

DEPARTMENT OF THE INTERIOR**Fish and Wildlife Service****50 CFR Part 18**

[Docket No. FWS-R7-ES-2021-0037;
FXES111607MRG01-212-FF07CMM00]

RIN 1018-BF13

**Marine Mammals; Incidental Take
During Specified Activities; North
Slope, Alaska**

AGENCY: Fish and Wildlife Service,
Interior.

ACTION: Proposed rule; notice of
availability of draft environmental
assessment; and request for comments.

SUMMARY: We, the U.S. Fish and Wildlife Service, in response to a request from the Alaska Oil and Gas Association, propose to issue regulations authorizing the nonlethal, incidental, unintentional take by harassment of small numbers of polar bears and Pacific walrus during year-round oil and gas industry activities in the Beaufort Sea (Alaska and the Outer Continental Shelf) and adjacent northern coast of Alaska. Take may result from oil and gas exploration, development, production, and transportation activities occurring for a period of 5 years. These activities are similar to those covered by the previous 5-year Beaufort Sea incidental take regulations effective from August 5, 2016, through August 5, 2021. This proposed rule would authorize take by harassment only. No lethal take would be authorized. If this rule is finalized, we will issue Letters of Authorization, upon request, for specific proposed activities in accordance with this proposed regulation. Therefore, we request comments on these proposed regulations.

DATES: Comments on these proposed incidental take regulations and the accompanying draft environmental assessment will be accepted on or before July 1, 2021.

ADDRESSES: You may view this proposed rule, the associated draft environmental assessment, comments received, and other supporting material at <http://www.regulations.gov> under Docket No. FWS-R7-ES-2021-0037, or these documents may be requested as described under **FOR FURTHER INFORMATION CONTACT**. You may submit comments on the proposed rule by one of the following methods:

- *U.S. mail:* Public Comments Processing, Attn: Docket No. FWS-R7-ES-2021-0037, U.S. Fish and Wildlife Service; MS: PRB (JAO/3W); 5275

Leesburg Pike; Falls Church, VA 22041-3803.

- *Electronic submission:* Federal eRulemaking Portal at: <http://www.regulations.gov>. Follow the instructions for submitting comments to Docket No. FWS-R7-ES-2021-0037.

We will post all comments at <http://www.regulations.gov>. You may request that we withhold personal identifying information from public review; however, we cannot guarantee that we will be able to do so. See Request for Public Comments for more information.

FOR FURTHER INFORMATION CONTACT: Marine Mammals Management, U.S. Fish and Wildlife Service, 1011 East Tudor Road, MS-341, Anchorage, AK 99503, Telephone 907-786-3844, or Email: R7mmmregulatory@fws.gov. Persons who use a telecommunications device for the deaf (TDD) may call the Federal Relay Service (FRS) at 1-800-877-8339, 24 hours a day, 7 days a week.

SUPPLEMENTARY INFORMATION:

Executive Summary

In accordance with the Marine Mammal Protection Act (MMPA) of 1972, as amended, and its implementing regulations, we, the U.S. Fish and Wildlife Service (Service or we), propose incidental take regulations (ITR) that, if finalized, would authorize the nonlethal, incidental, unintentional take of small numbers of Pacific walrus (*Odobenus rosmarus divergens*) and polar bears (*Ursus maritimus*) during oil and gas industry (hereafter referred to as "Industry") activities in the Beaufort Sea and adjacent northern coast of Alaska, not including lands within the Arctic National Wildlife Refuge, for a 5-year period. Industry operations include similar types of activities covered by the previous 5-year Beaufort Sea ITRs effective from August 5, 2016, through August 5, 2021 and found in title 50 of the Code of Federal Regulations (CFR) in part 18, subpart J.

This proposed rule is based on our draft findings that the total takings of Pacific walrus (walrus) and polar bears during proposed Industry activities will impact no more than small numbers of animals, will have a negligible impact on these species or stocks, and will not have an unmitigable adverse impact on the availability of these species or stocks for taking for subsistence uses by Alaska Natives. We base our draft findings on past and proposed future monitoring of the encounters and interactions between these species and Industry; species research; oil spill risk assessments;

potential and documented Industry effects on these species; natural history and conservation status information of these species; and data reported from Alaska Native subsistence hunters. We have prepared a draft environmental assessment in conjunction with this rulemaking, which is also available for public review and comment.

The proposed regulations include permissible methods of nonlethal taking; mitigation measures to ensure that Industry activities will have the least practicable adverse impact on the species or stock, their habitat, and their availability for subsistence uses; and requirements for monitoring and reporting. Compliance with this rule, if finalized, is not expected to result in significant additional costs to Industry, and any costs are minimal in comparison to those related to actual oil and gas exploration, development, and production operations.

Background

Section 101(a)(5)(A) of the Marine Mammal Protection Act (MMPA; 16 U.S.C. 1371(a)(5)(A)) gives the Secretary of the Interior (Secretary) the authority to allow the incidental, but not intentional, taking of small numbers of marine mammals, in response to requests by U.S. citizens (as defined in 50 CFR 18.27(c)) engaged in a specified activity (other than commercial fishing) within a specified geographic region. The Secretary has delegated authority for implementation of the MMPA to the U.S. Fish and Wildlife Service. According to the MMPA, the Service shall allow this incidental taking if we find the total of such taking for a 5-year period or less:

(1) Will affect only small numbers of marine mammals of a species or population stock;

(2) will have no more than a negligible impact on such species or stocks;

(3) will not have an unmitigable adverse impact on the availability of such species or stocks for taking for subsistence use by Alaska Natives; and

(4) we issue regulations that set forth:

(a) Permissible methods of taking;

(b) other means of effecting the least practicable adverse impact on the species or stock and its habitat, and on the availability of such species or stock for subsistence uses; and

(c) requirements for monitoring and reporting of such taking.

If final regulations allowing such incidental taking are issued, we may then subsequently issue Letters of Authorization (LOAs), upon request, to authorize incidental take during the specified activities.

The term “take,” as defined by the MMPA, means to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal (16 U.S.C. 1362(13)). Harassment, as defined by the MMPA, for activities other than military readiness activities or scientific research conducted by or on behalf of the Federal Government, means “any act of pursuit, torment, or annoyance which (i) has the potential to injure a marine mammal or marine mammal stock in the wild” (the MMPA defines this as Level A harassment); or “(ii) has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering” (the MMPA defines this as Level B harassment) (16 U.S.C. 1362(18)).

