FINAL ENVIRONMENTAL ASSESSMENT

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

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

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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 U.S. Fish and Wildlife Service (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 of such taking associated with the specified activity will have a negligible impact on the species or stock and will not have an unmitigable adverse impact on the availability of the species or stock for subsistence uses. If these findings are made, the Service must issue regulations that include monitoring and reporting requirements and permissible methods of taking and other means to ensure the least practicable adverse impact on the species and its habitat and on the availability of the species for subsistence uses, paying particular attention to rookeries, mating grounds, and areas of similar significance. The scope of such regulations includes descriptions of the species, habitat, and the availability of the species for subsistence uses. The regulations may also stipulate monitoring activities and reporting requirements to mitigate potential impacts to these species and subsistence hunting. Service regulations [50 CFR 18.27(f)] provide for the issuance of Letters of Authorization (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 - refers to a portion of a marine mammal species or stock whose taking would have a negligible impact on that species or stock.

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

Harass - for non-military readiness activities, means any act of pursuit, torment, or annoyance that a) has the potential to injure a marine mammal or marine mammal stock in the wild; or b) 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) is 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 polar bears (*Ursus maritimus*) and Pacific walruses (*Odobenus rosmarus divergens*) during oil and gas exploration activities in the Beaufort Sea is, or is not, a major Federal action. A positive finding would require the development of an Environmental Impact Statement.

In Alaska, oil and gas industry (Industry) activities occurring in Federal waters and on Federal lands are permitted by the Department of the Interior's Bureau of Ocean Energy Management, Regulation and Enforcement (BOEMRE) and the Bureau of Land Management (BLM), respectively, while these activities on State lands are permitted by the State of Alaska. Regardless of whether an activity is on State, Federal, or privately-owned land, a U.S. Army Corps of Engineers permit for work that occurs in waters of the U.S. (including wetlands) is also required. The Service is responsible for the management of Pacific walruses and polar bears, which are both protected under the Marine Mammal Protection Act (MMPA); the polar bear is also listed as a threatened species under the Endangered Species Act (ESA).

It is important to note that the issuance of incidental take regulations (ITRs) does not authorize the actual activities associated with oil and gas exploration or production. It is also important to note that this document is not evaluating the potential impacts of oil and gas exploration activities on walruses and polar bears. Rather, this EA examines the potential impacts of implementing regulations for the incidental take of walruses and polar bears in the Beaufort Sea Region on walruses, polar bears, and the subsistence use of these resources. Furthermore, unlike the authorizations for Industry activities listed above, ITRs are issued for a specific length of time – in this case, a period of 5 years. This EA will be used to determine if the action (implementation of regulations for a period of 5 years) will have significant impacts, address any unresolved environmental issues, and provide a basis on whether or not to issue regulations authorizing the incidental take of Pacific walruses and polar bears.

B. Purpose and Need

Although Section 101 of the MMPA placed a moratorium on the taking of marine mammals in U.S. waters, 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 Beaufort 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 through harassment and through human encounters with polar bears or walrus.

In 2009, the Service received a petition to promulgate a renewal of regulations for non-lethal incidental take of small numbers of walruses and polar bears in the Beaufort Sea for a period of 5 years (2011-2016). The request was submitted on April 22, 2009, by the Alaska Oil and Gas

Association (AOGA) on behalf of its members[1] and other participating parties[2]. The petition is available at: (http://alaska.fws.gov/fisheries/mmm/itr.htm).

The information provided by the petitioners indicates that projected oil and gas activities over this time frame will encompass onshore and offshore exploration, development, and production activities. The petitioners have also specifically requested that these regulations be issued for non-lethal take. Industry has indicated that, through implementation of the mitigation measures, it is confident a lethal take will not occur. All projected activities described by AOGA in their petition were considered in our analyses. In addition, projections of reasonably foreseeable activities for the period 2011–2016 in the offshore environment described in the Arctic Multiple Sale DEIS (http://alaska.boemre.gov/ref/EIS%20EA/ArcticMultiSale_209/_DEIS.htm) were analyzed as well.

C. Location

The geographic area covered by the requested incidental take regulations (hereafter referred to as the Beaufort Sea Region; Figure 1) encompasses all Beaufort Sea waters east of a north-south line through Point Barrow (71°23'29" N, -156°28'30 W, BGN 1944), and up to 200 miles north of Point Barrow, including all Alaska State waters and Outer Continental Shelf (OCS) waters, and east of that line to the Canadian border. The onshore region is the same north/south line at Barrow, 25 miles inland and east to the Canning River. The Arctic National Wildlife Refuge is excluded from these regulations. The geographical extent of these regulations is similar to previous regulations (71 FR 43926), where the offshore boundary is the Beaufort Sea Planning area, approximately 200 miles offshore.

D. Description of Activities

As stated in the Petition, the scope of the regulations is limited to activities that will be conducted during the exploration, development, production, and decommissioning of oil and gas resources along the Beaufort Sea and adjacent northern coast of Alaska within the defined geographic region. Throughout the five years that the future regulations will be in place, the petitioners expect that oil and gas activities will remain at similar levels of seasonality, and type as under the prior regulations. Examples of future Industry activities include the completion of the Alpine Satellite Development, development of Point Thomson, Oooguruk, Nikaitchuq, and areas in the National Petroleum Reserve – Alaska (NPR-A). The locations of these operations are assumed by the petitioners, for the purpose of meeting MMPA requirements, to be approximately equally divided among the onshore and offshore tracts presently under lease and to be leased during the period under consideration.

[1] AOGA members represented in the petition include: Alyeska Pipeline Service Company, Anadarko Petroleum Corporation, BP Exploration (Alaska) Inc., Chevron USA, Inc., Eni Petroleum, ExxonMobil Production Company, Flint Hills Resources, Inc., Marathon Oil Company, Pacific Energy Resources Ltd., Petro-Canada (Alaska) Inc., Petro Star Inc., Pioneer Natural Resources Alaska, Inc., Shell Exploration & Production Company, StatoilHydro, Tesoro Alaska Company, and XTO Energy, Inc.

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

In addition, for the purpose of assessing possible impacts related to this action, the petitioners assume that these activities will occur equally spaced over time and area for the upcoming ice-covered and open-water seasons. Due to the large number of variables affecting Industry activities, prediction of exact dates and locations of operation for the open-water and ice-covered seasons is speculative. However, operators must provide specific dates and locations of proposed activities prior to receiving an LOA.

Below is a summary of operations and actions submitted by Industry that are anticipated to be conducted for the open-water and ice-covered seasons. Similar activities have been conducted in the past and are likely to continue to be conducted over the life of the oilfields. Oil and gas activities anticipated and considered in our analysis for ITRs are based upon information provided by Industry during the timeframes of 2011-2016. Detailed descriptions are provided in the petition (http://alaska.fws.gov/fisheries/mmm/Beaufort_Sea/petitions/aoga_ita_petition.pdf), but briefly these activities include:

GEOLOGICAL AND GEOPHYSICAL SURVEYS

Geological and geophysical surveys are conducted to gather information about subsurface geology. Geological surveys assist in interpreting conditions in the subsurface and may consist of: Potential field surveys, including gravity, magnetic, and electromagnetic surveys; surface geologic surveys; geotechnical site investigations; geochemical surveys; and other evaluations requiring access to the surface of the land or seafloor. Geophysical surveys can be divided into two classes: seismic and shallow hazard surveys. Seismic surveys generally map deep strata beneath the surface of the ground in search of gas and oil-bearing rock formations. Shallow hazard surveys, also known as “site clearance” or “high resolution surveys,” are conducted to gather information on near-surface hazards up to 305 to 500 meters (m) (1,000 to 1,640 ft) below ground level, which could be encountered during drilling, as well as to determine foundation and permafrost conditions. This information is used to plan drilling operations to avoid or minimize the risk of such features.

Industry-based geological and geophysical surveys are explained in detail in the petition and include:

1. Geotechnical Site Investigation;
2. Reflection Seismic Exploration;
3. Vibroseis;
4. Airgun and Watergun Seismic Data Collection;
5. Explosives Seismic Data Collection;
6. Vertical Seismic Profiles;
7. Seafloor Imagery;
8. Offshore Bathymetry; and
9. Ultra Shallow Water (USW) Array.

ENVIRONMENTAL STUDIES

In addition to geological and geotechnical surveys, Industry will conduct environmental studies to collect baseline data or to answer specific research questions. Environmental studies can include, but are 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; non-profit organizations; and other local community stakeholders. These data are necessary to develop mitigation and monitoring strategies associated with exploration and development plans by:

1. Understanding the life cycles and natural variability of wildlife resources, most notably marine mammals, and plant communities;
2. Assessing whether exploration activities and development of oilfield operations affect wildlife populations and plant communities, and developing appropriate mitigation and monitoring strategies;
3. Identifying the location of important cultural and historical artifacts in order to avoid these areas during exploration and development phases; and
4. Understanding the potential for impacts to tundra, air, and aquatic resources through exploration activities and developing mitigation and monitoring strategies.

For the Petition period of 2011 to 2016, Industry states that studies will continue to be conducted for general monitoring purposes or in anticipation of exploration and development of Alaska's North Slope natural resources.

OFFSHORE AND ONSHORE EXPLORATORY DRILLING

Industry describes three forms of exploratory drilling platforms used in offshore exploration, namely artificial and natural islands, bottom-founded structures, and floating vessels. Onshore exploration in the Alaskan Arctic may be conducted from ice pads (single season or multi-season) and gravel pads. These types of platforms are explained in more detail in the Petition, but can include:

1. Artificial Islands;
2. Caisson-retained Island;
3. Steel Drilling Caisson;
4. Floating Drilling Vessels; and
5. Ice Pads, Roads, and Islands.

DEVELOPMENT AND PRODUCTION

As stated in the Petition, existing North Slope production operations extend from the oilfield units of Alpine in the west to Point Thomson and Badami in the east. Badami and Alpine are developments without permanent access roads; access is available to these fields by airstrips, barges, and seasonal ice roads. Oil pipelines extend from these fields and connect to the Trans-Alaska Pipeline System (TAPS). North Slope oilfield developments include a series of major fields and their associated satellite fields. In some cases a new oilfield discovery has been developed completely using existing infrastructure. Thus, the Prudhoe Bay oilfield unit encompasses the Prudhoe Bay, Lisburne, Niakuk, West Beach, North Prudhoe Bay, Point

McIntyre, Borealis, Midnight Sun, Polaris, Aurora, and Orion reservoirs, while the Kuparuk oilfield development incorporates the Kuparuk, West Sak, Tarn, Palm, Tabasco, and Meltwater oilfields.

North Slope oilfield units that are described in the Petition include:

1. Prudhoe Bay Unit;
2. Kuparuk River Unit;
3. Greater Point McIntyre;
4. Milne Point;
5. Endicott;
6. Badami;
7. Alpine;
8. Northstar;
9. Oooguruk Unit; and
10. Nikaitchuq Unit.

Planned Activities during 2011-2016

According to Industry, possible future activities, which seem likely within the five-year period covered by the requested regulations could include areas associated with the offshore BOEMRE OCS lease sales, onshore and offshore State of Alaska lease sales, onshore NPR-A exploration, and development activities. Seismic exploration and exploratory drilling could occur in established areas as well as potential new prospects. In addition, activities associated with potential new satellite oilfields could occur across the North Slope in areas recently leased or in those areas subject to continuing evaluation.

Areas of planned activity could include the following:

National Petroleum Reserve – Alaska (NPR-A)

The BLM manages over 9 million hectares (23 million acres) in the NPR-A, including the Northwest (3.5 million hectares, 8.8 million acres), Northeast (1.8 hectares, 4.6 million acres), and South (3.6 million hectares, 9 million acres) Planning Areas. The area of activity in this Petition includes the Northwest and Northeast areas.

From 2000 to 2008, 25 exploratory wells have been drilled in both the Northeast and Northwest planning areas of the NPR-A. Current operator/ownership information is available on the BLM NPR-A website at http://www.blm.gov/ak/st/en/prog/energy/oil_gas/npra.html. Exploration activities have occurred on the FEX LP leases in the Northwest Planning Area between 2006 - 2008. Exploration may continue where new activities have been developed. New project elements included exploration drilling at nine new ice drill pad locations (in the Uugaq, Aklaq, Aklaqyaaq, and Amaguq prospects), 99 km (62 mi) of new access corridor, and 34 new water sources.

In the Northeast Planning Area, CPAI applied for permits to begin a five-year (2006-2011) winter drilling program at 11 sites in the Northeast Planning Area of the NPR-A (Noatak, Nugget, Cassin and Spark DD prospects), including 177 km (110 mi) of new right-of-way corridors and 10 new water supply lakes. CPAI is planning to continue to develop their program in the Northeast Planning Area throughout the duration of the requested regulations.

State of Alaska Lease Sales
In 1996, the State of Alaska Department of Natural Resources (ADNR), Oil and Gas Division, adopted an "area wide" approach to leasing. Under area wide leasing, the state offers all available state acreage not currently under lease within each area annually. The area of activity in this Petition includes the North Slope and Beaufort Sea planning areas. Lease sale data are available on the ADNR website at: http://www.dog.dnr.state.ak.us/oil/index.htm. Industry activities may occur on state lease sales during the time period of the requested action.

Liberty
BPXA is currently in the process of developing the Liberty field, where the use of ultra extended-reach drilling (uERD) technology will access an offshore reservoir from existing onshore facilities. The Liberty reservoir is located in federal waters in Foggy Island Bay about 13 km (8 mi) east of the Endicott Satellite Drilling Island (SDI). Drilling of the initial Liberty development well and first oil production is planned to occur during the 5-year period of the proposed action.

Point Thomson
The Point Thomson reservoir is approximately 32 km (20 mi) east of the Badami field. In January 2009, ADNR issued a conditional interim decision that allows the drilling of two wells by 2010 and commencing production by 2014. Following startup of production from Point Thomson in 2014, field development is expected to include additional liquids production and sale of gas. Field development will require additional wells, field facilities, and pipelines. The timing and nature of additional facilities and expansions will depend upon initial field performance and timing of an Alaska gas pipeline to export gas off the North Slope.

Alpine Satellites Development
CPAI has proposed to develop oil and gas from five satellites. Two proposed satellites known as CD-3 (CD North during exploration) and CD-4 (CD South) are in the Colville Delta. The CD-3 drill site is located north of CD-1 (Alpine facility) and is a roadless development accessed by a gravel airstrip or ice road in winter. The CD-4 drill site is connected to the main production pad via a gravel road. Three other proposed satellites known as CD-5, CD-6, and CD-7 (Alpine West, Lookout, and Spark, respectively, during exploration) are in the NPR-A. The remaining three drill sites are planned to be connected to CD-2 via road and bridge over the Niglilq Channel from CD-5. The other two drill sites are planned to be connected to CD-5 via road; however, the permitting for these scenarios has not been completed. Development of five drill sites is planned by CPAI in the immediate future in the Alpine development area.

Ataruq (Two Bits)
The Ataruq project is permitted for construction but not completely permitted for operation. This Kerr-McGee Oil and Gas Corporation project is located about 7.2 km (4.5 mi) northwest of KRU Drill Site 2M. The area consists of two onshore prospects and covers about 2,071 hectares

(5,120 acres). It includes a 6.4-km (4-mi) gravel road and a single gravel pad with production facilities and up to 20 wells in secondary containment modules. The processed fluids will be transported to DS 2M via a pipe-in-a-pipe buried line within the access road. After drilling, the facility would be normally unmanned.

Shell Offshore Exploration Activities
Shell anticipates conducting an exploration drilling program, called the Suvulliq Project, on BOEMRE Alaska OCS leases located in the Beaufort Sea during the arctic drilling seasons of 2011-2016. Presently, the arctic drilling seasons are generally considered to be from July through October in the Beaufort Sea. Shell would use a floating drilling vessel complimented by ice management and oil spill response barges and/or vessels to accomplish exploration and/or delineation drilling during each arctic drilling season.

North Shore Development
Brooks Range Petroleum Company is proposing the North Shore Development Project to produce oil from several relatively small, isolated hydrocarbon accumulations on the North Slope. The fields are close to existing Prudhoe Bay infrastructure, where production will concentrate on the Ivishak and Sag River sands prospects. Horizontal drilling technology and long-reach wells will be used to maximize production while minimizing surface impacts. BRPC expects to recover between five and ten million barrels of oil, and future exploration success could increase the reserves. First oil is currently planned for the end of 2010.

Potential Future Gas Pipeline
One company is currently proposing to construct a natural gas pipeline that would transport natural gas from the North Slope to North American markets. Only a small portion (40 km [25 mi] inland) of a pipeline would occur within the specified area of activity covered under this Petition. Initial stages of the gas pipeline development, such as environmental studies and route selection, could occur during the 5-year period of the requested action.

The project is proposed by the TransCanada Corporation. The Alaska Gasline Inducement Act (AGIA) was passed into law by the State of Alaska in May 2007. TransCanada Corporation was selected by the State of Alaska in August 2008 as the exclusive recipient of the AGIA license. TransCanada Corporation is currently in the planning stages of developing the Alaska Pipeline Project, which will move natural gas from Alaska to North American markets. The project is planned to stretch approximately 2,760 km (1,715 mi) from Prudhoe Bay to the British Columbia/Alberta border near Boundary Lake. The Alaska Pipeline Project also includes a gas treatment plant in the Prudhoe Bay area with associated construction activities including dock/causeway improvements and barge channel dredging.

E. Scope of Analysis

When the public proposes to conduct a specific activity requiring authorization from a Federal agency, the agency shall establish the scope of the EA. In this case, Industry has requested the Service to provide incidental take authorization under the MMPA. The scope of their activities has been previously described. The purpose of establishing the scope of analysis is to address impacts of the specific activity(ies) 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.

Previous comments received from the public indicate that some commenters believe that the Service has sufficient control and responsibility over portions of the project beyond Service jurisdiction, e.g., where the environmental consequences of the larger action (i.e., the oil and gas exploration itself, or future work such as development and production) are essentially products of the MMPA authorization. It is important to note that 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 of polar bears and Pacific walruses should be allowed during the course of Industry pursuit of lawful activities. Also, it should be noted that the ITRs are not issued for an indefinite length of time, but rather are valid for only a specified length of time (five years) and then become null and void. The Service has concluded that there is limited Service control and responsibility associated with the oil and gas exploration activities themselves. Consequently, the scope of analysis for this proposed action will be limited primarily to the impacts and alternatives resulting related to the proposed activities that include: 1) exploratory; 2) development; 3) production; and 4) decommissioning actions. Established oil and gas activities that will support the suite of actions include: 1) geological and geophysical surveys; 2) supporting environmental studies; 3) offshore and onshore exploratory drilling; and 4) support and distribution operations associated with the development and production of existing oilfields. Other project-related impacts 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 would result in no incidental take regulations 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 further mitigation to minimize the effects of Industry activities on polar bears and walruses, 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 would be liable for penalties should a take occur.

Consequently, as polar bears are listed as "threatened" under the ESA, a No Action alternative would also influence ESA Section 7 consultations for any activities that require a federal action in the range of the polar bear. For the Service to exempt incidental take under ESA, the Service must conclude that the take associated with a Federal action (1) is not likely to jeopardize listed species, or destroy or adversely modify designated critical habitat, (2) results from an otherwise lawful activity, and (3) is incidental to the purpose of the action. Further, the exemption provided as a result of formal consultation must include measures to minimize take. Therefore, consistent with ESA and its regulations at 50 CFR §402.14(i), incidental take statements for marine mammals are not included in formal consultations until regulations, authorizations, or permits under section 101(a)(5) of the MMPA are in effect. No issuance of incidental take regulations could, therefore, compromise ESA section 7 consultations.

