waters. The program was developed as a result of cooperation between SINTEF (The Foundation for Scientific and Industrial Research at the Norwegian Institute of Technology in Trondheim) and Shell, Chevron, Statoil, ConocoPhillips, Total, and AGIP KCO. The main objective of this project was to develop knowledge, tools, and technologies to benefit environmental oil spill response strategies in arctic and ice covered waters (Sørstrøm *et al.* 2010).

Because of renewed interest in offshore oil and gas activities, the intensity of environmental research in the Chukchi Sea increased in 2006. Monitoring associated with seismic, shallow hazards, and other geotechnical surveys were conducted by various oil and gas companies. Joint Monitoring Program Reports combine the results of all Chukchi Sea monitoring programs.

ConocoPhillips initiated an interdisciplinary research program in 2008, with the participation of Shell, which focused on their respective offshore lease areas. This Chukchi Sea Environmental Studies Program is ecosystem based, containing various components that contain physical and chemical oceanography, planktonic, benthic, fish, seabird, marine mammal, and acoustic studies. Statoil joined ConocoPhillips in this effort in 2010. These studies have been conducted in 2008, 2009, 2010, and 2011 and are expected to continue into the 2013 to 2018 timeframe, along with additional exploration drilling monitoring programs. More recently, Shell has also entered into a five-year collaborative science agreement with the North Slope Borough (NSB).

The National Science Foundation (NSF) also funds numerous multiyear projects and scientific studies for the Chukchi Sea area. One example of a multiyear NSF project is the ten-year construction of the $200 million *Alaska Region Research Vessel*, scheduled to conduct science operations beginning in 2014. This vessel will work to support ongoing studies for this area (NSF 2011a).

Academic and scientific institutions, such as Woods Hole Oceanographic Institute, Scripps Institution of Oceanography, and a number of universities and colleges, are also actively involved in collecting and analyzing data in areas that include the Chukchi Sea Region (WHOI 2011; Scripps 2011).

Stipulations on all current OCS leases in the Chukchi Sea (from Lease Sale 193) require a lessee proposing to conduct exploration operations during subsistence periods to conduct site specific monitoring programs in consultation with NMFS recognized co-management organizations. Recognized co-management organizations can be found under Stipulation 4 in the Record of Decision for Lease Sale 193 (BOEMRE 2011, Attachment A). Relevant co-management bodies are the Eskimo Walrus Commission and the Alaska Nanuuq Commission. These bodies encourage self-regulation and implementation of co-management agreements, while supporting scientific programs involving these mammals in the arctic ecosystem. The Indigenous People's

Council for Marine Mammals (IPCoMM) meets bi-annually and is composed of 17 total marine mammal commissions, councils, and other Alaska Native Organizations.

For the period of 2013 to 2018, studies will continue to be conducted for general monitoring purposes or in anticipation of exploration and development of Alaska's natural resources.

Industry has been conducting scientific and environmental studies in the Chukchi Sea Region since the 1980s, with an increase in the number and scope of these studies occurring since 2006. These studies will likely continue through the timeframe of the requested ITRs, with focused monitoring studies taking place during drilling efforts.

Offshore Environmental Studies

Offshore studies are likely to include ecological surveys of the benthos, plankton, fish, bird, and marine mammal communities and use of Chukchi Sea waters; acoustical studies of the distribution on seasonal use of the Chukchi Sea by marine mammals; investigations of sediment and water quality; and physical oceanographic investigations of sea ice movement, currents, and meteorology.