The terms “negligible impact” and “unmitigable adverse impact” are defined in title 50 of the CFR at 50 CFR 18.27 (the Service’s regulations governing small takes of marine mammals incidental to specified activities). “Negligible impact” is 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. “Unmitigable adverse impact” means an impact resulting from the specified activity (1) that is likely to reduce the availability of the species to a level insufficient for a harvest to meet subsistence needs by (i) causing the marine mammals to abandon or avoid hunting areas, (ii) directly displacing subsistence users, or (iii) placing physical barriers between the marine mammals and the subsistence hunters; and (2) that cannot be sufficiently mitigated by other measures to increase the availability of marine mammals to allow subsistence needs to be met.

The term “small numbers”; is also defined in 50 CFR 18.27. However, we do not rely on that definition here as it conflates “small numbers” with “negligible impacts.” We recognize “small numbers” and “negligible impacts” as two separate and distinct requirements for promulgating incidental take regulations (ITRs) under the MMPA (see *Natural Res. Def. Council, Inc. v. Evans*, 232 F. Supp. 2d 1003, 1025 (N.D. Cal. 2003)). Instead, for our small numbers determination, we estimate the likely number of takes of marine mammals and evaluate if that take is small relative to the size of the species or stock.

The term “least practicable adverse impact” is not defined in the MMPA or its enacting regulations. For this proposed ITR, we ensure the least practicable adverse impact by requiring mitigation measures that are effective in reducing the impact of Industry activities but are not so restrictive as to make Industry activities unduly burdensome or impossible to undertake and complete.

In this proposed ITR, the term “Industry” includes individuals, companies, and organizations involved in exploration, development, production, extraction, processing, transportation, research, monitoring, and support services of the petroleum industry. Industry activities may result in the incidental taking of Pacific walruses and polar bears.

The MMPA does not require Industry to obtain an incidental take authorization; however, any taking that occurs without authorization is a violation of the MMPA. Since 1993, the oil and gas industry operating in the Beaufort Sea and the adjacent northern coast of Alaska has requested and we have issued ITRs for the incidental take of Pacific walruses and polar bears within a specified geographic region during specified activities. For a detailed history of our current and past Beaufort Sea ITRs, refer to the **Federal Register** at 81 FR 52276, August 5, 2016; 76 FR 47010, August 3, 2011; 71 FR 43926, August 2, 2006; and 68 FR 66744, November 28, 2003. The current regulations are codified at 50 CFR part 18, subpart J (§§ 18.121 to 18.129).

Summary of Current Request

On June 15, 2020, the Service received a request from the Alaska Oil and Gas Association (AOGA) on behalf of its members and other participating companies to promulgate regulations for nonlethal incidental take of small numbers of walruses and polar bears in the Beaufort Sea and adjacent northern coast of Alaska for a period of 5 years (2021–2026) (hereafter referred to as “the Request”). We received an amendment to the Request on March 9, 2021, which was deemed adequate and complete. The amended Request is available at www.regulations.gov at Docket No. FWS–R7–ES–2021–0037.

The AOGA application requests regulations that will be applicable to the oil and gas exploration, development, and production, extraction, processing, transportation, research, monitoring, and support activities of multiple companies specified in the application. This includes AOGA member and other non-member companies that have applied for these regulations and their

subcontractors and subsidiaries that plan to conduct oil and gas operations in the specified geographic region. Members of AOGA represented in the Request include: Alyeska Pipeline Service Company, BlueCrest Energy, Inc., Chevron Corporation, ConocoPhillips Alaska, Inc. (CPAI), Eni U.S. Operating Co. Inc. (Eni Petroleum), ExxonMobil Alaska Production Inc. (ExxonMobil), Furie Operating Alaska, LLC, Glacier Oil and Gas Corporation (Glacier), Hilcorp Alaska, LLC (Hilcorp), Marathon Petroleum, Petro Star Inc., Repsol, and Shell Exploration and Production Company (Shell).

Non-AOGA companies represented in the Request include: Alaska Gasline Development Corporation (AGDC), Arctic Slope Regional Corporation (ASRC) Energy Services, Oil Search (Alaska), LLC, and Qilak LNG, Inc. If finalized, these regulations would apply only to AOGA members, the non-members noted above, their subsidiaries and subcontractors, and companies that have acquired any of the above. The activities and geographic region specified in AOGA’s request and considered in these proposed regulations are described in the following sections titled Description of Specified Activities and Description of Specified Geographic Region.

Description of the Proposed Regulations

The proposed regulations, if finalized, would authorize the nonlethal, incidental, unintentional take of small numbers of Pacific walruses and polar bears that may result from Industry activities based on standards set forth in the MMPA. They would not authorize or “permit” Industry activities. The Bureau of Ocean Energy Management (BOEM), the Bureau of Safety and Environmental Enforcement, the U.S. Army Corps of Engineers, and the Bureau of Land Management (BLM) are responsible for permitting activities associated with Industry activities in Federal waters and on Federal lands. The State of Alaska is responsible for permitting Industry activities on State lands and in State waters. The proposed regulations include:

- Permissible methods of nonlethal taking;
- Measures designed to ensure the least practicable adverse impact on Pacific walruses and polar bears and their habitat, and on the availability of these species or stocks for subsistence uses; and
- Requirements for monitoring and reporting.

Description of Letters of Authorization (LOAs)

An LOA is required to conduct activities pursuant to an ITR. Under this proposed ITR, if finalized, entities intending to conduct the specific activities described in these regulations may request a LOA for the authorized nonlethal, incidental Level B take of walrus and polar bears. Per AOGA's Request, such entities would be limited to the companies, groups, individuals specified in AOGA's Request, their subsidiaries or subcontractors, and their successors-in-interest. Requests for LOAs must be consistent with the activity descriptions and mitigation and monitoring requirements of the ITR and be received in writing at least 90 days before the activity is to begin. Requests must include (1) an operational plan for the activity; (2) a digital geospatial file of the project footprint, (3) estimates of monthly human occupancy of project area; (4) a walrus and/or polar bear interaction plan, (5) a site-specific marine mammal monitoring and mitigation plan that specifies the procedures to monitor and mitigate the effects of the activities on walrus and/or polar bears, including frequency and dates of aerial infrared (AIR) surveys if such surveys are required, and (6) Plans of Cooperation (described below). Once this information has been received, we will evaluate each request and issue the LOA if we find that the level of taking will be consistent with the findings made for the total taking allowable under the ITR. We must receive an after-action report on the monitoring and mitigation activities within 90 days after

the LOA expires. For more information on requesting and receiving an LOA, refer to 50 CFR 18.27.