Furthermore, because the provisions section 101(a)(5)(A) instruct the Secretary to allow the incidental, but not intentional, taking of small numbers of marine mammals, subject to making the requisite findings the alternative to take no action is not available.

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

The preferred alternative is to promulgate ITRs, which would authorize incidental take of small numbers of Pacific walruses and polar bears associated with oil and gas activities in the Beaufort Sea and adjacent Alaska coast. The intent of the preferred alternative is to provide petitioners an overall "umbrella" set of guidelines which, when followed, allow the oil and gas exploration, development, and production activities described above to be authorized under an LOA. The LOAs would 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. Conditioning LOAs would be done on a case-by-case basis to afford additional protection to sensitive areas, such as areas being utilized by denning polar bears. These regulations would 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: 1) initiating an Incidental Harassment Authorization (IHA) program; 2) separating Industry operations by the type of activity, as well as the location or timing of the activity; and 3) promulgating separate rules for each type of activity.

In contrast to the "umbrella" type of authorization provided by a 5-year ITR, an IHA entails issuing individual authorizations for specific activities each year. For example, during the 2006 and 2007 open-water season, the Service authorized IHAs for oil and gas exploration activities in the Chukchi Sea as a means to establish temporary incidental take authorization for a limited number of projects occurring in the area prior to the promulgation of ITRs. This was a new process for the Service. The IHA process has limitations in that authorizations are issued on a piecemeal basis (project-by-project), and consequently they generally do not provide the comprehensive coverage necessary to evaluate potential impacts from the various onshore and offshore oil and gas activities that may affect walruses and polar bears during the next 5 years. While an IHA program is possible, it is not practicable and the Service believes that a 5-year ITR is a more thorough process for evaluating anticipated projects and the potential impacts, as well as a more efficient use of staff time.

Similar reasoning was used to evaluate 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 on polar bears and walruses 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 determined. Our analysis indicates that separating Industry operations is not a viable alternative, as we cannot separate, exclude, or exempt specific activities in making a negligible finding.

IV. AFFECTED ENVIRONMENT

A. Physical Environment

The regional climate of Alaska's North Slope is typical of the Arctic zone, where weather extremes are common and climate influences the geographic features (Truett and Johnson 2000). Summers are short in duration, with continuous daylight, where average summer temperatures range between 5 to 15 ^{o}C. During the summer the ground thaws to a depth of 12 to 16 inches and the landscape is dominated by wetlands. Winters are dark and cold and last 8 to 9 months. Average winter temperatures range between -20 and -60^{o}C in January (Truett and Johnson 2000). Annual precipitation is low and averages 13 – 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 Beaufort Sea 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/September.

Broken ice. The broken ice period is that time the sea transitions from ice-covered to open water (break-up) and from open-water to ice-covered (freeze-up). These periods usually occur in June and October, respectively.

Winter (ice covered). Winter conditions in the Beaufort Sea begin with freeze-up and an increase in the amount of sea ice. The ice reaches a maximum thickness of approximately 2 m by March/April. There are considerable variations from year to year and the edge of the pack ice in September ranges from about 12 to 66 miles offshore (Labelle *et al*. 1983). In recent years, however, the sea ice has exhibited record lows in sea ice extent, where it forms later in the fall and retreats earlier in the summer (Rigor and Wallace 2004**).** By October, the ice edge has usually moved south of Barrow. From November through May, ice covers nearly all of the Beaufort Sea. The winter sea-ice regime can be divided into three distinct zones: landfast-ice, shear, and pack ice.

***Landfast-ice*.** The landfast-ice zone extends from the shore out to the zone of grounded ridges. These ridges first form in about 24 to 45 feet of water but, by late winter may extend to deeper water. Wind and water stress on floating sheets of ice results in deformation and displacement. 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 land-fast 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 first year ice, and multi-year ice. The first year ice that forms in the fractures, leads, and polynyas (large areas of open water) varies in thickness from less than one inch to greater than a few feet. Multi-year ice is ice that has persisted for more than a year.

The violent interactions between ice zones create deformed ice, known as ice ridges. These ridges are usually about 3 to 6 feet in height, but may reach heights of 20 feet.

B. Biological Environment

The biological environment associated with this environmental assessment in the Beaufort Sea includes polar bears from the Southern Beaufort and Chukchi-Bering seas stocks and the Pacific walrus stock.

Polar bears (*Ursus maritimus*)

Stock Definition and Range

Polar bears occur throughout the Arctic. The world population estimate of polar bears ranges from 20,000–25,000 individuals. In Alaska, they have been observed as far south in the eastern Bering Sea as St. Matthew Island and the Pribilof Islands (Ray 1971). However, they are most commonly found within 180 miles of the Alaskan coast of the Chukchi and Beaufort Seas, from the Bering Strait to the Canadian border. Two stocks occur in Alaska: (1) the Chukchi-Bering seas stock (CS); and (2) the Southern Beaufort Sea stock (SBS) (Figure 3). A summary of the CS and SBS polar bear stocks are described below. A detailed description of the CS and SBS polar bear stocks can be found in the, "Range-Wide Status Review of the Polar Bear (*Ursus maritimus*)" 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.

Southern Beaufort Sea (SBS) - The SBS polar bear population is shared between Canada and Alaska. Radio-telemetry data, combined with earlier tag returns from harvested bears, suggest that the SBS region comprised a single population with a western boundary near Icy Cape, Alaska, and an eastern boundary near Pearce Point, Northwest Territories, Canada. Early estimates from the mid 1980s suggested the size of the SBS population was approximately 1,800 polar bears, although uneven sampling was known to compromise the accuracy of that estimate. A population analysis of the SBS stock was completed in June 2006 through joint research coordinated between the United States and Canada. That analysis indicated the population of the region between Icy Cape and Pearce Point is now approximately 1,500 polar bears (95 percent confidence intervals approximately 1,000–2,000). Although the confidence intervals of the current population estimate overlap the previous population estimate of 1,800; other statistical

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

Recent analyses of radio-telemetry data of spatio-temporal use patterns of bears of the SBS stock using new spatial modelling techniques suggest realignment of the boundaries of the Southern Beaufort Sea area. We now know that nearly all bears in the central coastal region of the Beaufort Sea are from the SBS population, and that proportional representation of SBS bears decreases to both the west and east. For example, only 50 percent of the bears occurring in Barrow, Alaska, and Tuktoyaktuk, Northwest Territories, are SBS bears, with the remainder being from the CS and Northern Beaufort Sea populations, respectively. The recent radio-telemetry data indicate that bears from the SBS population seldom reach Pearce Point, which is currently on the eastern management boundary for the SBS population. Conversely, SBS bears can also be found in the western regions of their range in the Chukchi Sea (i.e., Wainwright and Point Lay) in lower proportions than the central portion of their range.

Management and conservation concerns for the SBS and CS polar bear populations include: climate change, which continues to increase both the expanse and duration of open water in summer and fall; human activities within the near-shore environment, including oil and gas activities; atmospheric and oceanic transport of contaminants into the Arctic; and the potential for inadvertent over-harvest, should polar bear stocks become nutritionally-stressed or decline due to some combination of the afore-mentioned threats.

The polar bear was listed as threatened, range-wide, under the Endangered Species Act on May 14, 2008 due to loss of sea ice habitat caused by climate change (73 FR 82212); a final special rule under Section 4(d) of the ESA for the polar bear was published on December 16, 2008 (73 FR 76249). Additional threats evaluated during the listing included impacts from activities such as industrial operations, subsistence harvest, shipping and tourism. No other impacts were considered significant in causing the decline but minimizing effects from these activities could become increasingly important for conservations and polar bear numbers continue to diminish. More information can be found at: http://www.fws.gov/ and http://alaska.fws.gov/fisheries/mmm/polarbear/pbmain.htm

Chukchi/Bering seas stock (CS) – The CS is defined as those polar bears inhabiting the area as far west as the eastern portion of the Eastern Siberian Sea, as far east as Point Barrow, and extending into the Bering Sea, with its southern boundary determined by the extent of annual ice. Based upon telemetry studies, the western boundary of the population has been set near Chaunskaya Bay in northeastern Russia. The eastern boundary is at Icy Cape, Alaska, which also is the previous western boundary of the SBS. This eastern boundary constitutes a large overlap zone with bears in the SBS population. The status of the CS population, which was believed to have increased after the level of harvest was reduced in 1972, is now thought to be uncertain or declining. The most recent population estimate for the CS population is 2,000 animals. This was based on extrapolation of aerial den surveys from the early 1990s; however, this crude estimate is currently considered to be of little value for management. Reliable

estimates of population size based upon mark and recapture are not available for this region and measuring the population size remains a research challenge (Evans *et al*. 2003).

In Alaska, average annual harvest levels declined by approximately 50 percent between the 1980s and the 1990s and have remained at low levels in recent years. There are several factors potentially affecting the harvest level in western Alaska. The factor of greatest direct relevance is the substantial illegal harvest in Chukotka. In recent years a reportedly sizable illegal harvest has occurred in Russia, despite a ban on hunting that has been in place since 1956. In addition, other factors such as climatic change and its effects on pack ice distribution, as well as changing demographics and hunting effort in native communities could influence the declining take. The unknown rate of illegal take makes the stable designation uncertain and tentative.

Until recently, the U.S. and Russia have managed the shared CS polar bear population independently. Now, U.S and Russian bear researchers and managers are currently working to update and enhance the collective knowledge of polar bears in the CS stock. 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 at Washington, D.C., on October 16, 2000 (Agreement). The purpose of the Agreement is to assure long-term, science-based conservation of the polar bear population and determined necessary includes the imposition of binding harvest limits; implementation of the Agreement allows for unifying management. The Agreement also calls for the active involvement of Native people and their organizations in the management of this polar bear population and will also enhance such long-term joint efforts as conservation of ecosystems and important habitats, harvest allocations based on sustainability, collection of biological information, and increased consultation and cooperation with state, local, and private interests.

In addition, the Agreement established the U.S.–Russia Polar Bear Commission (Commission), which functions as the bilateral managing authority to make scientific determinations, establish taking limits, and carry out other responsibilities important to the conservation and management of the polar bear. The Commission, at its meeting in June of 2010, determined that establishing a limit to the subsistence harvest of polar bears from the Alaska–Chukotka polar bear population was needed. Further, the Commission determined that the two countries will work together over the coming year to identify legal requirements and documents needed to implement the determined subsistence harvest limit and that further discussion would take place at the next Commission meeting in June 2011.

Habitat

Polar bears evolved for life in the arctic and are distributed throughout most ice-covered seas of the Northern Hemisphere. 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. Over most of their range, polar bears remain on the sea ice year-round or spend only short periods on land.

The Service designated critical habitat for polar bear populations in the U.S. effective January 6, 2011 (75 FR 76086; December 7, 2010). Critical habitat identifies geographic areas that contain features that are essential for the conservation of a threatened or endangered species and that may require special management or protection. The designation of critical habitat under the ESA does not affect land ownership or establish a refuge, wilderness, reserve, preserve, or other conservation area. It does not allow government or public access to private lands. A critical habitat designation does not affect private lands unless federal funds, permits, or activities are involved. Federal agencies that undertake, fund, or permit activities that may affect critical habitat are required to consult with the Service to ensure that such actions do not adversely modify or destroy critical habitat.

The Service designated critical habitat in three areas or units: barrier island habitat, sea ice habitat (both described in geographic terms) and terrestrial denning habitat (a functional determination). Barrier island habitat includes coastal barrier islands and spits along Alaska's coast, and is used for denning, refuge from human disturbances, access to maternal dens and feeding habitat, and travel along the coast. Sea ice habitat is located over the continental shelf, and includes water 300m and less in depth. Terrestrial denning habitat includes lands within 32 km of the northern coast of Alaska between the Canadian border and the Kavik River and within 8 km between the Kavik River and Barrow. The total area designated covers approximately 187,157 square miles and is entirely within the lands and waters of the United States.

Polar bear habitat in the Beaufort Sea is described in detail in the final rule which designated polar bear critical habitat (75 FR 76086; December 7, 2010). A detailed description of polar bear habitat can be found at:
http://alaska.fws.gov/fisheries/mmm/polarbear/pdf/federal_register_notice.pdf.

Denning and Reproduction

Females without dependent cubs breed in the spring. Females can initiate breeding at 5 to 6 years of age. Females with cubs do not mate. Pregnant females enter maternity dens by late November, and the young are usually born in late December or early January. Only pregnant females den for an extended period during the winter; other polar bears may excavate temporary dens to escape harsh winter winds. An average of two cubs is born. Reproductive potential (intrinsic rate of increase) is low. The average reproductive interval for a polar bear is 3 to 4 years, and a female polar bear can produce about 8 to 10 cubs in her lifetime; in healthy populations, 50 to 60 percent of the cubs will survive. Female bears can be quite sensitive to disturbances during this denning period.

In late March or early April, the female and cubs emerge from the den. If the mother moves young cubs from the den before they can walk or withstand the cold, mortality to the cubs may increase. Therefore, it is thought that successful denning, birthing, and rearing activities require a relatively undisturbed environment. Radio and satellite telemetry studies elsewhere indicate that denning can occur in multi-year pack ice and on land. Recent studies of the SBS indicate

that the proportion of dens on pack ice have declined from approximately 60% in 1985-1994 to 40% in 1998-2004.

In northern Alaska, maternal polar bear dens appear to be less concentrated than in Canada to the east and in Russia to the west. In Alaska, 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 stock (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 the Colville and Canning rivers. Denning for the Chukchi Sea bears occurs on Wrangel and Herald islands and the Chukotka coast.

Prey

Ringed seals (*Pusa hispida*) are the primary prey of polar bears in most areas. Bearded seals (*Erignathus barbatus*) and walrus calves are hunted occasionally. Polar bears can opportunistically scavenge marine mammal carcasses. Polar bears will occasionally feed on bowhead whale (*Balaena mysticetus*) carcasses at Point Barrow, Cross, and Barter islands, 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. Polar bears are also known to ingest anthropogenic, nonfood items including Styrofoam, plastic, antifreeze, and hydraulic and lubricating fluids.

Polar bears use the sea ice as a platform to hunt seals. Polar bears hunt seals using various means. They can hunt along leads and other areas of open water, by waiting at a breathing hole, or by breaking through the roof of a seal lair. Lairs are excavated in snow drifts on top of the ice. Bears also stalk seals in the spring when they haul out on the ice in warm weather. The relationship between ice type and polar bear distribution is as yet unknown, but it is suspected to be related to seal availability. Due to changing sea ice conditions the area of open water and proportion of marginal ice has increased and extends later in the fall. This may limit seal availability to polar bears as the most productive areas for seals appear to be over the shallower waters of the continental shelf.

Mortality

Polar bears are long-lived (up to 30 years), have no natural predators, and do not appear prone to death by diseases or parasites. Cannibalism by adult males on cubs and occasionally on other bears is known to occur. The most significant source of mortality is man. Before the MMPA was passed in 1972, polar bears were taken by sport hunters and residents. Between 1925 and 1972, the mean reported kill was 186 bears per year. Seventy-five percent of these were males, as cubs and females with cubs were protected. Since 1972, only Alaska Natives from coastal Alaskan villages have been allowed to hunt polar bears for their subsistence uses or for handicraft and clothing items for sale. The Native hunt occurs without restrictions on sex, age, or number provided that the population is not determined to be depleted. From 1980 to 2005, the total annual harvest for Alaska averaged 101 bears: 64 percent from the Chukchi Sea and 36 percent from the Beaufort Sea. Other sources of mortality related to human activities include

bears killed during research activities, euthanasia of sick and or injured bears, and defense of life kills by non-Natives (Brower *et al*. 2002).

Distributions and Abundance in the Beaufort Sea

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). Polar bears can also be observed throughout the year in the onshore and nearshore environments, where they will opportunistically scavenge on marine mammal carcasses washed up along the shoreline (Kalxdorff and Fischbach 1998). Their distribution in the coastal habitat can be influenced by the movement of the seasonal pack ice.

More specifically, during the ice-covered season, pregnant females can use terrestrial denning habitat between late-October to mid-April. The percentage of pregnant females using terrestrial habitat for denning is unknown, but as stated earlier, the proportion of dens on terrestrial habitat has increased in recent years. In additional, a small proportion of bears of different cohorts may be found along the coastline as well during this time period. During the open water season (July through September) a small proportion of bears will utilize the coastal environments while the majority of the population will be on the ice edge of the pack ice.

During the late summer/fall period (August through October) polar bears will most likely be encountered along the mainland coastline and barrier islands, using these areas as travel corridors and platforms for searching for prey. Based on industry observations, encounter rates are higher during the fall period (August to October) than any other time period. The duration the bears spend in these coastal habitats depends on storm events, ice conditions, and the formation of the annual ice. In recent years, polar bears have been observed in larger numbers than previously recorded during the fall period. One reason for this increase is thought to be subsistence-harvested bowhead whale (*Balaena mysticetus*) remains at Cross and Barter islands, which provide a readily available food source for the bears in these areas (Schliebe *et al*. 2005). Based on industry observations and coastal survey data acquired by the Service, up to approximately 125 individuals of the SBS bear population have been observed during the fall period between Barrow and the Alaska-Canada border during the survey years from 2000 to present.

Pacific walrus (*Odobenus rosmarus divergens*)

Stock Definition and Range

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). The population ranges across the international boundaries of the United States and Russia, and both nations share common interests with respect to the conservation and management of this species (Figure 2). The distribution of Pacific walruses varies markedly with the season. During the late winter breeding season, walruses are found in areas of the Bering Sea where open leads, polynyas, or areas of broken pack ice occur. Significant winter concentrations are normally found in the Gulf of Anadyr, the St. Lawrence Island Polynya, and in an area south of Nunivak Island. In the spring and early summer, most of the population follows the retreating pack ice northward into the Chukchi Sea; however, several thousand animals, primarily adult males, remain in the Bering

Sea, using coastal haul outs during the ice-free season. During the summer months, walruses are widely distributed across the shallow continental shelf waters of the Chukchi Sea. Significant summer concentrations are normally found in the unconsolidated pack ice west of Point Barrow, and along the northern coastline of Chukotka in the vicinity of Wrangell Island. Small herds of walruses occasionally range east of point Barrow into the Beaufort Sea in late summer. As the ice edge advances southward in the fall, walruses reverse their migration and re-group on the Bering Sea pack ice.

A detailed description of Pacific walrus can be found at:
http://alaska.fws.gov/fisheries/mmm/walrus/pdf/74_FR_46548.pdf

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 (1957) 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 markedly in response to varying levels of human exploitation. Large-scale commercial harvests are believed to have reduced the population to 50,000-100,000 animals in the mid-1950s (Fay *et al*. 1989). The population appears to have increased rapidly in size during the 1960s and 1970s in response to harvest regulations and reductions in hunting pressure (Fay *et al*. 1989). Between 1975 and 1990, visual aerial surveys were carried out by the United States and Russia at 5-year intervals, producing population estimates ranging from 201,039 to 290,000 walruses. In 2006, U.S. and Russian researchers surveyed walrus groups in the pack ice of the Bering Sea using thermal imaging systems to detect walruses hauled out on sea ice and satellite transmitters to account for walruses in the water (USFWS unpubl. data). The number walruses within the surveyed area were estimated at 129,000 with 95% confidence limits of 55,000 to 507,000 individuals. Previous aerial survey results are highly variable and not directly comparable among years because of differences in survey methods, timing of surveys, segments of the population surveyed, and incomplete coverage of areas where walrus may have been present (Fay *et al*. 1989; Gilbert 1999) . Because of such issues, existing abundance estimates do not provide a basis for determining trends in population size (Hills and Gilbert 1994).