Most bird and marine mammal surveys will be conducted from vessels. The vessels will conduct transects at slow speeds while observers on the vessels identify the number and species of birds or marine mammals sighted. Densities would then be calculated based on the area surveyed and numbers observed. Some marine mammal surveys will also be conducted from fixed wing aircraft as part of the mandatory marine mammal monitoring programs associated with seismic surveys and exploration drilling. Sediments and plankton, benthic invertebrate, and fish communities will be studied from vessels as well, using small sampling devices such as box cores and Van Veen grabs (sediments and benthos), plankton or bongo nets (plankton), and trawls (fish). Various types of buoys have also been deployed in the Chukchi Sea in the past for data collection, and this effort will likely continue through 2013 to 2017 as well. Some of these buoys document ice movement, others collect meteorological and oceanographic data, and others are acoustical recording received sounds that can later be used to document presence/absence and distribution of marine mammals.

Onshore Environmental Studies

Various types of environmental studies will likely be conducted onshore in the Chukchi Sea Region in 2013 to 2018 in support of offshore oil and gas exploration. The hydrology of coastal rivers and lakes may be studied to determine such parameters as volume, flow, and flood stages. Habitat assessments and other types of fish and wildlife surveys may be conducted to determine and document the distribution and abundance of wildlife species in the region. Surveys may also be conducted to determine the presence or absence of archaeological resources. These studies would generally be conducted by small teams of scientists that would base their operations in Chukchi Sea communities and travel to study sites by helicopter. Most surveys would be conducted on foot or from the air. Small boats may be used for hydrology studies, fish surveys, and other studies in aquatic environments.

Expected Level of Oil and Gas Activities in 2013 to 2018

The following sections describe the level of activities expected within the Chukchi Sea Region within the specified period of June 11, 2013, to June 11, 2018. This time period contains the entire open water seasons of 2013 to 2017 but terminates before the start of the 2018 open water season. Therefore, activities such as exploration drilling, seismic surveys, and shallow hazards surveys which are conducted in the open water season, would not be expected to be conducted within the timeframe in 2018 as indicated below.

Yearly projections of expected activities are estimates with a reasonable degree of uncertainty. More or less activities may actually occur in a given year than projected. The projection for the total amount of activity over the five-year period reflects the best estimate of the number and type of activities that will occur during the timeframe.

Offshore Activities

Drilling, seismic surveys, and shallow hazards surveys that may be conducted in the Chukchi Sea Region will occur from June 11, 2013, to June 11, 2018. This time period contains the entire open water seasons of 2013 to 2017 but terminates before the start of the 2018 open water season. Therefore, activities such as exploration drilling, seismic surveys, and shallow hazards surveys that are conducted in the open water season would not be expected to be conducted within the timeframe in 2018.

We estimate that a total of three to eight wells may be drilled per year by multiple operators in the Chukchi Sea Region. The number of wells is not necessarily reflective of the number of exploration drilling programs or drilling units. All these wells will be drilled offshore during the open water season from self-contained drilling units on current lease holdings in the OCS. We assume that seismic surveys and shallow hazards surveys are expected to be conducted in 2014 and 2017, but they may be conducted in any given year. Ice gouge surveys will likely be conducted each year of the specified period (except 2018), with surveys up to 3,100 mi (5,000 km) in length being conducted annually. Strudel scour surveys and other types of bathymetric surveys would also be conducted (State waters only) each year except 2018. Geotechnical studies, including the collection of deep and shallow corings and possibly CPT, will be conducted in conjunction with some of these offshore bathymetric surveys.

Various environmental studies associated with offshore exploration activities are expected to take place during 2013 to 2018. These surveys may include physical oceanography studies (temperature, salinity, ocean acidification, currents, ice movements), sedimentation and water quality studies, ecological studies (plankton, benthos, fish, seabird, and marine mammal communities), acoustical studies (to characterize ambient and industrial sounds and to record vocalizations of marine mammals), and meteorology studies.

Onshore Activities

No exploration drilling, seismic surveys, or shallow hazard surveys are expected for onshore portions of the Chukchi Sea Region. Onshore geotechnical surveys and environmental studies are expected to be conducted each year. Most geotechnical surveys would be conducted in the winter. Environmental studies will likely be conducted in spring, summer, or fall.