Description of Plans of Cooperation (POCs)

A POC is a documented plan describing measures to mitigate potential conflicts between Industry activities and subsistence hunting. The circumstances under which a POC must be developed and submitted with a request for an LOA are described below.

To help ensure that Industry activities do not have an unmitigable adverse impact on the availability of the species for subsistence hunting opportunities, all applicants requesting an LOA under this ITR must provide the Service documentation of communication and coordination with Alaska Native communities potentially affected by the Industry activity and, as appropriate, with representative subsistence hunting and co-management organizations, such as the North Slope Borough, the Alaska Nannut Co-Management Council (ANCC), and Eskimo Walrus Commission (EWC), among others. If Alaska Native communities or representative subsistence hunting organizations express concerns about the potential impacts of project activities on subsistence activities, and such concerns are not resolved during this initial communication and coordination process, then a POC must be developed and submitted with the applicant's request for an LOA. In developing the POC, Industry representatives will further engage with Native communities and/or representative subsistence hunting

organizations to provide information and respond to questions and concerns. The POC must provide adequate measures to ensure that Industry activities will not have an unmitigable adverse impact on the availability of walrus and polar bears for subsistence uses.

Description of Specified Geographic Region

The specified geographic region covered by the requested ITR (Beaufort Sea ITR region (Figure 1)) encompasses all Beaufort Sea waters (including State waters and Outer Continental Shelf waters as defined by BOEM) east of a north-south line extending from Point Barrow (N71.39139, W156.475, BGN 1944) to the Canadian border, except for marine waters located within the Arctic National Wildlife Refuge (ANWR). The offshore boundary extends 80.5 km (50 mi) offshore. The onshore boundary includes land on the North Slope of Alaska from Point Barrow to the western boundary of the Arctic National Wildlife Refuge. The onshore boundary is 40 km (25 mi) inland. No lands or waters within the exterior boundaries of the Arctic National Wildlife Refuge (ANWR) are included in the Beaufort Sea ITR region. The geographical extent of the proposed Beaufort Sea ITR region (approximately 7.9 million hectares (ha) (~19.8 million acres (ac))) is smaller than the region covered in previous regulations (approximately 29.8 million ha (~73.6 million ac) were included in the ITR set forth via the final rule that published at 81 FR 52276, August 5, 2016).

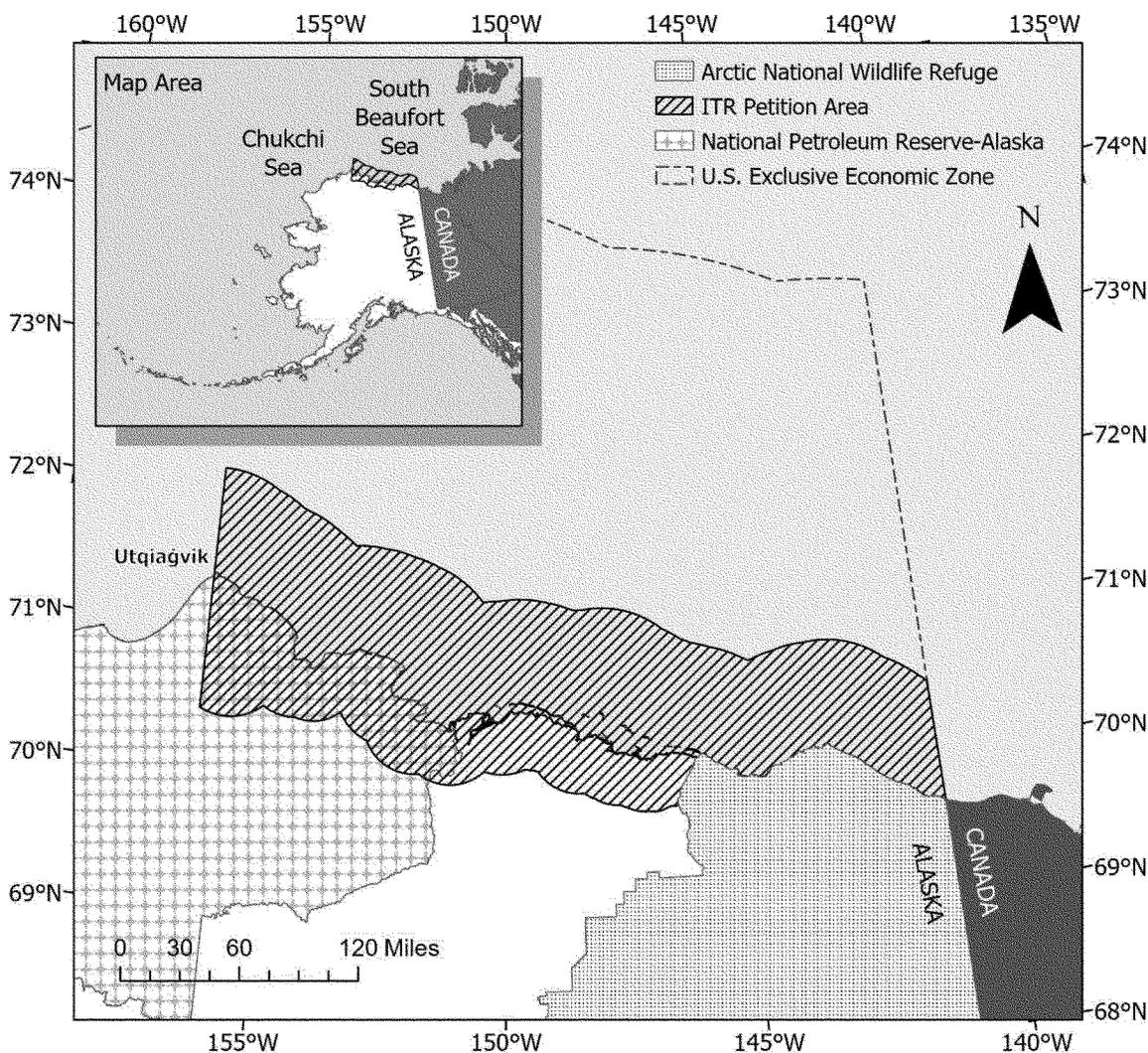


Figure 1—Map of the Beaufort Sea ITR region.