Changes in walrus population status (i.e., population size relative to carrying capacity) have also been investigated by examining changes in biological parameters over time. Based on evidence of changes in abundance, distributions, condition indices, and life-history parameters, (Fay *et al*. 1989; 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 approaching, or had exceeded, the carrying capacity of its environment by the early 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). Although harvest levels declined sharply in the late 1980s, and increased reproductive rates and earlier maturation in females suggest that density dependent regulatory mechanisms were relaxed in the 1990s, it is not clear whether these changes reflect a decline in abundance, changes in environment conditions or a combination factors (Garlich-Miller *et al*. 2006).

Habitat

Walruses rely on floating pack ice as a substrate for resting and giving birth. Walruses generally require ice thicknesses of 50 cm (20 in) or more to support their weight. Although walruses can break through ice up to 20 cm (8 in) thick, they usually occupy areas with natural openings and are not found in areas of extensive, unbroken ice (Fay 1982). Thus, their concentrations in winter tend to be in areas of divergent ice flow or along the margins of persistent polynyas. Concentrations in summer tend to be in areas of unconsolidated pack ice, usually within 100 km (30 mi) of the leading edge of the ice pack (Gilbert 1999). When suitable pack ice is not available, walruses haul out to rest on land. Isolated sites, such as barrier islands, points, and headlands, are most frequently occupied. Social factors, learned behavior, and proximity to their prey base are also thought to influence the location of haul out sites. Traditional walrus haul out sites in the eastern Chukchi Sea include Cape Thompson, Cape Lisburne and Icy Cape. In recent years, the Cape Lisburne haul out site has seen regular use in late summer. Numerous haul outs also exist along the northern coastline of Chukotka, and on Wrangell and Herald islands, which are considered important haul-out areas in September, especially in years when the pack ice retreats far to the north.

Although capable of diving to deeper depths, walruses are generally found in shallow waters of 100 ft (30 m) or less, possibly because of higher productivity of their benthic foods in shallower water. They feed almost exclusively on benthic invertebrates although Native hunters and researchers have also reported incidences of walruses preying on seals. Prey densities are thought to vary across the continental shelf according to sediment type and structure. Preferred feeding areas are typically composed of sediments of soft, fine sands. The juxtaposition of ice over appropriate depths for feeding is especially important for females and their dependent young that are not capable of deep diving or long exposure in the water. The mobility of the pack ice is thought to help prevent walruses from overexploiting its prey resource (Ray *et al*. 2006). Foraging trips may last for several days, during which time they dive to the bottom nearly continuously. Most foraging dives to the bottom last between 5 and 10 minutes, with a relatively short (1–2 minute) surface interval. The intensive tilling of the sea floor by foraging walruses is thought to have significant influence on the ecology of the Bering and Chukchi seas. Foraging activity recycles large quantities of nutrients from the sea floor back into the water column, provides food for scavenger organisms, and contributes greatly to the diversity of the benthic community.

Life History

Walruses are long-lived animals with low rates of reproduction. Females reach sexual maturity at 4–9 years of age. Males become fertile at 5–7 years of age; however, they are usually unable to compete for mates until they reach full physical maturity at 15–16 years of age. 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^{o}N (Fay *et al.* 1984). Calves are capable of entering the water shortly after birth, but tend to haul out frequently, until their swimming ability and blubber layer are well developed. Newborn calves are tended closely. They accompany their mother from birth and are usually not weaned for 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 together to form large "nursery herds" (Burns 1970). Summer distribution of females and young walruses is closely tied to the movements of the pack ice relative to feeding areas. Females give birth to one calf every two or more years. This reproductive rate is much lower than other pinniped species; however, some walruses live to age 35–40 and remain reproductively active until relatively late in life (Garlich-Miller *et al*. 2006).

Walruses are extremely social and gregarious animals. They tend to travel in groups and haul out onto ice or land in groups. Walruses spend approximately one-third of their time hauled out onto land or ice. Hauled-out walruses tend to lie in close physical contact with each other. Youngsters often lie on top of the adults. The size of the hauled out groups can range from a few animals up to several thousand individuals.

Mortality

Polar bears are known to prey on walrus calves, and killer whales (*Orcinus orca*) have been known to take all age classes of animals. Predation levels are thought to be highest near terrestrial haul out sites where large aggregations of walruses can be found; however, few observations exist for off-shore 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 first contact. Presently, walrus hunting in Alaska and Chukotka is restricted to meet the subsistence needs of aboriginal peoples. The Service, in partnership with the Eskimo Walrus Commission (EWC) and the Association of Traditional Marine Mammal Hunters of Chukotka, administered subsistence harvest monitoring programs in Alaska and Chukotka in 2000–2005. Harvest mortality over this time frame averaged 5,458 walruses per year. This mortality estimate includes 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 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.

Distributions and Abundance in the Beaufort Sea

The distribution of Pacific walruses is thought to be influenced primarily by the extent of the seasonal pack ice. In May and June, most of the Pacific walrus population migrates through the Bering Strait into the Chukchi Sea. Walruses tend to migrate into the Chukchi Sea along lead systems that develop along the northwest coast of Alaska. Walruses are expected to be closely associated with the southern edge of the seasonal pack ice during the open water season. By July, large groups of walruses, up to several thousand animals, can be found along the edge of the pack ice between Icy Cape and Point Barrow. During August, the edge of the pack ice generally retreats northward to about 71 ^{o}N, but in light ice years, the ice edge can retreat beyond 76 ^{o}N. The sea ice normally reaches its minimum (northern) extent in September. In years when the sea ice retreats beyond the relatively shallow continental shelf waters of the Chukchi Sea, some animals migrate west towards Chukotka, while others have been observed hauling out along the shoreline between Point Barrow and Cape Lisburne. In recent years coastal haul outs

in Chukotka Russia have seen regular and persistent use in the fall. Russian biologists attribute the increased use of these coastal haul outs to diminishing sea ice habitat. A similar event was recorded along the Alaskan coastline in August–September 2007, when several thousand animals were reported along the Chukchi Sea coast between Barrow and Cape Lisburne. The pack ice usually advances rapidly southward in October, and most walruses are thought to have moved into the Bering Sea by mid–to-late November.

Walruses are considered extralimital in the Beaufort Sea. A total of 9 walrus sightings have been reported as a result of Industry monitoring efforts over the past twenty years. (Kalxdorff and Bridges 2003; USFWS unpubl. data). Two sightings occurred in 1996; one involved a single animal observed from a seismic vessel near Point Barrow, and a second animal was sighted during an aerial survey approximately five miles northwest of Howe Island. In 1997, another single animal was sighted during an aerial survey approximately twenty miles north of Pingok Island. In 1998, a dead walrus was observed on Pingok Island being scavenged by polar bears. One walrus was observed hauled out near the Steel Drilling Caisson (SDC) at McCovey in 2002. In 2004, one walrus was observed 50m from the Saltwater Treatment Plant, on West Dock. In addition, walrus have been observed on the armor of Northstar Island three times since 2001, where in 2004, 3 walrus were observed on the armor in two separate instances.

C. ESA-listed species

Polar Bear

The Service listed the polar bear as a threatened species under the ESA on May 15, 2008 (73 FR 28212) and published a final special rule under Section 4(d) of the ESA for the polar bear on December 16, 2008 (73 FR 76249). The Section 4(d) rule provided that activities authorized or exempted under the MMPA may not be considered as violations under the ESA or its implementing regulations (50 CFR 17.40(q)(2)). On December 7, 2010 (75 FR 76086), the Service designated critical habitat for polar bear populations in the U.S., effective January 6, 2011.

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

Additional information can be found at:
http://alaska.fws.gov/fisheries/mmm/polarbear/pbmain.htm

Walrus

On February 8, 2008, the Service was petitioned to list the Pacific walrus as threatened or endangered under the ESA and to designate critical habitat. After reviewing the petition, the Service published a 90-day finding (74 FR 46548) that states the information provided in the petition, as well as other information in our files, presents substantial scientific or commercial information indicating that the petitioned action may be warranted. A 12-month finding and Pacific walrus status review is forthcoming.

Additional information can be found at:
http://alaska.fws.gov/fisheries/mmm/walrus/pdf/74_FR_46548.pdf

D. Socio-Economic Environment

The communities most likely to be impacted by the proposed regulation are Barrow, Nuiqsut, and Kaktovik, while to a lesser degree Wainwright and Atqasuk as these two villages also have the ability to harvest walrus in the Beaufort Sea (the proposed geographic region) and polar bears from the SBS stock. 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 coastal Alaska. Walrus meat is consumed by humans while the ivory is used to manufacture traditional arts and crafts. Few walruses are harvested in the Beaufort Sea along the northern coast of Alaska since the primary range of Pacific walrus is predominantly in the Chukchi Sea, west and south of the Beaufort Sea. Polar bears are hunted primarily for their fur, which is used to manufacture cold weather clothing. Their 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.

A Native-to-Native agreement between the Inupiat from Alaska and the Inuvialuit in Canada was created for the SBS stock of polar bears in 1988. Polar bears harvested from the communities of Barrow, Nuiqsut, Kaktovik, Wainwright, and Atqasuk are currently considered part of the SBS stock and thus are subject to the terms of the Inuvialuit-Inupiat Polar Bear Management Agreement (Agreement). The Agreement establishes quotas and recommendations concerning protection of denning females, family groups, and methods of harvest. Quotas are based on estimates of population size and age-specific estimates of survival and recruitment. The current quota for polar bears under the Agreement is 70 total bears per year. The quota is allocated with 35 bears to Canadian Inuvialuit and 35 bears to Alaskan Inupiat. The 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.

As discussed above, in 2000, the United States and Russia signed a bi-lateral Agreement to conserve and manage their shared population of polar bears. In 2010, the Joint Commission, with input from both governments, the scientific community and Native subsistence users from both countries, established a quota for the harvest of polar bears from the Chukchi/Bearing Sea stock. The quota is currently set at 58 polar bears of which 19 are to be females and 39 males. The quota is to be allocated between Native subsistence hunters in Alaska and Chukotka. Harvest and monitoring programs to allocate and administer the quota are currently being developed by both countries.

Additionally, and similar to the exemption under the MMPA for Alaska Natives discussed above, section 10(e) of the ESA allows for the continued harvest of species listed as threatened or endangered in Alaska for subsistence purposes.

The Service collects information on the subsistence harvest of walruses and polar bears in Alaska through the Marking, Tagging and Reporting Program (MTRP). The program is administered through a network of MTRP "taggers" employed in subsistence hunting communities. The marking and tagging rule requires that hunters 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. The MTRP reports are thought to generally underestimate total U.S. subsistence walrus harvest with one estimate as low as 30 percent of actual harvest in Barrow. Polar bear harvests reported by the MTRP are believed to be as high as 50 percent of the actual subsistence harvest in the communities most affected by the proposed regulation.

Harvest levels of polar bears and walruses in these communities can vary considerably between years, presumably in response to differences in animal distribution, sea ice conditions and hunter effort. Information on subsistence harvests of walruses and polar bears in each community is presented below.

Table 1. Number of Pacific walruses and polar bears harvested 2005-2009 in 5 Alaska communities, as recorded through the USFWS MTRP.

	Wainwright	***Barrow***	***Atqasuk***	***Nuiqsut***	***Kaktovik***
Pacific Walrus	67	65	0	0	0
Polar Bear	13	84	3	6	11

Wainwright

Wainwright is located approximately 72 miles southwest of Barrow on the northwest coast of Alaska. Wainwright hunters have consistently harvested more walruses than any other subsistence community on the North Slope of Alaska. Most Wainwright walrus hunting occurs within 20 miles of the community within the Chukchi Sea. In the past 20 years, Wainwright hunters have reported 835 harvested walruses with 67 of those since 2005.

Polar bears are harvested throughout much of the year, with peak harvests reported in May and December. Polar bears are often harvested coincidentally with beluga and bowhead whale harvests. Most polar bear hunting typically occurs within 10 miles of the community and some bears are harvested within the village itself. Wainwright hunters have reported 13 polar bears harvested since 2005. Approximately 40% of bears harvested from Wainwright are allocated to the SBS due to the overlap of the range of the CS and SBS bear populations.

Barrow

Barrow is the northernmost community in the United States. Walruses constitute a small portion of the total marine mammal harvest for this community. Most walrus hunting from Barrow occurs in June and July when the land-fast ice breaks up and hunters can access the north migrating walruses on the retreating pack ice by boat. Walrus hunters from Barrow range up to 60 miles from shore, however, most reported harvests were within 30 miles of the community. Hunters from Barrow have reported 477 walruses harvested in the past 20 years with 65 of those since 2005, where up to six animals, approximately 10% of the harvest, were taken east of Point Barrow in the last five years within the limits of the incidental take regulations.

The number of polar bears harvested in Barrow is most likely influenced by ice conditions and the number of people out on the ice. Hunting areas for polar bears often overlap with areas of bowhead whale subsistence hunting; particularly the area from Point Barrow South to Walakpa Lagoon where walrus and whale carcasses are known to concentrate polar bears seasonally. The majority of reported polar bear harvests by Barrow residents occur in February and March and are often associated with other subsistence hunting activities (e.g., bowhead or beluga whales and seals) or where bears are considered to be a danger to the community or hunters. It is common for subsistence harvest of polar bears to overlap with bear removal for community safety. Relatively few Alaska Natives are known to hunt specifically for polar bears anymore. When polar bears are specifically hunted it is primarily between October and March. Barrow hunters have reported 84 polar bears harvested since 2005.

Atqasuk

Atqasuk is located on the Meade River approximately 60 miles South of Barrow. Atqasuk hunters do not normally hunt walrus due to the village's distance from the sea and the limited occurrence of walrus in their coastal hunting grounds. There have been five harvested walruses reported from Atqasuk hunters over the past 20 years. Since 2005 no walrus and three polar bears have been reported harvested by Atqasuk hunters.

Nuiqsut

Nuiqsut is located along the Nechelik Channel of the Colville River Delta about 35 miles from the Beaufort Sea coast. Hunters from Nuiqsut do not normally hunt walrus due to the limited occurrence of walrus in their hunting grounds. There have been no reported walruses harvested from Nuiqsut hunters in the past 20 years.

Hunters from Nuiqsut harvest bowhead whales in waters near Cross Island in the fall and spring. Cross Island is a Beaufort Sea coastal barrier island and is the hunting base for Nuiqsut whale hunters. Since 2005 six harvested polar bears have been reported by Nuiqsut hunters, mostly on Cross Island.

Kaktovik

Kaktovik is located on the north shore of Barter Island, between the Okpilak and Jago Rivers, off the Beaufort Sea coast within the boundaries of the Arctic National Wildlife Refuge. Hunters from Kaktovik do not normally hunt walrus due to the limited occurrence of walrus in their

hunting grounds. They have reported harvesting only two walruses over the past 20 years. Since 2005 hunters in Kaktovik have reported harvesting 11 polar bears, many of these within the village itself.

In an unusual incident, and well outside what is considered to be the usual range of polar bears in Alaska, a single polar bear was killed by local hunters near Fort Yukon in 2008. Fort Yukon is a small community near the confluence of the Yukon and Porcupine rivers approximately 240 miles south of the Beaufort Sea coast and 145 miles North of Fairbanks.

Native subsistence harvest is the greatest source of human caused polar bear mortality. The Alaska Native subsistence harvest from the SBS population of polar bears has remained relatively consistent since 1980 and averages less than 40 bears per year. A small number of polar bears have been killed by humans over the past 20 years during research activities, euthanasia (due to illness or injury) or by non-Natives in defense of life.

Other socio-economic activity centered on these species, such as eco-tourism or wildlife viewing (predominantly for polar bears), has occurred in Barrow and Kaktovik. Viewing opportunities, however, are seasonally unpredictable due to bears travelling along the coast and the availability of opportunistic food sources, such as whale carcasses. Wildlife viewing is currently limited to Barrow and Kaktovik, which are located on the periphery of oil and gas industry activity areas. Oil and gas industry operators do not allow wildlife viewing, or any other tourist activity, within their areas of operation. Nevertheless, wildlife viewing, especially for polar bears, appears to be increasing. The Service is currently working with communities to minimize impacts on polar bears from viewing activities by developing guidelines that limit potential interactions.

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 a 5-year ITR for oil and gas exploration activities in the Beaufort Sea and alternatives to that proposed action are presented.

A. Alternative 1 – No Action Alternative

If this alternative is implemented, no ITRs would be issued. Consequently, any takes resulting from the proposed activities would not be authorized and any incidental takes would 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 for Pacific walrus. 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 requirements for an ESA incidental take statement

(ITS) to be issued, where compliance with the terms and conditions of this LOA ensures that the LOA holder is also in compliance with the ESA. The lack of ITRs could slow the permitting process for activities and require re-initiation of Section 7 consultation since the current Biological Opinion us predicated upon the current ITRs.

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

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

Under this alternative, the general mitigation measures described in Section VI would be implemented to minimize potential adverse impacts from the proposed Industry activities, as well as provide data to continually improve our ability to evaluate the effects on 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 walrus. 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 polar bears or Pacific walruses identified in MMPA Incidental Take Authorizations would supersede any such related mitigation measures in the relevant Bureau of Ocean Energy Management, Regulation and Enforcement (BOEMRE) permit.

1. Potential Impacts on Marine Mammals

Polar Bears

As stated in previous ITRs, the polar bears of the SBS stock have limited exposure to Industry operations during the open-water season in the Beaufort Sea as they generally move northward and westward to the northern portion of the Beaufort Sea and the northwestern portion of the Chukchi Sea during this time, traveling with the receding ice. The spatial and temporal distribution of polar bears during the open-water season reduces the likelihood and scale of potential impacts on polar bears from Industry activities. Polar bears have been documented in open-water, miles from the ice edge or ice floes, though such observations have been relatively rare.

One anticipated consequence of a warming climate is the reduction of Arctic sea ice. The effect on polar bears of Industry activities in the Beaufort Sea with reduced sea ice is unknown. The

trend in the Beaufort Sea is sea ice retreating earlier in the season and farther north off the continental shelf over deeper waters than has been observed in the past. The trend for sea ice returning is later in the season than observed in the past with multi-year ice becoming thinner as well. This set of circumstances may contribute to a longer open water season in the Beaufort Sea. A longer open water season is both potentially beneficial for Industry activities and potentially problematic for polar bears. It is unknown how polar bears may respond to an increased open water season. If observations of polar bears using open water were to increase significantly then Industry activities in the Beaufort Sea during the open water season would have to face additional scrutiny and review.

Seismic/Noise

Minimal research has been conducted on the effects of noise on polar bears, nor the potential for seismic survey sounds to cause auditory impairment or other physical effects in polar bears. Polar bears are curious and tend to investigate novel sights, smells and possibly noises. Noise produced by seismic activities could elicit several different responses in polar bears. Noise may act as a deterrent to bears entering the area of an operation, or noise could potentially attract curious bears. Available data suggest that such effects, if they occur at all, would likely be limited to short distances and to seismic projects involving larger airgun arrays (thousands of cubic inches of airgun capacity *vs.* hundreds or less for smaller arrays). There is no evidence indicating that airgun pulses have caused serious injury or death to polar bears, even in the case of larger airgun arrays. Marine mammals that show behavioral avoidance of seismic vessels are especially unlikely to incur auditory impairment or other physical effects. Polar bears spend the majority of their time on sea ice substrate. When in water they normally swim with their heads above the surface where underwater noises are weak or undetectable. Based on polar bear behavior, it is unlikely that a polar bear would be underwater in close enough proximity to a seismic airgun array, or long enough, to incur injury or significant disturbance.

The Service concludes that it is unlikely that any single bear would be exposed to sounds from seismic survey operations long enough or strong enough for injury or disturbance to occur. Furthermore, mitigation measures described in Section VI, including the power down or shut down of the airguns if a polar bear enters the 190 db ensonification zone, will reduce any adverse effects that might occur.

Vessel/Aircraft Disturbance

Marine vessels, such as barges, ships and ice breakers, may act as physical obstructions, altering or intercepting bear movements in the spring when Industry exploration activities typically begin, particularly if they transit through a confined lead or polynya system. Leads and polynyas are important habitat for marine mammals, which makes them important hunting areas for polar bears. A similar situation could occur in the fall when the pack ice begins to increase again. Noise, sights and smells produced by exploration activities may repel or attract bears, either disrupting their natural behavior or endangering them by causing them to threaten the safety of Industry personnel.

Polar bears are known to retreat from sources of noise and the sight of vessels and aircraft, especially helicopters. The effects of fleeing from aircraft may be minimal if the event is short and the animal is otherwise unstressed. Likewise, fleeing from a working icebreaker may have

minimal effects for a healthy animal on a cold day. However, on a warmer day, a short run may be enough to overheat a well-insulated polar bear. The effect of fleeing an aircraft or vessel on polar bear cubs, particularly cubs of the year, would likely be the use of energy that otherwise would be needed for survival during that critical time in a polar bear's life. If the exposure was brief and singular then the effect would most likely be minimal. Multiple exposures of a young bear to Industry activities could be more serious. Mitigation measures in section VI will help reduce the chances of such exposure.

Seismic activities typically avoid high density ice floes and the pack ice edge. They may, however, encounter bears in more open water with lower densities of ice. Polar bears spend the majority of their time on sea ice or on shore during the open-water season, this reduces the likelihood of impacts from seismic exploration activities. Consequently, it is unlikely that seismic exploration activities would result in more than temporary behavioral disturbance to polar bears.

However, with the amount of Arctic sea ice cover changing rapidly due to climate change, Industry activities may begin to encounter more bears in open water or low density ice conditions. Researchers have observed that in some cases bears swim long distances during the open water period seeking either ice or land and may become vulnerable to exhaustion and storms with large waves because ice floes are dissipating and unavailable or unsuitable for use as haul outs or resting platforms. In the fall of 2004, four drowned polar bears were observed in the Beaufort Sea during a BOEMRE coastal aerial survey program.

Vessel traffic could result in short-term behavioral disturbance to polar bears. If a ship is surrounded by ice it becomes more likely that curious bears may approach. Any human "on-ice activities" required by Industry exploration create the opportunity for bear-human interactions. In relatively ice-free waters polar bears are less likely to approach ships, though they may be encountered on ice floes. For example, during the late 1980s, at the Belcher exploration drilling site in the Beaufort Sea, during a period of little ice, a large floe threatened the drill rig. After the floe was moved by an icebreaker, workers noticed a female bear with a cub-of-the-year and a lone adult swimming nearby. It was assumed these bears had been disturbed from the ice floe by the icebreaker. In this instance such short-term disturbance could potentially affect the survival of the cub while disturbance of the adults was likely negligible.

Routine aircraft traffic should have little to no effect on polar bears. Extensive or repeated overflights, however, could disturb polar bears. Behavioral reactions of non-denning polar bears will typically 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. In contrast, denning female bears may abandon or depart their dens early in response to repeated noise such as that produced by recurring aircraft overflights. Adoption of mitigation measures, such as minimum flight elevations over polar bears or areas of concern and flight restrictions around known polar bear dens, will be required, as appropriate, to reduce the likelihood that bears are disturbed by aircraft.

Onshore Drilling / Human Disturbance

Onshore activities and facilities have the potential to interact with polar bears primarily during the fall and ice-covered season when bears come ashore to feed, den or travel. Noise produced

by onshore Industry activities during the open-water and ice-covered seasons could potentially result in disturbance of polar bears. Exposure to Industry activities, such as seismic exploration or exploratory drilling facilities, may potentially affect polar bears, denning or otherwise, in different ways.

Noise disturbance can originate from stationary or mobile sources. Noise produced by stationary Industry activities may elicit several different responses in polar bears. The noise may act as a deterrent to bears entering the area, or the noise could potentially attract bears. Attracting bears to these facilities, especially exploration facilities in the coastal or nearshore environment, could result in human–bear encounters, with the potential for unintentional harassment, lethal take or intentional hazing (under separate authorization) of the bear.

Noise from industry activities has the potential to disturb bears at den sites. The timing of industry activity coupled with the behavioral phase in the polar bear denning cycle can have varying effects and potential impacts on the female bear and the family group. Researchers have suggested that disturbance near a den, including noise and human activity, during the early stages of denning when the pregnant female has limited investment at the site, may cause her to abandon the site in search of another one. Premature site abandonment may also occur, after the bears have emerged but still lingering at the den site, when cubs are acclimating to their "new environment". During this time the female bear is hyper-vigilant of her surroundings in regards to her offspring. Industry activity, sights, sounds or even smells at this critical phase may disturb the female to the point of abandoning the den site before the cubs are physiologically prepared to travel and survive away from the den. Conversely, it appears that during the phase when the female is inside there is a diminished potential for disturbance by in-air sounds due to the acoustic insulating characteristics of snow. Paradoxically, it seems an elevated level of industry activity may occur in close proximity to a den site while the female is inside and the den is covered with insulating snow and not cause abandonment, however, even a low level of activity near a den during the early or late stages of denning may cause abandonment.

An example of a potential den abandonment in the early stages of denning occurred in January 1985, where a female polar bear may have abandoned her den due to Rolligon traffic approximately 250 to 500 meters from the den site. Another example occurred in 2002 when a research observation camp, during a den emergence study on the North Slope, may have caused a female bear and her cub(s) to abandon their den and move to the ice sooner than necessary. Another Industry example of polar bear den disturbance and possible abandonment occurred in 2006 when a female and two cubs emerged from a den approximately 400 meters from an active river crossing construction site. Construction noise and activity may have contributed to the abandonment of the den site after three days and within hours of cub emergence. In 2009, a female and two cubs emerged from a den site within 100 meters of an active ice road with frequent Industry traffic. This group possibly abandoned the site after being disturbed by road activity. While such events may have occurred, information indicates they have been infrequent and isolated. It is important to note that knowledge of these recent examples occurred because of the monitoring and reporting program established by the ITRs.

Conversely, during the ice-covered seasons of 2000-2001 and 2001-2002, active polar bear dens were located within approximately 0.4 km and 0.8 km (0.25 mi and 0.5 mi), respectively, of

Industry remediation activities on Flaxman Island in the Beaufort Sea with no observed impact to the bears. This suggests that polar bears exposed to routine industrial sounds may habituate to those sounds and show less vigilance than bears not exposed to such stimuli. This observation came from a study that occurred in conjunction with Industry activities on Flaxman Island in 2002 and a study of undisturbed dens in 2002 and 2003 (N = 8) (Smith *et al*. 2007). Researchers assessed vigilant behavior with two potential measures of disturbance: proportion of time scanning their surroundings and the frequency of observable vigilant behaviors. The two bears exposed to the industrial activity within 1.6 km spent less time scanning their surroundings than bears in undisturbed areas and engaged in vigilant behavior significantly less often.

The potential for disturbance increases once the female emerges from the den, when she is more vigilant of her surroundings as she uses the den site. As noted earlier, in some cases, with bears inside dens, Industry activities have occurred near the den sites with no observed disturbance. In the 2006 den previously discussed, it was assumed that Industry activity commenced in the area after the den was established. Ancillary activities occurred within 50 meters of the den site while the female was in the den with no apparent disturbance. Ongoing activity most likely had been occurring for approximately three months in the vicinity of the den. Likewise, in 2009, two bear dens were located along an active ice road, one after ice road construction commenced. One den site was exposed to road activity approximately 100 meters away for approximately 1 month while the second den site, most likely established prior to ice road activity, was exposed to approximately 3 months of activity approximately 100 meters away. Both bears emerged at the appropriate time and abandoned the dens in an apparently undisturbed manner. In all, there have been three recorded examples (in 2006, 2009, and 2010) of pregnant female bears establishing dens prior to Industry activity, within 400 meters of the den site, and remaining in the den during the activity through emergence.

More recent data suggests that with proper mitigation measures in effect, activities can continue in the vicinity of dens until the emergence by the female bear. At that time, mitigation, such as activity shut downs near the den and 24-hour monitoring of the den site can limit bear-human interactions, thereby allowing the female bear to abandon the den naturally and minimize impacts to the animals. As an example: In the spring of 2010, an active den site was observed approximately 60 meters from a heavily-used ice road. A one-mile exclusion zone was established around the den, closing a two-mile portion of the road. Monitors were assigned to observe bear activity and monitor human activity to minimize any other impacts to the bear group. These mitigation efforts minimized disturbance to the bears and allowed them to abandon the den site naturally.

Noise and vibrations produced by terrestrial seismic activities during the ice-covered season could potentially result in impacts on polar bears. During this time of year, denning female bears as well as mobile, non-denning bears could be exposed to and affected differently by potential impacts from seismic activities. As with other Industry activities, the best available scientific information indicates that female polar bears entering dens, or females in dens with cubs, are more sensitive than other age and sex groups to noises. Standardized mitigation measures will be implemented to limit or minimize disturbance impacts to denning bears. These mitigation measures are currently in place and are implemented when necessary through LOAs in the Beaufort Sea.

The following mitigation measures, as well as the other measures described in Section VI, will reduce potential Industry impacts and disturbance to polar bears:

1) Development of project specific polar bear interaction plans;
2) Maintenance of a 1-mile buffer between Industry activities and known active polar bear dens to limit disturbance to the bear;
3) Avoid or minimize work in known polar bear denning habitat until bears have abandoned their dens;
5) Use Forward Looking Infrared (FLIR) technology, coupled with trained dogs, to locate or verify occupied polar bear dens;
4) Conduct research to enable more accurate and reliable detection of active polar bear dens through the use of FLIR imagery; and
6) Conduct research to evaluate transmission of noise and vibration through ground, snow, ice, and air and the potential levels of noise and vibration inside polar bear dens.

Furthermore, as part of the LOA application for seismic surveys during denning season, Industry will provide the proposed seismic survey routes. To minimize the likelihood of disturbance to denning females, the Service shall evaluate the proposed routes with information about known polar bear dens, historic denning sites, identified denning habitat, and den surveys.

Human-polar bear encounters are potentially dangerous for both polar bears and humans. Whenever humans work in the habitat of polar bears, there is a chance of an encounter, though, historically, such encounters have been uncommon in association with Industry. Depending upon the circumstances, bears may be repelled from or attracted to sounds, smells, or sights associated with onshore Industry activities. Adoption of mitigation measures to reduce these encounters include:

1) Development of project specific polar bear interaction plans;
2) Attractants management (e.g., food handling, garbage disposal and sanitation);
3) Use of safety gates, fences, cages and safe zones;
4) Use of bear monitors, motion and infrared detection systems;
5) Specify the chain of command and communication for responding to a polar bear sighting; and
6) Require all Industry personnel to participate in polar bear interaction training.

The Service concludes that only small numbers of polar bears would potentially be exposed to disturbance or harassment from onshore Industry disturbance. Furthermore, mitigation measures described above and in Section VI will reduce any adverse effects that might occur.

Oil/Fuel Spills

Polar bears can potentially be affected by Industry activities through spill or discharge of oil, wastes or other substances. The National Pollutant Discharge Elimination System Permit Program requires all North Slope oil companies to submit and maintain an oil spill contingency plan. It is illegal to discharge oil into the environment and a reporting system requires operators to report spills. The Service will evaluate requests from Industry for LOAs for incidental take

relative to potential impacts upon polar bears and Pacific walruses. Because of the highly technical nature of many Industry activities, however, the Service must rely on the support and advice of permitting authorities in other regulatory agencies to appropriately address a company's oil spill contingency plans and operations plans prior to the approval and permitting of the project.

According to BOEMRE, on the Beaufort and Chukchi Seas OCS, Industry has drilled 35 exploratory wells. During the time of this drilling, Industry has had 35 small spills totaling 26.7 bbl or 1,120 gallons (gal). Of the 26.7 bbl spilled, approximately 24 bbl were recovered or cleaned up. According to BOEMRE estimates, the chance of a large (≥1,000 bbl) oil spill from exploratory activities in the Beaufort Sea is very low. To date, no large exploratory offshore oil spills have occurred on the North Slope or the Beaufort or Chukchi seas.

Most Industry spills, on and offshore, are considered small by Industry standards (< 50 barrels). Larger spills (≥ 500 barrels) accounted for most of the annual volume and occurred primarily onshore. Five large spills occurred between 1985 and 1998 on the North Slope. Recent oil spills on the North slope occurred in 2006, approximately 6,400 bbl of oil, and in 2009, approximately 1000 bbl of mixed oil and water. These recent spills were onshore, associated with pipelines and posed minimal risk to walrus and polar bears.

Larger spills associated with Alaska oil and gas activities on the North Slope have been primarily associated with production activities, as opposed to exploration or development, and have occurred at production facilities or pipelines connecting wells to the TAPS. Small spills of oil or waste products from Industry activities over time could pose a cumulative risk of impact to polar bears. The effects of contaminated fur or ingested oil or wastes, depending on the amount and type of oil or wastes involved, could be short term and relatively minor or could possibly result in death. For example, in April 1988, a polar bear was found dead on Leavitt Island, in the Beaufort Sea, approximately 9.3 km (5 nautical miles) northeast of Oliktok Point. The cause of death was determined to be poisoning by a mixture that included ethylene glycol and Rhodamine B dye. The source of the mixture was not determined since those chemicals were used in the area by multiple Industry and non-Industry groups.

For this rule, potential spills from Industry activities would most likely occur onshore associated with pipelines or offshore associated with the marine vessels. Such spills would most likely be localized and relatively small. Spills in the offshore or onshore environments classified as minor could occur during normal operations (e.g., transfer or transport of fuel or other substances, handling of lubricants and liquid products and general maintenance of equipment). Potential large spills in the Beaufort Sea region would likely be associated with drilling platforms or drilling ships. However, drilling platforms and drilling ships have their own containment capability in case of a spill or blowout. The amount of release from a drilling platform or drilling ship is not expected to be at the same level as potential spills from production facilities. Nevertheless, the Service must consider the potential for a catastrophic failure of spill prevention and containment systems and evaluate such a scenario against potential impacts to polar bears and Pacific walruses.

Based upon the best information currently available, the Service concludes that the probability of a large catastrophic offshore oil spill in the Beaufort Sea during the period of this rule is very small. The Service must acknowledge, however, that should such an unlikely event occur, the impacts to some polar bears is likely to be severe and probably lethal. The number of polar bears potentially affected by a large catastrophic spill is unknown. Variables such as time of year, weather and polar bear distribution would all influence the number of bears exposed to contamination. It is, however, most likely that only a relatively small number of bears would be potentially exposed or affected by such a spill, but those affected bears would likely be severely affected.

The Service is tasked with analyzing and identifying incidental take of small numbers of polar bears and walruses. Because of the existing Federal and State requirements for oil spill prevention and clean-up plans; the low probability of occurrence of a large spill; the historical evidence indicating that spills are relatively rare and when they do occur, are small in size and located on terrestrial environments; and the use of technologies such as blow-out prevention to prevent and/or minimize the effects of a spill, the Service concludes that operational spills would likely be of a relatively small volume, and any impacts associated with an operational spill are expected to be limited to a small numbers of bears.

Pacific Walrus

The Beaufort Sea is beyond the normal range of the Pacific walrus and the likelihood of encountering walruses during Industry operations appears to be low. During the time period of the proposed regulations, industry operations may occasionally encounter small groups of walruses swimming in open water or hauled out onto ice floes or along the coast. Although interactions are expected to be infrequent, proposed activities could potentially result in disturbances. The response of walruses to disturbance stimuli is highly variable. Anecdotal observations by walrus hunters and researchers suggest that males tend to be more tolerant of disturbances than females and individuals tend to be more tolerant than groups. Females with dependent calves are considered least tolerant of disturbances. In other parts of their range, disturbance events are known to cause walrus groups to abandon land or ice haul outs and occasionally result in trampling injuries or cow-calf separations, both of which are potentially fatal. Calves and young animals at the perimeter of the haul outs appear particularly vulnerable to trampling injuries.

Based upon previous aerial survey efforts in the Chukchi Sea (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 open-water season. Therefore, in evaluating potential impacts of offshore exploration activities, broken pack ice may serve as a reasonable predictor of walrus abundance. Activities occurring in or near sea ice habitats are presumed to have the greatest potential for impacting walruses.

Seismic/Noise

Seismic operations 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 re 1 μPa) safety radius for seismic activities could suffer temporary shifts in hearing thresholds (Kastak *et al*. 2005).

Seismic surveys and high-resolution site clearance surveys are typically carried out in open water conditions where walrus concentrations are expected to be low. This will minimize potential interactions with large concentrations of walruses which typically favor sea ice habitats. Seismic operations in the Beaufort Sea are more likely to encounter small herds 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 adaptive management responses (where the mitigation measures required are dependent on what is discovered during monitoring). With the adoption of the mitigation measures described in Section VI, the Service concludes that the only anticipated effects of seismic operations in the Beaufort Sea would be short-term behavioral alterations of small numbers of walruses.

Onshore/ Offshore Drilling

Onshore drilling operations are not expected to interact with walruses. Although offshore drilling activities are expected to occur primarily in open water conditions away from the ice pack, the dynamic movements of sea ice could potentially transport walruses within range of drilling operations. 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. Drilling operations could impact walruses by noise and mainly through vectors supporting the operation, such as vessel (transport and ice management) and aircraft traffic.

Vessel/Aircraft Disturbance

Although seismic surveys and offshore drilling operations are expected to occur in areas of open water away from the pack ice, support vessels and/or aircraft servicing seismic and drill operations may encounter aggregations of walruses hauled out onto sea ice. The sight, sound or smell of humans and machines could potentially displace these animals from any ice haul outs. 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-winged aircraft are less likely to elicit a response than helicopter overflights. Walruses are particularly sensitive to changes in engine noise and are more likely to stampede when planes turn or fly low overhead. Researchers conducting aerial surveys for walruses in sea ice habitats have observed little reaction to fixed-winged aircraft above 457 m (1,500 ft).

The reaction of walruses to vessel traffic is dependent upon vessel type, distance, speed, and previous exposure to disturbances. Drilling operations are expected to involve drill ships attended by icebreaking vessels to manage incursions of sea ice. Ice management operations are expected to have the greatest potential for disturbances since walruses are more likely to be encountered in sea ice habitats and ice management operations typically require the vessel to accelerate, reverse direction, and turn rapidly thereby maximizing propeller cavitations and resulting noise levels. Previous monitoring efforts in the Chukchi Sea suggest that icebreaking

activities can displace some walrus groups up to several kilometers away; however most groups of hauled out walruses showed little reaction beyond 800 m (0.5 mi) (Brueggeman *et al.* 1990). Monitoring programs associated with exploratory drilling operations in the Chukchi Sea in 1990 noted that 25% of walrus groups encountered in the pack ice during icebreaking responded by diving into the water, with most reactions occurring within one km (0.6 mi) of the ship. The monitoring report, noting 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).