Description of Specified Activities

This section first summarizes the type and scale of Industry activities proposed to occur in the Beaufort Sea ITR region from 2021 to 2026 and then provides more detailed specific information on these activities. Year-round onshore and offshore Industry activities are anticipated. During the 5 years that the proposed ITR would be in place, Industry activities are expected to be generally similar in type, timing, and effect to activities evaluated under the prior ITRs. Due to the large number of variables affecting Industry activities, prediction of exact dates and locations of activities is not possible in a request for a five-year ITR. However, operators must provide specific dates and locations of proposed activities in their requests for LOAs. Requests for LOAs for activities and impacts that exceed the scope of analysis and

determinations for this proposed ITR will not be issued. Additional information is available in the AOGA Request for an ITR at: www.regulations.gov in Docket No. FWS-R7-ES-2021-0037.

Exploration Activities

AOGA's request includes exploration activities specified in the Request are for the purpose of exploring subsurface geology, water depths, and seafloor conditions to help inform development and production projects may occur in those areas. Exploration survey activities include geotechnical site investigations, reflection seismic exploration, vibroseis, vertical seismic profiles, seafloor imagery collection, and offshore bathymetry collection. Exploratory drilling and development activities include onshore ice pad and road development, onshore gravel pad and road development, offshore ice road

development, and artificial island development.

The location of new exploration activities within the specified geographic region of this proposed rule will be influenced by the location of current leases as well as any new leases acquired via potential future Federal and State of Alaska oil and gas lease sales.

BOEM Outer Continental Shelf Lease Sales

BOEM manages oil and gas leases in the Alaska Outer Continental Shelf (OCS) region, which encompasses 242 million ha (600 million ac). Of that acreage, approximately 26 million ha (~65 million ac) are within the Beaufort Sea Planning Area. Ten lease sales have been held in this area since 1979, resulting in 147 active leases, where 32 exploratory wells were drilled. Production has occurred on one joint

Federal/State unit, with Federal oil production accounting for more than 28.7 million barrels (bbl) (1 bbl = 42 U.S. gallons or 159 liters) of oil since 2001 (BOEM 2016). Details regarding availability of future leases, locations, and acreages are not yet available, but exploration of the OCS may continue during the 2021–2016 timeframe of the proposed ITR. Lease Sale 242, previously planned in the Beaufort Sea during 2017 (BOEM 2012), was cancelled in 2015. BOEM issued a notice of intent to prepare an environmental impact statement (EIS) for the 2019 Beaufort Sea lease sale in 2018 (83 FR 57749, November 16, 2018). While the 2019–2024 Draft Proposed Program included three OCS lease sales, with one each in 2019, 2021, and 2023, but has not been approved. Information on the Alaska OCS Leasing Program can be found at: <https://www.boem.gov/about-boem/alaska-leasing-office>.

National Petroleum Reserve—Alaska

The BLM manages the 9.2 million ha (22.8 million ac) Natural Petroleum Reserve—Alaska (NPR–A), of which 1.3 million ha (3.2 million ac) occur within the Beaufort Sea ITR region. Lease sales have occurred regularly in the NPR–A; 15 oil and gas lease sales have been held in the NPR–A since 1999. There are currently 215 leases covering more than 607,028 ha (1.5 million ac) in the NPR–A. Current operator/ownership information is available on the BLM NPR–A website at <https://www.blm.gov/programs/energy-and-minerals/oil-and-gas/leasing/regional-lease-sales/alaska>.

State of Alaska Lease Sales

The State of Alaska Department of Natural Resources (ADNR), Oil and Gas Division, holds annual lease sales of State lands available for oil and gas development. Lease sales are organized by planning area. Under area-wide leasing, the State offers all available State acreage not currently under lease within each area annually. AOGA's Request includes activities in the State's North Slope and Beaufort Sea planning areas. Lease sale data are available on the ADNR website at: <https://dog.dnr.alaska.gov/Services/BIFAndLeaseSale>. Projected activities may include exploration, facility maintenance and construction, and operation activities.

The North Slope planning area has 1,225 tracts that lie between the NPR–A and the ANWR. The southern boundary of the North Slope sale area is the Umiat baseline. Several lease sales have been held to date in this leasing area. As of May 2020, there are 1,505 active leases on the North Slope,

encompassing 1.13 ha (2.8 million ac), and 220 active leases in the State waters of the Beaufort Sea, encompassing 244,760 ha (604,816 ac). The Beaufort Sea Planning Area encompasses a gross area of approximately 687,966 ha (1.7 million ac) divided into 572 tracts ranging in size from 210 to 2,330 ha (520 to 5,760 ac).

Development Activities

Industry operations during oil and gas development may include construction of roads, pipelines, waterlines, gravel pads, work camps (personnel, dining, lodging, and maintenance facilities), water production and wastewater treatment facilities, runways, and other support infrastructure. Activities associated with the development phase include transportation activities (automobile, airplane, and helicopter); installation of electronic equipment; well drilling; drill rig transport; personnel support; and demobilization, restoration, and remediation work. Industry development activities are often planned or coordinated by unit. A unit is composed of a group of leases covering all or part of an accumulation of oil and/or gas. Alaska's North Slope oil and gas field primary units include: Duck Island Unit (Endicott), Kuparuk River Unit, Milne Point Unit, Nikaitchuq Unit, Northstar Unit, Point Thomson Unit, Prudhoe Bay Unit, Badami Unit, Oooguruk Unit, Bear Tooth Unit, Pikka Unit, and the Colville River and Greater Mooses Tooth Units, which for the purposes of this ITR are combined into the Western North Slope.

Production Activities

North Slope production facilities occur between the oilfields of the Alpine Unit in the west to Badami and Point Thomson in the east. Production activities include building operations, oil production, oil transport, facilities, maintenance and upgrades, restoration, and remediation. Production activities are long-term and year-round activities whereas exploration and development activities are usually temporary and seasonal. Alpine and Badami are not connected to the road system and must be accessed by airstrips, barges, and seasonal ice roads. Transportation on the North Slope is by automobile, airplanes, helicopters, boats, vehicles with large, low-pressure tires called Rolligons, tracked vehicles, and snowmobiles. Aircraft, both fixed wing and helicopters, are used for movement of personnel, mail, rush-cargo, and perishable items. Most equipment and materials are transported to the North Slope by truck or barge. Much of the

barge traffic during the open-water season unloads from West Dock.

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

Oil and Gas Support Activities

In addition to oil and gas production and development activities, support activities are often performed on an occasional, seasonal, or daily basis. Support activities streamline and provide direct assistance to other activities and are necessary for Industry working across the North Slope and related areas. Several support activities are defined in AOGA's request and include: Placement and maintenance of gravel pads, roads, and pipelines; supply operations that use trucks or buses, aircraft (fixed-wing or rotor-wing), hovercrafts, and barges/tugs to transport people, personal incidentals (food, mail, cargo, perishables, and personal items) between Units and facilities; pipeline inspections, maintenance dredging and scribing operations; and training for emergency response and oil spill response. Some of these activities are seasonal and performed in the winter using tundra-appropriate vehicles, such as road, pad, and pipeline development and inspections. Field and camp-specific support activities include: Construction of snow fences; corrosion and subsidence control and management; field maintenance campaigns; drilling; well work/work-overs; plugging and abandonment of existing wells; waste handling (oil field wastes or camp wastes); camp operations (housekeeping, billeting, dining, medical services); support infrastructure (warehousing and supplies, shipping and receiving, road and pad maintenance, surveying, inspection, mechanical shops, aircraft support and maintenance); emergency response services and trainings; construction within existing fields to support oil field infrastructure and crude oil extraction; and transportation services by a variety of vehicles. Additional details on each of these support activities can be found in AOGA's request.

Specific Ongoing and Planned Activities at Existing Oil and Gas Facilities for 2021–2026

During the proposed regulatory period, exploration and development activities are anticipated to occur in the offshore and continue in the current oil field units, including those projects identified by Industry, below.

Badami Unit

The Badami oilfield resides between the Point Thomson Unit and the Prudhoe Bay Unit, approximately 56 km (35 mi) east of Prudhoe Bay. No permanent road connections exist from Badami to other Units, such as Prudhoe Bay or the Dalton Highway. The Badami Unit consists of approximately 34 ha (85 ac) of tundra, including approximately 9.7 km (6 mi) of established industrial duty roads connecting all infrastructure, 56 km (35 mi) of pipeline, one gravel mine site, and two gravel pads with a total of 10 wells. The oilfield consists of the following infrastructure and facilities: A central processing facility (CPF) pad, a storage pad, the Badami airstrip pad, the Badami barge landing, and a 40.2-km (25-mi)-pipeline that connects to Endicott.

During the summer, equipment and supplies are transported to Badami by contract aircraft from Merrill Field in Anchorage or by barge from the West Dock in Prudhoe Bay. During winter drilling activities, a tundra ice road is constructed near the Badami/Endicott Pipeline to tie-in to the Badami Central Production Facility pad. This winter tundra ice road is the only land connection to the Dalton Highway and the Badami Unit. Light passenger trucks, dump trucks, vacuum trucks, tractor trailers, fuel trucks, and heavy equipment (*e.g.*, large drill rigs, well simulation equipment) travel on this road during the winter season. This road also opens as an ADNRR-permitted trail during off-years where Tuckers (a brand of tracked vehicle) or tracked Steigers (a brand of tractor) use it with sleds and snow machines. Activities related to this opening would be limited to necessary resupply and routine valve station maintenance along the oil sales pipeline corridor.

Flights from Anchorage land at Badami Airfield (N70.13747, W147.0304) for a total of 32 flight legs monthly. Additionally, Badami transports personnel and equipment from Deadhorse to Badami Airfield. Approximately 24 cargo flights land at Badami Airfield annually depending on Unit activities and urgency. Badami also conducts aerial pipeline inspections. These flights are typically flown by

smaller, charter aircrafts at a minimum altitude of 305 m (1,000 ft) at ground level.

Tundra travel at Badami takes place during both the summer and winter season. Rolligons and Tuckers (off-road vehicles) are used during the summer for cargo and resupply activities but may also be used to access any pipelines and valve pads that are not located adjacent to the gravel roads. During periods of 24-hour sunlight, these vehicles may operate at any hour. Similar off-road vehicles are used during the winter season for maintenance and inspections. Temporary ice roads and ice pads may be built for the movement of heavy equipment to areas that are otherwise inaccessible for crucial maintenance and drilling. Ice road construction typically occurs in December or January; however, aside from the previously mentioned road connecting Badami to the Dalton Highway, ice roads are not routinely built for Badami. Roads are only built on an as-needed basis based on specific projects. Other activities performed during the winter season include pipeline inspections, culvert work, pigging, ground surveillance, geotechnical investigations, vertical support member (VSM) leveling, reconnaissance routes (along snow machine trails), and potentially spill response exercises. Road vehicles used include pickup trucks, vacuum trucks, loaders, box vans, excavators, and hot water trucks. Standard off-road vehicles include, but are not limited to, Tuckers, Rolligons, and snow machines.

On occasion, crew boats, landing craft, and barges may transport personnel and equipment from West Dock to Badami from July through September, pending the open-water window. Tugs and barges may also be used depending on operational needs. These trips typically go from Badami to other coastal Units, including Endicott and Point Thomson.

Badami performs emergency response and oil spill trainings during both open-water and ice-cover seasons. Smaller vessels (*i.e.*, zodiacs, aluminum work boats, air boats, and bay-class boats) typically participate in these exercises. Future classes may utilize other additional equipment or vessels as needed.

Currently, 10 wells have been drilled across the lifespan of the Badami Unit. Repair and maintenance activities on pipelines, culverts, ice roads, and pads are routine within the Badami Unit and occur year-round. Badami's current operator has received a permit from the U.S. Army Corps of Engineers to permit a new gravel pad (4.04 ha [10 ac])

located east of the Badami Barge Landing and a new gravel pit. This new pad would allow the drilling of seven more deployment wells at Badami. All new wells would be tied back to the CPF.

Duck Island Unit (Endicott)

Historically called the Endicott Oilfield, the Duck Island Unit is located approximately 16 km (10 mi) northeast of Prudhoe Bay. Currently, Hilcorp Alaska, LLC operates the oilfield. Endicott is the first offshore oilfield to continuously produce oil in the Arctic area of the United States and includes a variety of facilities, infrastructure, and islands. Endicott consists of 210 ha (522 ac) of land, 24 km (15 mi) of roads, 43 km (24 mi) of pipelines, two pads, and no gravel mine sites. The operations center and the processing center are situated on the 24-ha (58-ac) Main Production Island (MPI). To date, 113 wells have been drilled in efforts to develop the field, of which 73 still operate. Additionally, two satellite fields (Eider and Sag Delta North) are drilled from the Endicott MPI. Regular activities at Endicott consist of production and routine repair on the Endicott Sales Oil Pipeline, culverts, bridges, and bench bags. A significant repair on a bridge called the "Big Skookum" is expected to occur during the duration of this proposed ITR.