Because offshore exploration activities are expected to move throughout the Beaufort Sea, impacts associated with support vessels and aircrafts are likely to be distributed in time and space. Therefore, the only effect anticipated would be short-term behavioral alterations impacting small numbers of walruses in the vicinity of active operations. Adoption of mitigation measures that include an 800 m (0.5 mi) exclusion zones for marine vessels and aircraft around walrus groups observed on ice are expected to reduce the intensity of disturbance events and minimize the potential for injuries to animals.

Oil/Fuel Spills

The potential also exists for oil/fuel spills to occur from seismic and support vessels, fuel barges, and drilling operations. Little is known about the effects of oil on walruses; however, walruses may react to oil much like other pinniped species. Damage to the skin of pinnipeds can occur from contact with oil because some of the oil penetrates into the skin, causing inflammation and ulcers. Exposure to oil can quickly cause permanent eye damage. Inhalation of hydrocarbon fumes presents another threat to marine mammals. In studies conducted on other species of pinnipeds, pulmonary hemorrhage, inflammation, congestion, and nerve damage resulted after exposure to concentrated hydrocarbon fumes for a period of 24 hours. Walruses are extremely gregarious animals and normally associate in large groups; therefore any contact with spilled oil or fuel could impact several individuals.

Exposure to oil could also impact benthic prey species. 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 contamination within the organism. Exposure to oil may kill prey organisms or result in slower growth and productivity. Because walrus feed primarily on mollusks, they may be more vulnerable to a loss of this prey species than other pinnipeds that feed on a larger variety of prey.

Although oil/fuel spills have the potential to cause adverse impacts to walruses and prey species, small operational spills associated with the proposed exploration activities are not considered a major threat to walruses. Operational spills would likely be of a relatively small volume, and occur in areas of open ocean where walrus densities are expected to be relatively low. Adoption of mitigation measures that require both oil spill prevention and response plans reduce both the risk and scale of potential spills. Therefore, the Service concludes that any impacts associated with an operational spill are expected to be limited to a small numbers of animals.

2. Potential Impacts on the Physical Environment

The proposed project area is limited to the Beaufort Sea (see Figure 1). The proposed activities would: 1) allow for the continued use and maintenance of the established oilfields in terrestrial and marine environments for production, where the majority of Industry activity will be in the terrestrial environment; 2) use exploratory techniques to study the substrate for oil and gas reserves; 3) allow offshore drilling activities with stipulations in place that require plugging and capping of drill holes, and re-contouring the drill site as much as practicable; 4) allow onshore drilling, which could result in construction of ice pads, roads, and islands; and 5) allow vessels, ice breakers, and land transportation vehicles to help with facilitation of the above projects. A thorough discussion of impacts on the physical environment is found in the Arctic Multiple Sale DEIS (http://alaska.boemre.gov/ref/EIS%20EA/ArcticMultiSale_209/_DEIS.htm).

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

With inclusion of all appropriate mitigation measures described in Section VI, plus any other measures incorporated into an LOA, the Service has determined that the proposed action would result in no measurable impacts of the physical environment.

3. Potential Impacts on the Socio-economic Environment

Walruses and polar bears have cultural and subsistence significance to the Inupiat Eskimos inhabiting the north coast of Alaska. However, only a small number of walruses are harvested opportunistically in the geographic region due to the extralimital nature of walruses in the Beaufort Sea. Three North Slope communities are considered within the potentially affected area: Barrow, Nuiqsut, and Kaktovik. Two additional communities, Atqasuk and Wainwright, harvest resources for subsistence uses from the Beaufort Sea region even though they are not located in the geographic area. The subsistence harvest of polar bears can occur year round in the Beaufort Sea, depending on ice conditions, with peaks usually occurring in spring and fall.

Noise and disturbances associated with oil and gas activities have the potential to adversely impact subsistence harvests of walruses and polar bears by displacing animals beyond the hunting range of these communities. Likewise, Industry activity could deflect polar bears into more easily accessible hunting areas. Disturbances associated with Industry 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 Industry 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. The primary mitigation measure to minimize adverse impacts on subsistence uses is the requirement that companies consult with the subsistence communities of Barrow, Nuiqsut and Kaktovik prior to submitting an operational plan for their

activities, where a Plan of Cooperation (POC) may be developed. The POC includes a description of the procedures by which the holder of the Letter of Authorization will work and consult with potentially affected subsistence hunters and 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.

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 global climate situation is changing in myriad unknown and unpredictable ways. With inclusion of the monitoring, reporting, and research components described in the mitigation measures 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.

The following events have contributed to current environmental conditions in the Beaufort Sea and could also cumulatively affect Pacific walrus and polar bear population status in the next five years:

Commercial and Subsistence Harvest

Walruses have an intrinsically low rate of reproduction and are thus limited in their capacity to respond to 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 Russia have ranged from 2,300–9,500 animals per year. Notable harvest peaks occurred during 1930–1960 (4,500–9,500 per year) and in the 1980's (5,000–9,000 per year). Commercial hunting continued in Russia 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 ranged from approximately 2,400–4,700 animals per year. Recent recorded harvest levels for communities located in the geographic region of the requested action have indicated that 65 walrus were harvested between 2005 to 2009. However, the majority of harvested animals were taken to the west of Barrow, outside of the geographic region. Although recent overall harvest levels are lower than historic highs, lack of information on current population size or trend precludes an assessment of sustainable harvest rates. It is not anticipated that walrus harvest patterns will change significantly in the Beaufort Sea or the geographical region of the requested action.

For polar bears, the most significant source of mortality is man. Before the MMPA was passed in 1972, polar bears were taken by sport hunters and residents. Between 1925 and 1972, the mean reported kill was 186 bears per year. Seventy-five percent of these were males, as cubs and females with cubs were protected. Since 1972, only Alaska Natives from coastal Alaskan villages have been allowed to hunt polar bears for their subsistence uses or for handicraft and clothing items for sale. The Native hunt occurs without restrictions on sex, age, or number provided that the population is not determined to be depleted. From 1980 to 2005, the total annual harvest for Alaska averaged 101 bears: 64 percent from the Chukchi Sea and 36 percent from the Beaufort Sea. More recently, an average of 23 bears were harvested annually between 2005-2009 (n=117) in the Beaufort Sea area of the geographic region. Other sources of mortality related to human activities include bears killed during research activities, euthanasia of sick and or injured bears, and defense of life kills by non-Natives (Brower *et al*. 2002). One of the Service's management concerns is the possible inadvertent over-harvest of the CS or SBS stocks if the stocks become increasingly nutritionally-stressed or decline due to some combination of the following threats: climate warming, which continues to increase both the expanse and duration of open water in summer and fall; human activities, including hydrocarbon exploration and development occurring within the near-shore environment; increased shipping and icebreaker activity and the risk of a large spill from one of these vessels; and/or changing atmospheric and oceanic transport of contaminants into the region. 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 was recorded in 2002, 2005 and again in 2007; sea ice cover in 2003 and 2004 was also substantially below the 20-year mean. Currently, 2010 sea ice cover is predicted to be low, as July 2010 sea ice extent was the second lowest on record after 2007. 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 Arctic 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. When sea ice recedes beyond shallow feeding areas on the continental shelf to the deep waters of the Polar Basin, walruses relocate to coastal areas where they can rest on land. The number of walruses using land based haul outs along the Chukchi Sea coast during the summer months, and the duration of haul out use has increased significantly over the past decade, with up to several tens of thousands of animals hauling out at some locations along the coast of Russia and with smaller numbers on the western Alaskan coastline. Reasonably foreseeable impacts to walruses as a result of diminishing sea ice cover include: shifts in range and abundance; increased vulnerability to predation and disturbance, declines in available prey species; increased mortality rates resulting from storm events; and premature separation of females and dependent calves. Secondary effects on animal health and condition resulting from reductions in suitable foraging habitat may also influence survivorship and productivity. Additionally, large concentrations of walrus on shore for longer periods of time could afford opportunity for additional harvest, and could potentially translate to somewhat higher harvest levels in the North Slope region.

The loss of seasonal pack ice from continental shelf areas of the Chukchi Sea can reasonably be expected to reduce access to traditional offshore foraging areas, increase the energetic demands of foraging, and increase intra-specific competition for food in remaining habitat areas. While currently considered extralimital in the Beaufort Sea where only small numbers have been recorded, walrus numbers could increase if individuals move east foraging for food. Future studies investigating walrus distributions, population status and trends, and habitat use are critically important for responding to walrus conservation and management issues associated with changes in the sea ice environment.

For polar bears, habitat loss due to changes in arctic sea ice has been identified as the primary cause of decline in polar bear populations, where the decline of sea ice is expected to continue throughout the polar bear's range for the foreseeable future (73 FR 28212). In support of the listing, 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% loss of optimal summer polar bear habitat by 2050. 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 45-75 years, if sea ice declines continue at current rates.

As described, climate change is likely to have serious consequences for polar bears and their prey, ringed seals, and those effects will accumulate with any potential effects of oil and gas activities in the region (ACIA 2004, Derocher *et. al* 2004, NRC 2003). Climate change will affect polar bears in various ways. The timing of ice formation and breakup will determine how long and how efficiently polar bears can hunt seals, possibly reducing the availability of them. 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.

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

Due to the changing ice conditions the Service anticipates that polar bear use of the Beaufort Sea coast will increase during the open-water season (June through October). Indeed, polar bear use of coastal areas during the fall open-water period has increased in recent years in the Beaufort Sea. This change in distribution has been correlated with the distance to the pack ice at that time of year (the farther from shore the leading edge of the pack ice is, the more bears are observed onshore) (Schliebe *et al.* 2005). 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 of or avoidance by 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. The Service believes that inclusion of the proposed mitigation measures that include adaptive components will allow reassessment of this conclusion if necessary.

Commercial Fishing and Marine Vessel Traffic
Polar bears spend the majority of their time on pack ice during the open-water season, which limits their interaction with fishing vessels and barge traffic. However, polar bears are known to run from sources of noise 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. 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. If predictions for the decrease in the temporal and seasonal extent of the sea are realized, more vessels may transit the area and vessels may encounter polar bears more frequently. Researchers have observed that in some cases bears swim long distances during the open water period seeking either ice or land. With diminished ice, swimming bears may become vulnerable to exhaustion and storms because ice floes are dissipating and unavailable or unsuitable for use as haul outs or resting platforms. Although rarely documented, vessel interactions with swimming bears have the potential to impact animals greater than vessels contacting bears on ice floes. The energetic expenditure of a bear swimming to avoid a vessel is assumed to be higher than a bear on an ice floe.

Available data in the Beaufort Sea suggest that presently walruses rarely interact with commercial fishing and marine vessel traffic. 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 Siberian arctic waters may develop in coming decades. Commercial fishing opportunities may also expand should the sea ice continue to diminish. The result could be increased temporal and spatial overlap between fishing and shipping operations and walrus habitat use and increased interactions between walruses and marine vessels.

Past Offshore Oil and Gas Related Activities
Oil and gas related activities have been conducted in the Beaufort Sea since the late 1960s.

As discussed earlier, the Beaufort Sea is considered extralimital for Pacific walrus. Hence, only very small numbers of walrus are present within the area of activity, and only during the open water season. In addition, there are no known important foraging or haul out habitats for Pacific walrus within the geographic region.

While oil and gas activities have the potential to incidentally take small numbers of walrus during the open water season in the region of activity, few, if any, takes have been documented in the past. During the history of the incidental take regulations, the actual impacts from Industry activities on Pacific walrus, documented through monitoring, were minimal. From 1994 to 2004, Industry recorded nine sightings, involving a total of ten Pacific walrus, during the open-water season. From 2005 to 2009, an additional eight individual walrus were observed during Industry operations in the Beaufort Sea. In most cases, walrus appeared undisturbed by human interactions; however, three sightings during the early 2000s involved potential disturbance to the walrus. Two of three sightings involved walrus hauling out on the armor of Northstar Island and one sighting occurred at the SDC on the McCovey prospect, where the walrus reacted to helicopter noise. With the additional sightings in the Beaufort Sea, walruses were observed during exploration (eight sightings; five during recent aerial surveys), development (three sightings), and production (six sightings) activities. There is no evidence that there were any physical effects or impacts to these walruses based on the interaction with Industry. We know of no other interactions that occurred between walrus and Industry during the duration of the incidental take program.

Documented impacts on polar bears by the oil and gas Industry during the past 40 years appear to be minimal. Historically, polar bears spend a limited amount of time on land, coming ashore to feed, den, or move to other areas. With the changing of their distribution based on the changing ice environment, the Service anticipates that bears will remain on land longer. At times, fall storms deposit bears along the coastline where the bears remain until the ice returns. For this reason, polar bears have mainly been encountered at or near coastal and offshore production facilities, or along the roads and causeways that link these facilities to the mainland. During those periods, the likelihood of interactions between polar bears and Industry activities increases. We have found that the polar bear interaction planning and training requirements set forth in these regulations and required through the LOA process have increased polar bear awareness and minimized these encounters. LOA requirements have also increased our knowledge of polar bear activity in the developed areas.

As during previous ITRs, the majority of actual impacts on polar bears have resulted from direct human-bear encounters. Monitoring efforts by Industry required under previous regulations for the incidental take of polar bears documented various types of interactions between polar bears and Industry. Between 2006 to 2009, a total of 73 LOAs have been issued to Industry, with an average of 18 LOAs annually. Polar bear observations were recorded for 56% of the LOAs (41 of 73 LOAs).

From monitoring reports and observations during the past ITRs (2006-2009) an average of 306 polar bears have been reported over the time period (range: 170 to 420 bears). During 2007, seven companies, observed 321 polar bears from 177 sightings. In 2008, ten companies observed 313 polar bears from 186 sightings. In 2009 companies observed 420 polar bears during 245 sightings. In all three years, the highest number of bears was recorded in August and September. In 2007, the highest number of bears was recorded in August, where 90 sightings totaling 148 bears were observed, in 2008, 87 sightings totaling 162 bears were recorded in August, while in 2009, 77 bear sightings were reported. Sightings of polar bears have increased

from previous regulatory time periods due to a combination of variables. The high number of bear sightings for these years was most likely the result of an increased number of bears using the terrestrial habitat as a result of changes in sea ice habitat, multiple marine-based projects occurring near barrier islands (where multiple sightings were reported), as well as increased monitoring of industry projects, especially during August and September, where some repeat sightings of individual bears and family groups occurred. While the observation data has not been thoroughly analyzed for numerous variables, this trend in observations supports that of increasing use by bears of terrestrial habitat during ice-free months.

Industry activities that occur on or near the Beaufort Sea coast continue to have the greatest potential for encountering polar bears rather than Industry activities occurring inland. According to AOGA figures, the offshore facilities of Endicott, Liberty, Northstar and Oooguruk accounted for 47% of the bear observations between 2005 and 2008 (182 of 390 sightings).

Intentional take (through separate Service authorizations under sections 101(a)(4)(A), 109(h), and 112(c) of the MMPA) of polar bears occurs on the North Slope as well. It used to allow citizens to take polar bears by harassment (non-lethal deterrence activities) for the protection of both human life and polar bears while conducting activities in polar bear habitat. The Service provides guidance and training as to the appropriate harassment response necessary for polar bears. The largest operator on the North Slope, BPXA, has documented an increase in the total number of bear observations for their oil units since 2006 (39, 62, 96, and 205 bears for the years 2006, 2007, 2008, and 2009, respectively). However, the percentage of Level B deterrence events by BPXA has decreased from 64% in all of 2006 observations to 21% for all of 2009 observations (64%, 29%, 24%, and 21% for the years 2006, 2007, 2008, and 2009, respectively). BPXA attributes this decrease to an increase in polar awareness and deterrence training of personnel. A similar trend appears in the slope-wide data presented by AOGA, which encapsulates multiple operators. The percentage of Level B deterrence events appeared to have decreased from 39% of all reported polar bear sightings in 2005 to 23 % of all reported polar bear sightings in 2008 (39%, 55%, 29%, 23% for the years 2006, 2007, 2008, and 2009, respectively), where bears were deterred from industrial areas with no injury. We currently have no indication that these encounters, which alter the behavior and movement of individual bears, have an effect on survival and recruitment in the Southern Beaufort Sea polar bear population.

Summary of Cumulative Effects

For both polar bear and Pacific walrus, hunting pressure, climate change, and the expansion of commercial activities into their habitats all have potential to impact polar bears and walruses. 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 trends and habitat use patterns. The effectiveness of various mitigation measures and management actions will also need to be continually evaluated through monitoring programs and adjusted as necessary. Climate change is of particular concern, and will need to be considered in the evaluation of future proposed activities and as more information on polar bear and Pacific walrus population status becomes available. The observed and projected losses of sea ice habitats in the Beaufort Sea will likely result in significant changes in seasonal distributions and habitat use patterns of polar bears and walruses. It is difficult to forecast the rate and magnitude of future population changes because

of the uncertainty inherent in future sea ice projections as well as uncertainty in the relationships between habitat changes and population demographics.

Contribution of Proposed Activities to Cumulative Impacts
Proposed oil and gas operations identified by the petitioners 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 walruses and a limited number of polar bears are likely to interact with Industry activities. Required monitoring and mitigation measures, designed to minimize interactions between authorized projects and walruses or polar bears are also expected to limit the severity of any behavioral responses. Therefore, we conclude that the proposed Industry activities, as mitigated through the regulatory process, would contribute only a negligible increase over and above the effects of baseline activities currently occurring as well as future activities that are reasonably likely to occur within the 5-year period covered by the regulations.

VI. MITIGATION

Measures to mitigate potential effects of oil and gas activities on polar bear and walrus resources and subsistence use of those resources have been identified and developed through previous ITRs and implemented through stipulations in individual LOAs. Mitigation measures will vary depending upon the type of industry activity, the location, time of year, and other factors. In addition, there are existing mitigation measures that would apply to all offshore exploration activities in the Beaufort Sea OCS. They are briefly described below, but additional details can be found in Environmental Assessment - Proposed Oil & Gas Lease Sale 202, Beaufort Sea Planning Area (http://alaska.boemre.gov/ref/EIS%20EA/BeaufortEA_202/EA_202.htm); Draft Programmatic Environmental Impact Statement - Seismic Surveys in the Beaufort and Chukchi Seas, Alaska (http://alaska.boemre.gov/ref/EIS%20EA/draft_arctic_peis/draft_peis.htm); and Environmental Assessment - Proposed Oil & Gas Lease Sale 195, Beaufort Sea Planning Area (http://alaska.boemre.gov/ref/EIS%20EA/BeaufortFEIS_195/Sale195/EA_Sale195.pdf).

Mitigation Measures Associated with LOAs

Individual LOA stipulations have been the driving force behind mitigation to minimize impacts of the oil and gas industry on polar bears and walrus. In addition to the description and analysis of mitigation measures at the regulation level, the following mitigation, monitoring and reporting requirements could be required, but are not limited to conditions of an individual LOA. The purpose of monitoring and reporting is to determine effects of authorized oil and gas activities on polar bear and walrus in the Beaufort Sea and the northern coast of Alaska. Plans will be required to identify the methods used to determine and assess the effects of the authorized activity on polar bear and walrus. Monitoring and reporting plans will be reviewed annually and modifications will be made, if necessary, based upon interpretation of results.