Endicott's facilities are connected by gravel roads and are accessible through the Dalton Highway year-round via a variety of vehicles (pickup trucks, vacuum trucks, loaders, box vans, excavators, hot water trucks). Required equipment and supplies are brought in first from Anchorage and Fairbanks, through Deadhorse, and then into Endicott. Traffic is substantial, with heavy traffic on routes between processing facilities and camps. Conversely, drill site access routes experience much less traffic with standard visits occurring twice daily (within a 24-hour period). Traffic at drill sites increases during active drilling, maintenance, or other related projects and tends to subside during normal operations. Hilcorp uses a variety of vehicles on these roads, including light passenger trucks, heavy tractor-trailer trucks, heavy equipment, and very large drill rigs. Ice roads are only built on an as-needed basis for specific projects.

Air travel via helicopter from an established pad on Endicott to Deadhorse Airport is necessary only if the access bridges are washed out (typically mid to late May to the start of June). During such instances, approximately 20–30 crew flights would occur along with cargo flights about

once a week. Hilcorp also performs maternal polar bear den surveys via aircraft.

Hilcorp performs tundra travel work during the winter season (December–May; based on the tundra opening dates). Activities involving summer tundra travel are not routine, and pipeline inspections can be performed using established roads. During the winter season, off-road vehicles (e.g., Tuckers, snow machines, or tracked utility vehicles called Argo centaurs) perform maintenance, pipeline inspections, culvert work, pigging, ground surveillance, VSM leveling, reconnaissance routes (snow machine trails), spill response exercises, and geotechnical investigations across Endicott.

Tugs and barges are used to transport fuel and cargo between Endicott, West Dock, Milne, and Northstar during the July to September period (pending the open-water period). Trips have been as many as over 80 or as few as 3 annually depending on the needs in the Unit, and since 2012, the number of trips between these fields has ranged from 6 to 30. However, a tug and barge have been historically used once a year to transport workover rigs between West Dock, Endicott, and Northstar. Endicott performs emergency response and oil spill trainings during both the open-water and ice-covered seasons. Smaller vessels (i.e., zodiacs, Kiwi Noreens, bay-class boats) participate in these exercises; however, future classes may utilize other additional equipment or vessels (e.g., the ARKTOS amphibious emergency escape vehicle) as needed. ARKTOS training will not be conducted during the summer.

Kuparuk River Unit

ConocoPhillips Alaska, Inc. operates facilities in the Kuparuk River Unit. This Unit is composed of several additional satellite oilfields (Tarn, Palm, Tabasco, West Sak, and Meltwater) containing 49 producing drill sites. Collectively, the Greater Kuparuk Area consists of approximately 1,013 ha (2,504 ac) made up of 209 km (130 mi) of gravel roads, 206 km (128 mi) of pipelines, 4 gravel mine sites, and over 73 gravel pads. A maximum of 1,200 personnel can be accommodated at the Kuparuk Operations Center and the Kuparuk Construction Camp. The camps at the Kuparuk Industrial Center are used to accommodate overflow personnel.

Kuparuk's facilities are all connected by gravel road and are accessible from the Dalton Highway year-round. ConocoPhillips utilizes a variety of vehicles on these roads, including light

passenger trucks, heavy tractor-trailer trucks, heavy equipment, and very large drill rigs. Required equipment and supplies are flown in through Deadhorse and then transported via vehicle into the Kuparuk River Unit. Traffic has been noted to be substantial, with specific arterial routes between processing facilities and camps experiencing the heaviest use. Conversely, drill site access routes experience much less traffic with standard visits to drill sites occurring at least twice daily (within a 24-hour period). Traffic at drill sites increases during drilling activities, maintenance, or other related projects and tends to subside during normal operations.

The Kuparuk River Unit uses its own private runway (Kuparuk Airstrip; N70.330708, W149.597688). Crew and personnel are transported to Kuparuk on an average of two flights per day. Flights arrive into Kuparuk only on the weekdays (Monday through Friday). Year round, approximately 34 flights per week transport crew and personnel between Kuparuk and Alpine Airport. ConocoPhillips plans to replace the passenger flights from Alpine to Kuparuk in 2021 with direct flights to both Alpine and Kuparuk from Anchorage. These flights are expected to occur five times weekly and will replace the weekly flights from Alpine to Kuparuk. Cargo is also flown into Kuparuk on personnel flights. The single exception would be for special and specific flights when the Spine road is blocked. Occasionally, a helicopter will be used to transport personnel and equipment within the Kuparuk River Unit. These flights generally occur between mid-May and mid-September and account for an estimated 50 landings annually in Kuparuk. The location and duration of these flights are variable, and helicopters could land at the Kuparuk Airstrip or remote locations on the tundra. However, only 4 of the estimated 50 landings are within 3.2 km (5 mi) of the coast.

ConocoPhillips flies surveys of remote sections of the Kuparuk crude pipeline one to two times weekly during summer months as well as during winter months when there is reduced visibility from snow cover. During winter months, maternal den surveys are also performed using aircraft with mounted AIR cameras. Off-road vehicles (such as Rolligons and Tuckers) are used for maintenance and inspection of pipelines and power poles that are not located adjacent to the gravel roads. These vehicles operate near the road (152 m [500 ft]) and may operate for 24 hours a day during summer months. During winter months, temporary ice

roads and pads are built to move heavy equipment to areas that may be inaccessible. Winter tundra travel distances average approximately 1,931 km (1,200 mi) with ice roads averaging approximately 17.7 km (11 mi) and may occur at any hour of the day. Dredging and screeding occur annually to the extent necessary for safety, continuation of seawater flow, and dock stability at the Kuparuk saltwater treatment plant intake and at Oliktok dock. Dredging occurs within a 1.5-ha (3.7-ac) area, and screeding occurs within a 1-ha (2.5-ac) area. Operations are conducted during the open-water season (May to October annually). Removed material from screeding and dredging is deposited in upland areas above the high tide, such as along the Oliktok causeway and saltwater treatment plant (STP) pad. ConocoPhillips removes approximately 0.6 to 1.1 m (2 to 3.5 ft) of sediment per year. Dredging activities typically last for 21 days, and screeding activities typically last 12 days annually. Boats are also used to perform routine maintenance as needed on the STP outfalls and inlets. ConocoPhillips infrequently has marine vessel traffic at the Oliktok Dock.

ConocoPhillips performs emergency response and oil spill trainings during both open-water and ice-cover seasons. Smaller vessels (i.e., zodiacs, aluminum work boats, air boats, and bay-class boats) typically participate in these exercises. Future classes may utilize other additional equipment or vessels as needed.