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 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 (MMOs) 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 ½ mile radius of walruses or polar bears observed on land or ice.

(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 ½ mile operational exclusion zone around feeding walrus groups. Vessels may not be operated in such a way as to separate members of a group of walruses from other members of the group. When weather conditions require, such as when visibility drops, vessels should adjust speed accordingly to avoid the likelihood of injury to walruses.

(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 aircraft operate at an altitude lower than 457 m (1,500 ft) within 805 m (0.5 mi) of walruses or polar bears observed on ice or land. Helicopters may not hover or circle above such areas or within 805 m (0.5 mi) of such areas. When weather conditions do not allow a 457 m (1,500 ft) flying altitude, such as during severe storms or when cloud cover is low, aircraft may be operated below the 457 m (1,500 ft) altitude stipulated above. However, when aircraft are operated at altitudes below 457 m (1,500 ft) because of weather conditions, the operator must avoid areas of known walrus and polar bear concentrations and should take precautions to avoid flying directly over or within 805 m (0.5 mi) of these areas.

(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 seismic surveys.

Any offshore exploration activity expected to include the production of pulsed underwater sounds with sound source levels ≥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) Exclusion Zones - Establish and monitor with trained marine mammal observers (MMOs) an acoustically verified exclusion zone for walruses surrounding seismic airgun arrays or sound source where the received level would be ≥ 180 dB re 1 μPa; an acoustically verified exclusion zone for polar bears surrounding seismic airgun arrays or sound source where the received level would be ≥ 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 ≥ 160 dB re 1 μPa.

(ii) Power down/Shut down - 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 any polar bears 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 180dB re 1 μPa (walrus) or 190dB re 1 μPa (polar bear) the operator must immediately shut-down the seismic airgun array and/or other seismic sound sources. If observations are made or credible reports received about any injured or dead walruses and/or polar bears or that they are indicating acute distress due to seismic noise within or near the exclusion zones, the seismic airgun array and/or other seismic sound sources will be immediately shut down and the Service Incidental Take Coordinator contacted. The airgun array and/or other seismic sound sources will not be restarted until review and approval has been given by either the Service Incidental Take Coordinator or their designee.

(iii) Adaptive Response for Walrus Aggregations - Whenever an aggregation of 12 or more walruses is detected within the 160 dB re 1 μPa disturbance zone ahead of or perpendicular to the seismic vessel track, the holder of an LOA must: (A) Ensure sound pressure levels at the shortest distance to the aggregation do not exceed 160 dB re 1 μPa by powering down the seismic airgun array and/or other acoustic sources or by altering vessel course; and (B) Not proceed with powering up the seismic airgun array and/or other seismic sound sources, or resuming the original course, until it can be established that there are no walrus aggregations within the 160 dB re 1 μPa walrus disturbance zone based upon ship course, direction and distance from last sighting.

(iv) Ramp-up Procedures - (A) Prior to commencing ramp-up, the exclusion zones for polar bears and walruses must be visible and observed by a MMO watch for at least 30 minutes when: At the commencement of operations using air guns or sound sources; a complete shut-down has occurred; any time operation of the airgun array or sound source(s) is discontinued for a period of 10 minutes or more; or the MMO watch has been suspended; (B) If the exclusion zones are not completely visible for at least 30 minutes prior to ramp-up in either daylight or nighttime, ramp up may commence following established procedures which must include: Ramp-up airgun arrays slowly over a period of at least 30 minutes, start with one airgun or sound source in the array and then gradually add additional guns or sound sources, until the full array is firing.

(v) Poor Visibility Conditions - (A) During poor visibility conditions (fog, rain, snow, darkness, etc.), if the entire 190 dB re 1 μPa polar bear and 180 dB re 1 μPa walrus exclusion zones are visible using vessel lights and/or night vision devices, then ramp-up procedures of air guns or sound sources may occur following a 30 minute period of observation by MMOs with no sighting of polar bears or walruses in their respective exclusion zones; (B) If during poor visibility conditions, the full exclusion zones are not visible, the airguns cannot commence a ramp-up procedure from a full shutdown; (C) If, however, one or more airguns have been operational since before the onset of poor visibility conditions, they may continue to operate. In such a circumstance, ramp-up procedures may be initiated as described in (iv) and (v) above, though the entire safety radius may not be visible, under the assumption that polar bears and walruses will have been alerted by the sounds from the single airgun and have moved away.

(4) Additional mitigation measures for onshore 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 i.e., 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 observation and reporting procedures; and

(g) Polar bear avoidance and encounter procedures.

(i) 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.

(ii) Efforts to minimize disturbance around known polar bear dens. – Holders of a LOA must comply with Service restrictions on activities around known polar bear dens and make efforts to limit disturbance around those dens.

(a) 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.

(b) Exclusion zone around known polar bear dens – Operators must observe a 1-mile operational exclusion zone around all known polar bear dens during the denning season (November–April, or until the female and cubs leave the areas). Should previously unknown occupied dens be discovered within one mile of activities, work in the immediate area must cease and the Service Incidental Take Coordinator contacted for guidance. The Service will evaluate these instances on a case-by-case basis to determine the appropriate action. Potential actions may range from cessation or modification of work to conducting additional monitoring, and the holder of the authorization must comply with any additional measures specified.

(5) 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 n LOA, applicants must consult with potentially affected communities and appropriate subsistence user organizations to discuss potential conflicts with subsistence walrus and polar bear hunting caused by the location, timing, and methods of proposed operations and support activities (see 18.114(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. The Plan of Cooperation must include:

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

(b) 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.

(c) 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 location, timing and nature of proposed activities, holders of LOAs may 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 (MMOs) 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 paragraph (a) of this section, and to carry out specified monitoring activities identified in the Marine Mammal Monitoring and Mitigation Plan (see (B) (2) below) necessary to evaluate the impact of authorized activities on walruses, polar bears and the subsistence use of these subsistence resources. MMOs must have completed a marine mammal observer training course approved by the Service.

(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 regard to proximate bear activity to Industry facilities.

(2) Develop and implement a site-specific, Service approved, Marine Mammal Monitoring and Mitigation Monitoring Plan (4MP).

Monitor and evaluate the effects of authorized activities on polar bears, walruses and the subsistence use of these resources.

(i) 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, 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 Beaufort Sea on Pacific walruses or polar bears.

Where insufficient information exists to evaluate the potential effects of proposed activities on walruses, polar bears and the subsistence use of these resources, holders of letters of authorization may be required to fund or participate in joint monitoring and/or research efforts to address these information needs and insure the least practicable impact to these resources. Information needs in the Beaufort Sea include, but are not limited to:

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

(b) Cumulative effects of multiple simultaneous operations on walruses and polar bears.

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 hrs of ending activity

(ii) Walrus observation reports – The operator must report, on a weekly basis, 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 of walruses: sex and age (if known).
(c) Weather, visibility and ice conditions at the time of observation.
(d) Estimated range at closest approach.
(e) Industry activity at time of sighting.
(f) Behavior of animals sighted.
(g) Description of the encounter.
(h) Duration of the encounter.
(i) 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 of bears: sex and age.
(c) Observer name and contact information.
(d) Weather, visibility and ice conditions at the time of observation.

(e) Closest point of approach for bears from personnel and facilities.
(f) Industry activity at time of sighting, 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 (A) any incidental lethal take or injury of a polar bear or walrus; and, (B) 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) 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; and

(d) Estimates of take based on density estimates derived from monitoring and survey efforts.

D) Additional Requirements

In addition to the ITR mitigation measures, there are existing mitigation measures for offshore exploration activities in the Beaufort Sea OCS that have been developed by BOEMRE for their lease sales, which would be protective of polar bears and Pacific walrus. There are currently leases active in the Beaufort Sea from several different lease sales that will have variations in the stipulations (mitigation measures) attached to the leases depending upon the lease sale. BOEMRE lease sale stipulations that may directly or indirectly minimize industry impact to polar bears and walrus include:

(1) Orientation Program.

This stipulation requires all personnel involved in petroleum activities on the North Slope subject to these regulations be aware of the unique environmental, social, and cultural values of the local Inupiat residents and their environment. This is expected to help avoid damage or destruction of environmental, cultural and archaeological resources through awareness and understanding of historical and cultural values. It will also help to minimize potential conflicts between subsistence hunting activities of polar bears and walruses and oil and gas activities.

(2) Oil Spill Prevention and Response.

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. The oil spill prevention and response requirements are part of the law for all Outer Continental Shelf Lands Act (OCSLA) activities rather than a lease stipulation. Companies are required to provide an Oil Discharge Prevention and Contingency Plan (ODPCP) which includes the identification of sensitive areas that would require additional attention or protection. In addition, Sale 202 has Information to Lessees (ITLs) regarding activities that directly affect polar bears. Lessees are advised to consult with the Service and local Native communities while planning activities before submitting Oil-Spill Contingency Plans (OSCP). A second ITL states that Lessees be advised that coastal aggregations of polar bears are particularly vulnerable to the effects of an oil spill during the open water/broken-ice period, where aggregations must be accounted for in OSCPs.

(3) Site-Specific Monitoring Program for Bowhead whales.
In Sales 186, 195, and 202, site-specific monitoring programs for bowhead whales would indirectly provide information about the seasonal distributions of walruses and polar bears. While this information can be used to evaluate the threat of harm to the whale and provides immediate information about their activities, and their response to specific events. This will also contribute important information to ongoing walrus and polar bear monitoring efforts.

(4) Conflict Avoidance Mechanisms to Protect Subsistence-Harvesting Activities.

This lease stipulation for Sales 186, 195, and 202 will help reduce potential conflicts between subsistence hunters and proposed oil and gas activities. This will help to reduce noise and 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 in mitigating Industry exploration activities through the development of the annual oil/whaler agreement between the Alaska Eskimo Whaling Commission and oil companies. Mechanisms are focused on focused on August to October roughly from Anderson Point to Humphrey Point including Barter Island and extending 30 km offshore, and also September to October for the area from 15km west of Barrow to the east side of Dease Inlet and extending 50km offshore.

(5) Measures to Mitigate Seismic-Surveying Effects.

Protective measures, briefly described below, in BOEMRE's most recent marine seismic survey exploration permits and the recently completed *Programmatic Environmental Assessment of Arctic Ocean Outer Continental Shelf Seismic Surveys – 2006* (MMS 2006: http://alaska.boemre.gov/ref/EIS%20EA/Final_PEA/Final_PEA.pdf) will reduce the potential for Level A Harassment (injury) of walruses and polar bears during seismic operations. The spatial separation of seismic operations will reduce potential cumulative effects of simultaneous operations. The monitoring program will also provide location-specific information about the seasonal distributions of walruses and polar bears. This information can be used to evaluate the threat of harm to the species and provides immediate information about their activities, and their response to specific events. The measures include:

i) Spacing of Seismic Surveys - Operators must maintain a minimum spacing of 15 miles between the seismic-source vessels for separate simultaneous operations.

ii) Exclusion Zone - A 180/190-decibel (dB) isopleth-exclusion zone from the seismic-survey-sound source shall be free of marine mammals before the survey can begin and must remain free of mammals during the survey.

iii) Monitoring of the Exclusion Zone - Trained marine mammal observers (MMOs) shall monitor the area around the survey for the presence of marine mammals to maintain a marine mammal-free exclusion zone and monitor for avoidance or take behaviors.

iv) Monitoring of the Seismic-Survey Area - Aerial-monitoring surveys or an equivalent monitoring program designed to investigate animal distributions and abundance in the Seismic Survey may be required to estimate take.

v) Reporting Requirements - such as the monitoring plans required by the Service for polar bears and walruses provide regulatory agencies with specific information on the monitoring techniques to be implemented and how any observed impacts to marine mammals will be recorded. In addition, operators must report immediately any shut downs due to a marine mammal entering the exclusion zones and provide the regulating agencies with information on the frequency of occurrence and the types and behaviors of marine mammals (if possible to ascertain) entering the exclusion zones.

vi) Temporal/Spatial/Operational Restrictions - Seismic-survey and associated support vessels shall observe an 805 m (0.5-mi) safety radius around Pacific walrus groups hauled out onto land or ice. Aircraft shall be required to maintain a 457 m (1,500 ft) minimum altitude within 805 m (0.5 mi) of hauled out Pacific walruses. Seismic-survey operators shall notify BOEMRE and the Service in the event of any loss of cable, streamer, or other equipment that could pose a danger to marine mammals.

(6) Information to Lessees (ITLs).

These apply to Sales 186, 195 and 202, have protective effects for polar bears and walrus and make the lessee aware of additional laws or best practices they must follow.

ITL No. 4 - Lessees are advised that during the conduct of all activities related to leases issued as a result of this sale, the lessee and its agents will be subject to the provisions of the MMPA, the ESA, and applicable International Treaties.

ITL No. 5 - Lessees are advised that certain river deltas of the Beaufort Sea coastal plain, such as the Kongakut, Canning, and Colville, have been identified by the Service as special habitats for bird nesting and fish overwintering areas, as well as other forms of wildlife.

ITL No. 9 - Lessees are advised that polar bears may be present in the area of operations. Lessees should conduct their activities in a manner which will limit potential encounters and interaction between lease operations and polar bears. Lessees also are advised to consult "OCS Study MMS 93-0008, Guidelines for Oil and Gas Operations in Polar Bear Habitats."

ITL No. 11 - Lessees are advised that certain areas are especially valuable for their concentrations of marine birds, marine mammals, fishes, other biological resources, or cultural resources, and for their importance to subsistence harvest activities, and should be considered

when developing OSCP's. Examples of identified areas and time periods of special biological significance that could benefit polar bears and walrus directly and indirectly include: (1) the lead system off Point Barrow, April-June; (2) the Canning River Delta, January-December; (3) the Barter Island - Demarcation Point Area, January-December; (4) the Colville River Delta, January-December; (5) the Cross, Pole, Egg, and Thetis Islands, June-October; (6) the Flaxman Island waterfowl use and polar bear denning areas, January-December; (7) the Jones Island Group (Pingok, Spy, and Leavitt Islands) and Pole Island are known polar bear denning areas, November-April; and (8) the Sagavanirktok River delta, January-December.

VII. CONCLUSIONS

Under terms of the MMPA, based on the information contained in this document and the best available scientific information, the Service has determined that the impact of oil and gas activities as defined herein will result, at most, in Level B harassment of small numbers of polar bears and Pacific walruses. While incidental harassment of polar bears and walrus is reasonably likely to or reasonably expected to occur as a result of proposed activities, the overall impact would be negligible on polar bear and Pacific walrus populations. In addition, we find that most of the anticipated takes will be limited to non-lethal disturbances, affecting a relatively small number of animals and most disturbances will be relatively short-term in duration. 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. In consideration of the operational mitigation measures stipulated by the BOEMRE, and the additional protective measures associated with the Service MMPA incidental take regulations, we conclude that the specified activity will not have an unmitigable adverse impact on the availability of walruses or polar bears for subsistence uses.

VIII. AGENCIES/PERSONS CONSULTED

Persons and Agencies consulted included the following:

Bureau of Ocean Energy Management, Regulation and Enforcement
National Marine Fisheries Service
U.S. Geological Survey, Alaska Science Center
Alaska Oil and Gas Association
ConocoPhillips Alaska, Incorporated (CPAI)
Eskimo Walrus Commission
Nanuuq Commission
Alaska Eskimo Whaling Commission
North Slope Borough
Defenders of Wildlife
Marine Mammal Commission
Arctic Connections
National Wildlife Federation
Greenpeace
Center for Biological Diversity
Audubon Alaska
Earthjustice
Northern Alaska Environmental Center
Friends of Animals
Indigenous People's Council for Marine Mammals
Polar Bears International

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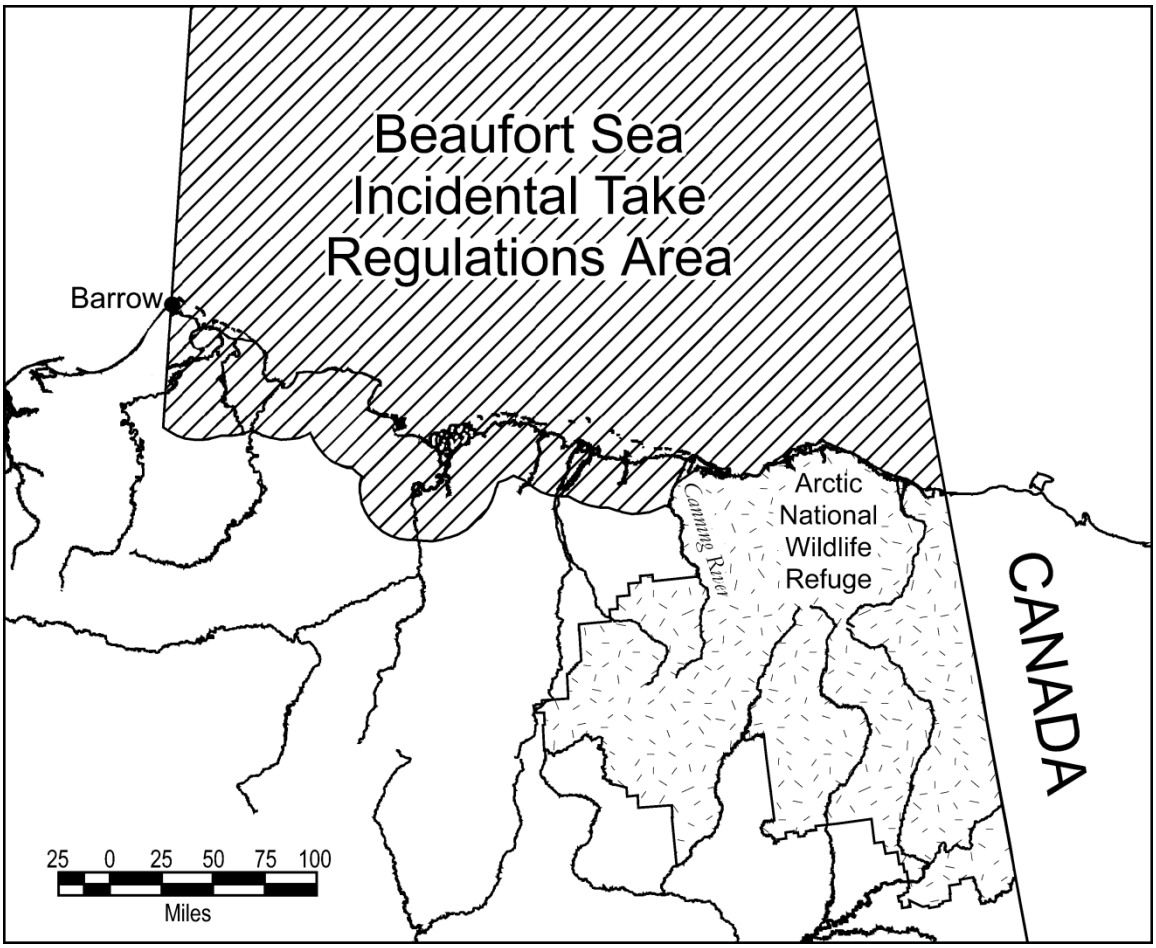

Figure 1: The geographic area of the Beaufort Sea and onshore coastal areas covered by the requested incidental take regulations.