The Willow Development Project, which is described in full in *Planned Activities at New Oil and Gas Facilities for 2021–2026*, would lead to increased activity through the Kuparuk River Unit. Prefabricated modules would be transported through the Unit. Module transportation involves an increase in road, aircraft, and vessel traffic resulting in the need for gravel road and gravel pad modifications, ice road and ice pad construction, and sea floor screeding. During the 2023 summer season, gravel hauling and placement to modify existing roads and pads used in support of the Willow Development would take place. An existing 12-acre gravel pad located 13.2 km (2 mi) south of the Oliktok Dock would require the addition of 33,411 cubic m (43,700 cubic yd) of gravel, increasing pad thickness to support the weight of the modules during staging. However, this addition of gravel would not impact the current footprint of the pad. Additionally, ConocoPhillips plans to widen six road curves and add four 0.2-ha (0.5-ac) pullouts between the Oliktok Dock and Drill Site 2P as well as

increase the thickness of the 3.2-km (2-mi) gravel road from the Oliktok Dock to the staging pad—requiring approximately 30,811 cubic m (40,300 yd) of gravel and resulting in an increase in footprint of the gravel road by <0.4 ha (<0.1 ac). Twelve culverts are estimated to be extended within this part of the gravel road to accommodate the additional thickness (approximately five culverts per mile). This would yield a new gravel footprint with an additional 2 ha (5.0 ac) and 90,752 cubic m (118,700 cubic yd). In 2025, a 6.1-ha (15-ac) ice pad, for camp placement, and an ice road for module transportation, would be constructed in association with the Willow Project. The planned location is near Drill Site 2P, over 32.2 km (20 mi) away from the coastline.

An increase in road traffic to Kuparuk is expected to begin in 2023 and continue into the summer of 2026. Activities would mostly consist of the transportation of freight, equipment, and support crews between Oliktok Point, the Kuparuk Airport, and the NPR–A. The number of weekly flights will also increase with an average of 6 additional weekly flights in 2023, 4 additional flights per week in 2024, 14 additional flights per week in 2025, and 4 additional flights per week in 2026. Eight barges would deliver the prefabricated modules and bulk material to Oliktok Dock using existing and regularly used marine transportation routes in the summer of 2024 and 2026.

Due to the current depths of water at the Oliktok Dock (2.4 m [8 ft]), lightering barges (barges that transfer cargo between vessels to reduce a vessel's draft) would be used to support the delivery of large modules to the Dock. The location of the lightering transfer would be approximately 3.7 km (2.3 mi) north of Oliktok Dock in 3.05 m (10 ft) of water. Screeding operations would occur during the summer open-water season 2022–2024 and 2026 starting mid-July and take approximately one week to complete. The activities would impact an area of 3.9 ha (9.6 ac) and an additional hectare (2.5 ac) in front of the Oliktok Dock to facilitate the unloading of the lightering barges. Bathymetry measurements would be taken after to confirm the appropriate conditions of the screeded seafloor surface.

Milne Point Unit

The Milne Point Unit is located 56 km (35 mi) northwest of Prudhoe Bay, producing from three main pools, including Kuparuk, Schrader Bluff, and Sag River. The total development area of Milne Point is 182 ha (450 ac), including 80 ha (198 ac) of 14 gravel

pads, 54 km (33 mi) of gravel roads and mines, 161 km (100 mi) of pipelines, and over 330 wells.

Milne Point's facilities are connected by gravel roads and are accessible by the Dalton Highway year-round via a variety of vehicles (pickup trucks, vacuum trucks, loaders, box vans, excavators, hot water trucks). Required equipment and supplies are brought in first from Anchorage and Fairbanks, through Deadhorse, and then into the Milne Point Unit. Arterial roads between processing facilities and camps experience heavy traffic use. Conversely, drill site access routes experience much less traffic, with standard visits to drill sites occurring twice daily (within a 24-hour period). Traffic at drill sites increases during drilling activities, maintenance, or other related projects and tends to subside during normal operations. Industry uses a variety of vehicles on these roads, including light passenger trucks, heavy tractor-trailer trucks, heavy equipment, and very large drill rigs.

Air travel via helicopter from an established pad (N70.453268, W149.447530) to Deadhorse Airport is necessary only if the access bridges are washed out (typically mid to late May to the start of June). During such instances, approximately 20–30 crew flights would occur, along with cargo flights, about once a week. Hilcorp also performs maternal polar bear den surveys via aircraft.

Hilcorp uses off-road vehicles (Rolligons and Tuckers) for tundra travel during summer months to access any pipelines and power poles not found adjacent to the gravel roads. During the winter seasons, temporary ice roads and ice pads are built as needed across the Unit to move heavy equipment to areas otherwise inaccessible. Hilcorp also uses their off-road vehicles (Tuckers, snow machines, and Argo centaurs) during the winter to perform maintenance and inspections. Additionally, road vehicles (pickup trucks, vacuum trucks, loaders, box vans, excavators, and hot water trucks) are used to perform pipeline inspections, culvert work, pigging, ground surveillance, VSM leveling, reconnaissance routes (snow machine trails), potential spill response exercises, and geotechnical investigations.

There are 14 pads and 2 gravel mine sites within the Milne Point Unit. Twenty-eight new wells are expected to be drilled over the next 7 years. Repair activities are routine at Milne Point and occur on pipelines, culverts, ice roads, and pads. Hilcorp also has plans to continue development on Milne Point

and will be running two to three more drilling rigs over the next 5 years—requiring several pad expansions to support them. Hilcorp plans to expand six pads, including: S Pad (4.5 ha [11 ac]), I Pad (0.81 ha [2 ac]), L Pad (0.81 ha [2 ac]), Moose Pad (0.81 ha [2 ac]), B Pad (2.1 ha [5.3 ac]), and E Pad (0.4 ha [1 ac]). Additionally, Hilcorp's proposed Raven Pad is projected to be built in 2021 between the L and F Pads. This pad will be 12.1 ha (30 ac) and contain various facilities, pipelines, ties, a new pipeline/VSM along existing routes connecting F Pad to CFP and 45 wells.