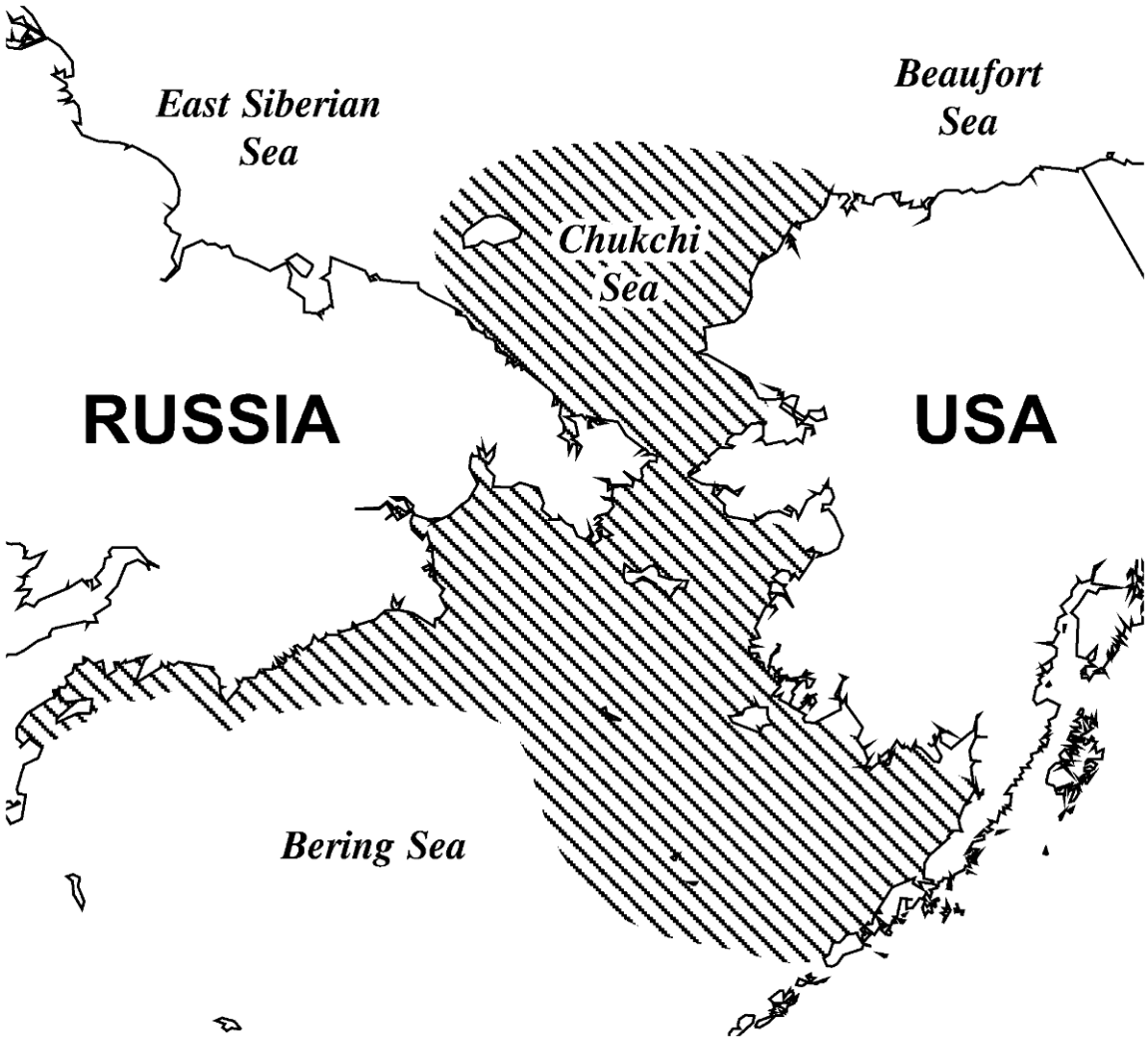

Figure 2. Distribution of Pacific walruses.

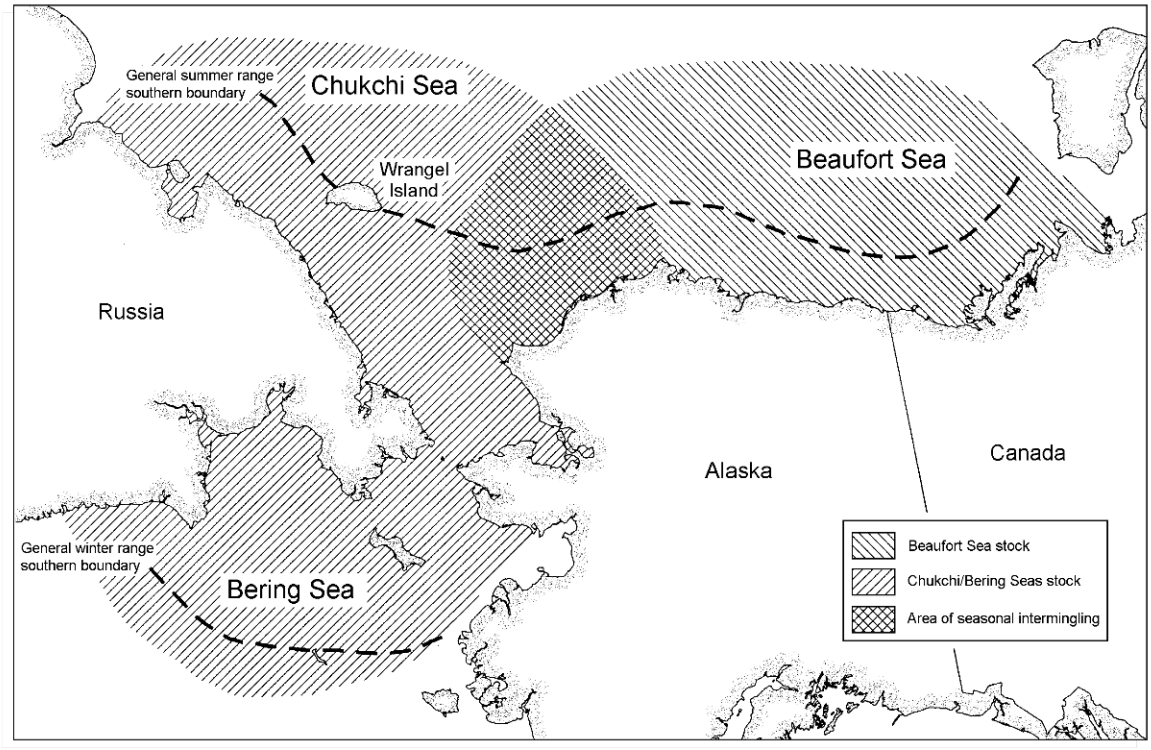

Figure 3. Stock boundaries for polar bears in Alaska.

Attachment 1

Detailed descriptions of activities authorized by the ITR

GEOLOGICAL AND GEOPHYSICAL SURVEYS

Geological and geophysical surveys are conducted to gather information about surface and subsurface geology. These surveys may consist of geophysical surveys including seismic, gravity, magnetic, and electromagnetic surveys; surface geologic surveys; geotechnical site investigations; geochemical surveys; and other evaluations of the surface of the land or seafloor. Seismic surveys can be divided into two classes: Deep penetration seismic and shallow hazard surveys. Deep penetration seismic surveys generally map deep strata beneath the surface of the ground in search of gas and oil-bearing rock formations. Shallow hazard surveys, also known as "site clearance" or "high resolution surveys," are conducted to gather information on near-surface hazards up to 800 to 1000 meters (m) (2625 to 3281 ft) below the sea floor, which could be encountered during drilling, as well as to determine foundation and permafrost conditions. This information is used to plan drilling operations to avoid or minimize the risk of such features.

1. Geotechnical Site Investigation

Shallow cores provide information about soil conditions where onshore or offshore pipelines, structures, or other facilities are planned, or to define where facilities may not be sited. Soil borings define the soil stratigraphy and geotechnical properties at selected points and may be integrated with seismic data to develop a regional model for predicting soil conditions in areas not sampled.

2. Reflection Seismic Exploration

Reflection seismology, or "seismic" data collection as it is more commonly referred to by the oil industry, is used to map the subsurface structure of rock formations. Seismic technology is used by geophysicists who interpret the data to map structural traps that could potentially contain hydrocarbons. Seismic exploration is the primary method of exploring for potential hydrocarbon deposits on land, under the sea, and in the transition zone (the interface area between sea and land). The general principle is to send sound energy waves (using an energy source like airgun or vibroseis) into the earth, through ground or water, where the different layers within the Earth's crust reflect back this energy. These reflected energy waves are recorded over a predetermined time period (called the record length) by using hydrophones in water and geophones on land. The reflected signals are recorded onto a storage medium. The data are then processed and seismic profiles are produced. These profiles are then interpreted for possible hydrocarbon containing structures.

High resolution seismic profiling is an integral part of site clearance and shallow hazard surveys. High resolution seismic profiling is accomplished typically through the use of a high-frequency sub-bottom profiler, an intermediate-frequency profiler, and a multi-channel system. A sub-bottom profiler is used to map geologic features by emitting a pulse with a transducer and receiving it with a receiver. Intermediate-frequency profilers outline the fine strata and density layers of the subsurface sediments, often referred to as a "boomer" or "bubble pulser." A multi-channel system tows an array of hydrophones that receive the signal from various sizes and numbers of air guns.

Seismic crews on the North Slope are typically between 80 and 160 personnel. Substantial logistical support is required to cover not only the seismic operation itself, but also to support the main camp (for catering, waste management and disposal, camp accommodations, washing facilities, water supply, laundry, etc.), fly camps (temporary camps set up away from the main camp on large land seismic

operations), all of the crew vehicles (maintenance, fuel, spares, etc.), security, possible helicopter operations, restocking of the explosive magazine, medical support, scientists, marine mammal observers, and many other logistical and support functions.

a. Vibroseis

Vibroseis seismic operations use truck-mounted vibrators that systematically put variable frequency energy into the earth. These can be used both onshore and on offshore sea ice. At least 1.2 m (4 ft) of sea ice is required to support heavy vehicles used to transport equipment offshore for exploration activities. These ice conditions vary, but generally exist from sometime in January until sometime in May in the area of activity. Several vehicles are normally associated with a typical vibroseis operation. One or two vehicles with survey crews move ahead of the operation and mark the source receiver points. Occasionally, bulldozers are needed to build snow ramps on the steep terrain or to smooth offshore rough ice within the survey area.

A typical wintertime exploration seismic crew consists of 40 to 160 personnel. Roughly 75 percent of the personnel routinely work on the active seismic crew, with approximately 50 percent of those working in vehicles and the remainder outside laying and retrieving geophones and cable. Other members of the team are focused on health, safety, or environmental issues, or general camp support.

With the vibroseis technique, activity on the surveyed seismic line begins with the placement of sensors. All sensors are connected to the recording vehicle by multi-pair cable sections. The vibrators move to the beginning of the line, and recording begins. The vibrators move along a source line, which is at some distance or angle to a sensor line. The vibrators begin vibrating in synchrony via a simultaneous radio signal to all vehicles.

In a typical survey, each vibrator will vibrate four times at each location. The entire formation of vibrators subsequently moves forward to the next energy input point (e.g., approximately 67 m [220 ft] in most applications) and repeats the process. In a typical 16- to 18-hour day, a survey will complete 6 to 16 linear km (4 to 10 mi) in two-dimensional (2D) seismic operation and 24 to 64 linear km (15 to 40 mi) in a three-dimensional (3D) seismic operation.

b. Airgun and Watergun Seismic Data Collection

Airgun arrays produce sound waves from multiple guns fired simultaneously that produce sudden releases of pressurized air bubbles to create the sound source, while “ocean bottom cable” or “streamer cables” with attached hydrophones receive the returned echoes. These seismic techniques use compressed air or water in a cylinder at a pressure of about 2,000 pounds per square inch (psi) released from the gun. In shallow waters or in transition (land and marine) surveys, ocean bottom cable is laid out on the ocean bottom with hydrophones; these hydrophones will measure the energy reflected by the geology. Typically, there will be a source vessel that deploys the airgun array and there will be multiple cable vessels that lay and pickup the cable.

In deeper waters, marine surveys are conducted using vessels capable of towing one or more seismic cables known as “streamers.” Larger vessels may use multiple streamers deployed in parallel, to record data suitable for the three-dimensional interpretation of the structures beneath the sea bed. A single vessel may tow up to 10 streamers, each up to 6 km (3.7 mi) in length, spaced 50 to 150 m (164 to 492 ft) apart. Hydrophones are deployed at regular intervals within each streamer. With this type of setup, the airguns and recording cables are on the same vessel, and the airgun array and streamers can be deployed at different depths, depending on the configuration of survey and regional geology.

To accurately calculate where subsurface features are located, navigators compute the position of both the sound source and each hydrophone group. The positioning accuracy required is achieved using a

combination of acoustic networks and differential global positioning system (GPS) receivers.

c. Explosives Seismic Data Collection

Explosives can also be used on land as a source of energy to achieve energy waves for seismic surveys. The field procedures for seismic activities using explosives are essentially the same as outlined in the vibroseis section. Explosives are typically set on land at implanted depths of 10 to 30 m (30 to 100 ft). Charges of high velocity explosives of 15 to 45 kilogram (kg) (33 to 99 pounds [lb]) are normally loaded into each hole or "shotpoint," and each shotpoint's charge is remotely detonated individually by the recording crew to produce a seismic record. Current practice limits the use of the explosive method to onshore operation.

3. Vertical Seismic Profiles

Vertical seismic profiles (VSPs) involve lowering geophones into a well bore on land or offshore and repeatedly activating the energy source. VSPs are elaborate checkshots that are used to calibrate seismic sections to well data (i.e., to correlate the reflections on the recorded seismic data with formations seen during drilling). VSPs are a form of well logging and are conducted both on and off the drill pad. VSP operations are usually crewed by fewer than eight people. If conducted during winter, four or five of the operators remain in the vehicles (vibrators) within 1.6 to 5 km (1 to 3 mi) of the rig, while the others are located at the rig.

4. Seafloor Imagery

A side-scan sonar is a sideward-looking, two-channel, narrow-beam instrument that emits a sound pulse and "listens" for its return. The sound energy transmitted is in a shape that sweeps the seafloor resulting in a 2D image that produces a detailed representation of the seafloor and any features or objects on it. A side-scan sonar emits high frequency sound typically between 120 and 132 kilohertz (kHz) band, occasionally reaching frequencies up to 410 to 445 kHz. The transmission pulse length can range from 5 microseconds to 20 miliseconds, depending on the equipment used. The sonar is typically towed behind a vessel.

Offshore Bathymetry

Bathymetry studies are typically conducted during the open water season, and occasionally during the winter ice-season, but generally after seismic surveys to obtain information on water depths, seafloor contours, hazards, and other environmental conditions. These studies are typically conducted using echosounders, such as single-beam or multi-beam sonar devices.

Echosounders measure the time it takes for sound to travel from a transducer, to the seafloor, and back to a receiver. The travel time can be converted to a depth value by multiplying it with the sound velocity of the water column. Echosounders are generally mounted to the ship hull or on a side-mounted pole and could be a single-beam with one transducer, or a multi-beam with an array of transducers.

The single-beam sonar device emits a high frequency single pulse of sound directly below the ship along the vessel trackline and provides a continuous recording of water depth along the survey track. Generally these recorders have compensation to rectify the data point. Sonars can operate at a frequency between either 3 kHz and 1000 kHz and emit approximately 5 to 50 pulses per second (pulses/sec). Each pulse length is between 0.07 and 500 miliseconds. These data can also provide information on evidence of water column anomalies which could indicate gas escaping into the water column.

A multi-beam sonar device is comprised of a transducer array that emits a swath of sound. The seafloor coverage swath of the multi-beam sonar depends on water depth, but is equal to 3 to 12 times the water depth. This sonar operates at a frequency between 100 to 455 kHz. It emits approximately 15 to 50 pulses/sec. The multi-beam system requires additional non-acoustic equipment including a

motion sensor (on vessel) to measure heave, roll, and pitch; a gyrocompass (on vessel); and a sound velocity probe lowered from the vessel. These data provide a 3D view of the seafloor in the surveyed area.

5. Ultra Shallow Water (USW) Array
This device is an array composed of a series of air powered seismic sound sources (shots) with variable power outputs. The "source array" transmits energy through the water where reflected energy is received by a multi-channel marine digital recording streamer system. This tool is useful in finding shallow faults and amplitude anomalies in the seafloor.

ENVIRONMENTAL STUDIES
In addition to geological and geotechnical surveys, over the past 40 years there has been extensive research and monitoring 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; non-profit organizations; and other local community stakeholders. Some research programs are multi-year efforts with objectives to collect baseline data or to answer specific research questions. These data are necessary to develop mitigation and monitoring strategies associated with exploration and development plans by:

• Understanding the life cycles and natural variability of wildlife resources, most notably marine mammals, and plant communities;
• Assessing whether exploration activities and development of oilfield operations affect wildlife populations and plant communities, and developing appropriate mitigation and monitoring strategies;
• Identifying the location of important cultural and historical artifacts in order to avoid these areas during exploration and development phases; and
• Understanding the potential for impacts to tundra, air, and aquatic resources through exploration activities and developing mitigation and monitoring strategies.
For the Petition period of 2011 to 2016, studies will continue to be conducted for general monitoring purposes or in anticipation of exploration and development of Alaska's North Slope natural resources.

OFFSHORE AND ONSHORE EXPLORATORY DRILLING
There are currently three principal forms of exploratory drilling platforms used in offshore exploration, namely artificial and natural islands, bottom-founded structures, and floating vessels. Onshore exploration in the Alaskan Arctic may be conducted from ice pads (single season or multi-season) and gravel pads.

1. Artificial Islands
Artificial islands are constructed in shallow offshore waters for use as drilling platforms. In the Arctic, artificial islands have been constructed from a combination of gravel, boulders, artificial structures (e.g., caissons which are watertight retaining structures), and/or ice. Artificial islands can be constructed at various times of the year. During summer, gravel is removed from the seafloor or onshore sites and barged to the proposed site and deposited to form the island. In the winter, gravel is transported over ice roads from an onshore site to the island site. After the artificial island is constructed to its full size, slope protection systems are installed, as appropriate for local oceanographic conditions, to reduce ice ride-up and erosion of the island. Once the island is complete, a drilling rig is transported to the island. One hundred or so people operate a typical rig site. Due to economic and engineering considerations, gravel island construction has historically been restricted to waters less than 15 m (50 ft) deep.

2. Caisson-retained Island

Caisson-retained islands are similar in construction and design to other artificial islands with one significant exception. Rather than relying entirely on gravel or large boulders for support, the island contains one or more floatable concrete or steel caissons, which rest on an underwater gravel berm or on the ocean floor in water less than 6 m (20 ft) deep. The berm is constructed with dredged or deposited material to within 6 m (20 ft) of the sea surface. When each caisson is in place, the resulting concrete or steel ring is filled with sand to give the structure stability. This design, like the gravel island, allows drilling to occur all year. When drilling is completed, the center core of sand can be dredged out, the caissons refloated, and the structure moved to a new location. The berm is left to erode by the natural action of the ocean. Personnel numbers on a caisson-retained island would be equivalent to those on an artificial island.

3. Steel Drilling Caisson

The Steel Drilling Caisson (SDC), a bottom-founded structure, is a "fit for purpose" drilling unit constructed typically by modifying the forward section of an ocean-going Very Large Crude Carrier (VLCC). The main body of the structure is approximately 162 m (531 ft) long, 53 m (174 ft) wide, and 25 m (83 ft) high. The deck has been cantilevered to provide additional space. The stability of the system under ice loading is provided by water ballasting of the original cargo tanks. Shotcrete has been applied to the base of the unit to increase its coefficient of friction. The SDC is designed to conduct exploratory year-round drilling under arctic environmental conditions. On its first two deployments in the Canadian Beaufort, the SDC was supported by subsea gravel berms. For its third deployment in Harrison Bay in 1986, a steel component was constructed to support the SDC in lieu of the gravel berms. It was also used in 2002 by EnCana on the McCovey prospect. The steel base configuration adds 13 m (44 ft) to the design height of the structure and allows deployment of the SDC in water depths of 8 to 24 m (25 to 80 ft) without bottom preparation. The SDC requires minimal support during the drilling season. It is typically stocked with supplies before being moved to a drill site. Two or three tugs and/or supply vessels tow the SDC to or from the drill site during open water periods. Deployment and recovery of the SDC require less than one week each. Personnel (typically a maximum of 100) and some smaller equipment are transported to and from the SDC by helicopter. Fuel and larger items, if required, are transported by supply vessel.

4. Floating Drilling Vessels

Floating drilling vessels include drillships (e.g., Northern Explorer II, Frontier Discoverer), semisubmersibles, or other floating vessels (e.g., Kulluk) in which the hull does not rest on the seafloor. These types of drilling vessels can typically be used in water depths greater than 18 m (60 ft) in the Beaufort Sea. This range makes them more suitable for the deeper water exploratory prospects than the "bottom founded" units such as the islands or the SDC mentioned in previous sections. Floating drilling vessel crews typically range from 100 to 200 people to operate the marine and drilling systems and ensure the safety of the operation (not including support or ice management vessels). These types of floating drilling vessels are held over a well drilling location either by a mooring system (consisting of an anchor, chain, and wire rope) or by the use of dynamic positioning (omni-directional thrusters coupled with a computer control system).

These types of floating drilling vessels operate during the Arctic drilling season with the potential to work during break-up and freeze-up, provided that support vessels are available to manage ice. Operations are supported by one or more ice management vessels (icebreakers) to ensure ice does not encroach on operations. If one of these vessels is moored, then an anchor-handling vessel is required to support the operations. A barge and tug, or other type of Oil Spill Response Vessel (OSRV), typically accompany these floating drilling vessels to provide a standby safety vessel, oil spill response capabilities, and refueling support. Most supplies (including fuel) necessary to complete drilling activities are stored on the drilling and support vessels; however, a shallow draft re-supply vessel can be utilized to move critical equipment to and from marine terminals/docks. Helicopters based at existing shore facilities routinely

transfer personnel and additional equipment. Flights average one or two per day. Fuel and supply caches may also be deployed on some occasions.

5. Ice Pads, Roads, and Islands

Ice roads provide seasonal routes for heavy equipment and supplies to be moved to remote areas, both onshore and offshore. These temporary, seasonal roads are constructed by spreading water from local sources (abandoned mine sites, lakes, rivers, seawater) to create a rigid surface. On land and along river corridors, ice roads and pads are constructed from freshwater sources. Most often and when available, abandoned mine sites that have filled with freshwater are used for construction of ice roads on tundra or along river banks. In cases where mine site water is not available, freshwater lakes are used for ice road construction. For grounded ice roads in shallow (< 2 m [< 6.5 ft]) waters of the Beaufort Sea, seawater is initially used for the foundation and the ice road is eventually "capped" with freshwater, strengthening the road. Floating ice roads may also be constructed over deeper water. Ice bridges may be constructed to provide winter access across frozen rivers; ice airstrips are built in the same manner as ice roads. Ice drilling and storage pads are now commonly used for winter exploration pads. Ice pads are also built in a similar way to ice roads and airstrips. The thickness of ice roads, pads, and bridges depends on the loads that must be supported and on terrain, and can range from 15 centimeter (cm) (6 inches [in]) to 3 m (10 ft). Offshore ice pads may be thicker. Insulated ice pads are occasionally used to allow the ice structure to remain intact through summer, and thus, be used for multiple drilling seasons. Offshore ice islands and offshore ice roads are built using similar techniques to their onshore counterparts.

DEVELOPMENT AND PRODUCTION

Existing North Slope production operations extend from Alpine in the west to Point Thomson and Badami in the east. Badami and Alpine are developments without permanent access roads; access is available to these fields by airstrips, barges, and seasonal ice roads. Sales oil pipelines extend from these fields and connect to TAPS. North Slope oilfield developments include a series of major fields and their associated satellite fields. In some cases a new oilfield discovery has been developed completely using existing infrastructure. Thus, the Prudhoe Bay oilfield unit encompasses the Prudhoe Bay, Lisburne, Niakuk, West Beach, North Prudhoe Bay, Point McIntyre, Borealis, Midnight Sun, Polaris, Aurora and Orion reservoirs, while the Kuparuk oilfield development incorporates the Kuparuk, West Sak, Tarn, Palm, Tabasco, and Meltwater oilfields.

1. Prudhoe Bay Unit

The Prudhoe Bay oilfield is the largest oilfield by production in North America and ranks among the 20 largest oilfields ever discovered worldwide. Over 11 billion barrels have been produced from a field originally estimated to have 25 billion barrels of oil in place. The Prudhoe Bay field also contains an estimated 26 trillion cubic ft of recoverable natural gas. More than 1,100 wells are currently in operation in the greater Prudhoe Bay oilfields, just over 900 of which are producing oil (others are for gas or water injection).

The total development area in the Prudhoe Bay Unit is approximately 2,785 hectares (6,883 acres). The Base Operations Center on the western side of the Prudhoe Bay oilfield can accommodate 476 people, the nearby Main Construction Camp can accommodate up to 680 people, and the Prudhoe Bay Operations Center on the eastern side of the field houses up to 488 people. Additional contract or construction personnel can be housed at facilities in nearby Deadhorse or in temporary camps placed on existing gravel pads.

2. Kuparuk River Unit

The Kuparuk oilfield is the second-largest producing oilfield in North America. More than 2.6 billion barrels of oil are expected to be produced from this oilfield. The Greater Kuparuk Area includes the satellite oilfields of Tarn, Palm, Tabasco, West Sak, and Meltwater. These satellite fields have been

developed using existing facilities. To date, nearly 900 wells have been drilled in the Greater Kuparuk Area. The total development area in the Greater Kuparuk Area is approximately 603 hectares (1,508 acres), including 167 km (104 mi) of gravel roads, 231 km (144 mi) of pipelines, 6 gravel mine sites, and over 50 gravel pads. The Kuparuk Operations Center and Kuparuk Construction Camp are able to accommodate up to 1,200 people. The Kuparuk Industrial Center is primarily used for personnel overflow during the winter in years with a large amount of construction.

3. Greater Point McIntyre

The Greater Point McIntyre Area encompasses the Point McIntyre field and nearby satellite fields of West Beach, North Prudhoe Bay, Niakuk, and Western Niakuk. The Point McIntyre area is located 11.3 km (7 mi) north of Prudhoe Bay. It was discovered in 1988 and came online in 1993. BPXA produces the Point McIntyre area from two drill site gravel pads. The field's production peaked in 1996 at 170,000 barrels per day, whereas in 2006 production averaged 21,000 barrels per day with just over 100 wells in operation. Cumulative oil production as of December 31, 2006 was 738 million barrels of oil equivalent (BOE).

4. Milne Point

Located approximately 56 km (35 mi) northwest of Prudhoe Bay, the Milne Point oilfield was discovered in 1969 and began production in 1985. The field consists of more than 220 wells drilled from 12 gravel pads. Milne Point produces from three main fields: Kuparuk, Schrader Bluff, and Sag River. Cumulative oil production as of December 31, 2006 was 248 million BOE. The total area of Milne Point and its satellites is 94.4 hectares (236 acres) of tundra, including 31 km (19 mi) of gravel roads, 64 km (40 mi) of pipelines, and one gravel mine site. The Milne Point Operations Center has accommodations for up to 300 people.

It is estimated that the Ugnu reservoir contains roughly 20 billion barrels of heavy oil in place. BPXA's reservoir scientists and engineers conservatively estimate that roughly 10 percent of that resource, or 2 billion barrels, could be recoverable. Currently, cold heavy oil production with sand (CHOPS) technology is being tested at Milne South Pad. CHOPS is part of a multi-year technology testing and research program initiated at Milne Point in 2007.

5. Endicott

The Endicott oilfield is located approximately 16 km (10 mi) northeast of Prudhoe Bay. It is the first continuously producing offshore field in the U.S. Arctic. The Endicott oilfield was developed from two man-made gravel islands connected to the mainland by a gravel causeway. The operations center and processing facilities are located on the 18-hectare (45-acre) Main Production Island. Approximately 80 wells have been drilled to develop the field. Two satellite fields drilled from Endicott's Main Production Island access oil from the Ivishak formation: Eider produces about 110 barrels per day, and Sag Delta North produces about 117 barrels per day. The total area of Endicott development is 156.8 hectares (392 acres) of land with 25 km (15 mi) of roads, 47 km (29 mi) of pipelines, and one gravel mine site. Approximately 100 people are housed at the Endicott Operations Center.

6. Badami

Production began from the Badami oilfield in 1998, but has not been continuous. The Badami field is located approximately 56 km (35 mi) east of Prudhoe Bay and is currently the most easterly oilfield development on the North Slope. The Badami development area is approximately 34 hectares (85 acres) of tundra including 7 km (4.5 mi) of gravel roads, 56 km (35 mi) of pipeline, one gravel mine site, and two gravel pads with a total of eight wells. There is no permanent road connection from Badami to Prudhoe Bay. The pipeline connecting the Badami oilfield to the common carrier pipeline system at Endicott was built from an ice road. The cumulative production is five million BOE. This field is currently in "warm storage" status and currently is not producing oil reserves at this time. BPXA recently

entered into an agreement with Savant LLC; under this agreement Savant will drill an exploration well in the winter of 2009 and potentially add an additional well in 2010. Depending on the outcome of these drilling programs, Badami could resume production.

7. Alpine

Discovered in 1996, the Alpine oilfield began production in November 2000. Alpine is the westernmost oilfield on the North Slope, located 50 km (31 mi) west of the Kuparuk oilfield and just 14 km (9 mi) northeast of the village of Nuiqsut. Although the Alpine reservoir covers 50,264 hectares (124,204 acres), it has been developed from 65.9 hectares (162.92 acres) of pads and associated roads. Alpine features a combined production pad/drill site and three additional drill sites with an estimated 172 wells. There is no permanent road connecting Alpine with the Kuparuk oilfield; small aircraft are used to provide supplies and crew changeovers. Major resupply activities occur in the winter, using the ice road that is constructed annually between the two fields. The Alpine base camp can house approximately 540 employees.

8. Northstar

The Northstar oilfield was discovered in 1983 and developed by BPXA in 1995. The offshore oilfield is located 6 km (4 mi) northwest of the Point McIntyre field and 10 km (6 mi) from Prudhoe Bay in about 39 feet of water. The 15,360-hectare (38,400-acre) reservoir has now been developed from a 2-hectare (5-acre) artificial island. Production from the Northstar reservoir began in late 2001. The 2-hectare (5-acre) island will eventually contain 19 producing wells, six gas injector wells, and one solids injection well. A subsea pipeline connects facilities to the Prudhoe Bay oilfield. Access to Northstar is via helicopter, hovercraft, and boat.

9. Oooguruk Unit

The Oooguruk Unit is located adjacent to Kuparuk River Unit in shallow waters of Harrison Bay. Pioneer and its partner, Eni, constructed an offshore drill site and onshore production facilities pad in 2006 on State of Alaska leases. A subsea flowline was constructed to transfer produced fluids 9.2 km (5.7 mi) from the offshore drill site to shore. The subsea flowline transitions to an aboveground flowline supported on vertical support members for 3.9 km (2.4 mi) to the onshore facilities for approximately 3.3 hectares (8.2 acres). The offshore drill site (2.4 hectares, 6 acres) is planned to support 48 wells drilled from the Nuiqsut and Kuparuk reservoirs. The wells are contained in well bay modules, with capacity for an additional 12 wells, if needed. Development drilling began in 2007 with unit production commencing in 2008.

10. Nikaitchuq Unit

The Nikaitchuq Unit is located at Spy Island, north of Oliktok Point and the Kuparuk River unit, and northwest of the Milne Point Unit. Former operator Kerr-McGee Oil and Gas Corporation drilled exploratory wells from up to three locations on or immediately adjacent to Spy Island, 6.4 km (4 mi) north of Oliktok Point in 2004-2005. Kerr McGee drilled six wells in the Nikaitchuq and Tuvaaq units between 2004 and 2005. Three of the six tested oil from the Schrader Bluff or Sag River formations; Kerr McGee drilled two additional Schrader Bluff wells in 2006. Seventy-six wells are expected to be drilled between 2008 and 2011, 31 of which would be producers. In 2007, Eni became operator in the area, after acquiring Armstrong Oil & Gas interests. In 2007, Eni received state approval for expansion of the unit, combining it with the former Tuvaaq unit and adding a segment from the Kuparuk unit. Initial drilling will be from a gravel pad housing production facilities. Future drilling will be from a small gravel island shoreward of the barrier islands.

OIL PRODUCTION PROCESSES

1. Production Facilities

Wells are drilled into oil bearing zones to bring oil to the surface. Wells are typically grouped on gravel pads (or islands), commonly called well pads or drill sites. During development design, pads are placed to

optimize oil recovery within the constraints of drilling reach and environmental protection. At the surface well-head, a mix of crude oil, water, and natural gas flows into the manifold building, which is also located on the well pad. The primary function of the manifold building is to combine production from multiple wells and route it to separation facilities via cross-country flow lines. Some remote locations with space limitations decrease the footprint of the manifold building by utilizing multi-phase flow meters instead of a test separator. Production from a well may be diverted through the multi-phase flow meter or sent directly to a common production flow line. Crude oil from offshore remote locations is transported via buried subsea pipelines to onshore flow lines that deliver it to the separation facilities.
At the separation facilities (also called production facilities, gathering centers, or flow stations), gas, oil, and water are separated. Following the separation process, oil is routed by pipeline to Pump Station 1, which is the beginning of the TAPS. The separated water (referred to as produced water) is sent via pipeline back to the well pads where it is typically injected back into the reservoir to help maintain reservoir pressure and enhance recovery of oil. Most of the produced gas is also reinjected to maintain reservoir pressure. A portion of the gas is used to fuel the overall production operation. In the Prudhoe Bay Unit, gas is first routed to the Central Gas Facility (CGF) where natural gas liquids (NGLs) and miscible injectant (MI) are extracted using a low temperature separation process. The NGLs are shipped via TAPS with the crude oil. MI is sent via pipelines to the well pads where it is injected for enhanced oil recovery. After the NGLs and MI are removed, the remaining gas is routed to compressors at both the CGF and the Central Compressor Plant, where it is compressed for re-injection into the gas cap of the reservoir. In older fields, such as Prudhoe Bay and Kurparuk, the crude oil fraction of production fluids is substantially less than the water and gas fraction.

2. Production Wastes

Production wastes include drilling muds that are used to lubricate and maintain the well bore during drilling, and rock fragments known as cuttings, removed by the drill bit. Drilling muds are either water-based mixtures comprised of naturally occurring clays and weighting materials with small amounts of other additives or oil-based mixtures comprised of mineral oil and weighting materials with small amounts of other additives. Until the 1990s, these production wastes were typically placed in “reserve pits” built into the gravel drilling pads; however, new technology has eliminated the need for reserve pits by grinding the cuttings and re-injecting the muds and ground cuttings into deep, confined geologic formations. Wastes that are generated during exploration drilling operations are similar in nature to production wastes and are treated similarly. Subsurface waste disposal is regulated by the Environmental Protection Agency (EPA) and the State of Alaska under the Underground Injection Control program. Other wastes generated by oilfield operations include well treatment fluids, chemicals used for processing crude oil, rig washwater, accumulated materials such as hydrocarbons solids, sands and emulsion from production separators and fluid treating vessels, and cooling waters. These wastes are handled by using a variety of techniques, including recycling, underground injection, beneficial reuse in enhanced oil recovery, and shipment to approved offsite facilities.

A small amount of hazardous waste is generated by production facilities. These wastes are handled in accordance with EPA regulations. Hazardous wastes are sent out of state by truck, rail, and barge to EPA permitted disposal facilities in the contiguous U.S. Non-hazardous solid waste and sanitary wastes are also generated at North Slope oilfield facilities. Solid wastes such as empty drums, paper products, wood, etc., are handled at the North Slope Borough (NSB) landfill or incinerated. Disposable food waste is also handled at the NSB landfill facility, and predator-proof dumpsters have been installed in the oilfield to minimize wildlife attraction to these potential food sources. Sewage wastes are physically and chemically treated by wastewater treatment facilities. North Slope area facilities also operate various recycling programs. Paper products, wood, scrap metal, cardboard, electronics, and other materials are collected and transported off the North Slope to appropriate recycling facilities.

3. Decommissioning

While no major oilfield has been decommissioned and abandoned to date, individual production pads and exploration sites have been subject to closeout, cleanup, and rehabilitation activities. Such activities may involve the removal of surface structures and equipment; permanently plugging and abandoning the wells and removal of the wellhead; the installation of well monitoring equipment, the removal or cleanup of contaminated gravel, soil, and/or drilling waste; the removal or grading of gravel; and the planting and restoration of vegetation.

SUPPORT AND DISTRIBUTION

1. Support Operations

Equipment and people associated with exploration and production operations are transported to and from the facilities by truck or bus, aircraft, hovercraft, marine vessel, or barge towed by a vessel. Equipment and materials are transported to the North Slope by truck. Aircraft, both fixed wing and helicopters, are used for movement of personnel, mail, rush-cargo, and perishable items. Marine vessel, barges, and tugs are used to transport items in open water.

2. Trans-Alaska Pipeline System

TAPS is a 122-cm (48-in) diameter crude oil transportation pipeline system that originates at Pump Station 1 in the Prudhoe Bay Field, and extends 1,287 km (800 mi) across the state to its terminus at the Valdez Marine Terminal. Alyeska Pipeline Service Company, as operator of the pipeline, conducts pipeline operations, maintenance and emergency response along the pipeline right-of-way, including approximately 37 km (23 mi) of pipeline located within 40 km (25 mi) of the Beaufort Sea coastline. Personnel are based out of pump stations, and reside in designated living facilities, where lodging and eating amenities are maintained. In addition to routine operations, project work and emergency response training takes place at various distances from the pump stations. Operations and maintenance of the pipeline and facilities includes a 238-km (148-mi) natural gas line that extends south from Pump Station 1 that supplies fuel to power turbines at Pump Stations 3 and 4. Travel primarily occurs along established roads, such as the Spine Road and the Dalton Highway, or along the pipeline right-of-way work pads. The Dalton Highway corridor is shared with the general public.

Congress enacted the Trans-Alaska Pipeline Authorization Act (TAPAA) on November 16, 1973. The Federal Agreement and Grant of Right-of-Way for the TAPS (Federal Grant) was issued on January 23, 1974, and the State Right-of-Way Lease for the TAPS was issued on May 3, 1974. The Federal Grant, as renewed, expires on May 2, 2034. On November 26, 2002, the lease for state land along the pipeline corridor was renewed for an additional 30 years.