Hilcorp is also planning to drill at least 28 new wells with a potential for more over the period of the proposed ITR. New facilities will be installed for polymer injections, flowlines for new wells, pipelines, camps, tanks, and main facility improvements. This will require the development of new gravel pits for mining. Some of the new facilities planned to be built include: Upgrades to Moose pad; F Pad Polymer facility installation and startup; 2020 shutdown for A-Train process vessel inspections and upgrades; LM2500 turbine overhaul completion; Raven Pad design and civil work; S Pad facility future expansion; S Pad polymer engineering and procurement; diesel to slop oil tank conversion; and I Pad redevelopment. Repair activities will be routinely performed on pipelines, culverts, ice roads, and pads. Power generation and infrastructure at L Pad and polymer injection facilities are also planned on Moose Pad, F Pad, J Pad, and L Pad.

Hilcorp plans to expand the size of the Milne mine site up to 9 ha (22.37 ac). Approximately 6.3 ha (15.15 ac) will be mined for gravel. Overburden store will require about 1 ha (2.5 ac) and will be surrounded by a 1.3-ha (3.4-ac) buffer. Around 0.5 ha (1.32 ac) will be used to expand the Dalton Highway. The Ugnu Mine Site E, located approximately 8 km (5 mi) southeast of Oliktok Point and 3.2 km (2 mi) south of Simpson Lagoon, will also be expanded during the 2021–2026 proposed ITR. Hilcorp's planned expansion for the new cell is approximately 259 m long by 274 m wide (850 ft long by 900 ft wide) or 7.1 ha (17.56 ac). This would produce an estimated 434,267 cubic m (568,000 cubic yd) of overburden including a 20 percent swell factor, and approximately 764,554 cubic m (1,000,000 cubic yd) of gravel. The footprint of the Phase I Material Site is expected to be 6.5 ha (16 ac). Overburden storage, a thermal barrier, and access road would require approximately 4.2 ha (10.3 ac). The final

site layout will be dependent on gravel needs.

Marine vessels (specifically crew boats) are used to transport workers from West Dock to Milne Point if bridges are washed out. Additionally, vessels (tugs/barges) are used to transport fuel and cargo between Endicott, West Dock, Milne Point, and Northstar from July to September. While the frequency of these trips is dependent on operational needs in a given year, they are typically sparse. Hilcorp performs several emergency response and oil spill trainings throughout the year during both the open-water and ice-covered season. Smaller vessels (*i.e.*, zodiacs, Kiwi Noreens, bay-class boats) typically participate in these exercises; however, future classes may utilize other additional equipment or vessels (*e.g.*, the ARKTOS amphibious emergency escape vehicle) as needed. ARKTOS training will not be conducted during the summer, though Hilcorp notes that some variation in activities and equipment can be expected.

Nikaitchuq Unit

Eni U.S. Operating Co., Inc., is the 100 percent working interest owner and operator of the Nikaitchuq Unit. The Nikaitchuq Unit includes the following infrastructure: Oliktok Production Pad (OPP), Spy Island Drill site (SID), Nikaitchuq Operations Center (NOC), a subsea pipeline bundle, an onshore crude oil transmission pipeline (COTP), and an onshore pad that ties into the Kuparuk Pipeline (known as KPP). Currently, the SID includes 19 production wells, one exploration well on a Federal offshore lease, 14 injection wells, one Class-1 disposal well, and two shallow water wells. The OPP includes 12 production wells, eight injection wells, three source water wells, one Class-1 disposal well, and two shallow water wells.

Road access in the Nikaichuq Unit for the OPP, NOC, and KPP are through connected gravel roads from the Dalton Highway year-round and maintained by Kuparuk. Equipment and cargo are brought in from Anchorage and Fairbanks after a stopover in Deadhorse. Traffic levels vary depending on ongoing activities but do not change significantly with time of year.

Crew and cargo are primarily transported using commercial flights to Deadhorse and then by vehicle. A helicopter may be used for transportation of personnel, the delivery and movement of supplies and equipment from Deadhorse when the Kuparuk Bridge is unavailable, or in the event of a medical emergency; however,

these flights are infrequent. Eni utilizes off-road vehicles (Rolligons and other track vehicles) for both the summer and winter seasons for tundra travel; however, tundra travel is infrequent. Primarily, these activities would occur when access to the COTP between OPP and KPP is being inspected or under maintenance. Eni utilizes off-road vehicles during winter to conduct maintenance and inspections on COTP and to transport personnel, equipment, and supplies between the OPP and SID during periods where a sea ice road between the two locations is being constructed. Until the sea ice road is completed, vehicles travel by a single snow trail (approximately 6.8 km [4.25 mi]).

Two to three ice roads are constructed within the Nikaichuq Unit annually. These ice roads are typically around 6.8 km (4.25 mi) long and 18.3 m (60 ft) wide. Traffic occurs at all hours, consisting of a variety of light vehicles, such as pickup trucks and SUVs, high-capacity personnel transport vehicles (busses), ice road construction equipment (road graders, water tankers, snow blowers, front end loaders, and dump trucks), vacuum trucks, and tractor trailers. To build the sea ice road, Eni harvests ice chips from Lake K-304 after constructing a 0.3-km (0.2-mi) long, 9.1-m (30-ft) wide tundra ice road. In the past, a short tundra ice road was also constructed and used to access a lake to obtain water for maintenance of a sea ice road, and such an ice road may be used in the future.

Maintenance activities, such as gravel and gravel bag placement along the subsea pipeline, may occur as needed. Routine screeding is generally performed near barge landings at OPP and SID. Dredging is also possible in this area, although not likely. Hovercrafts are used to transport both cargo and personnel year round but generally occur daily between Oliktok Point and SID during October through January and May through July. Crew boats with passengers, tugs, and barges are used to transport cargo from Oliktok Point to the SID daily during open-water months (July through September) as needed. Eni also performs emergency response and oil spill trainings during both open-water and ice seasons.

Northstar Unit

The Northstar Unit is made up of a 15,360-ha (38,400-ac) reservoir, and Hilcorp Alaska, Inc. currently operates it. Northstar is an artificial island located approximately 6 km (4 mi) northwest of Point McIntyer and 10 km (6 mi) from Prudhoe Bay. The water depth surrounding the island is

approximately 11.9 m (39 ft) deep. Thirty wells have been drilled to develop Northstar, of which 23 are still operable. A buried subsea pipeline (58 km [36 mi] long) connects the facilities from Northstar to the Prudhoe Bay oilfield. Access to the island is through helicopter, hovercraft, boat, tucker, and vehicle (only during the winter ice road season). Routine activities include maintenance and bench/block repairs on culvert, road, and pipelines.

There are no established roads on Northstar Island. Loaders, cranes, and a telescopic material handler are used to move cargo and equipment. Hilcorp exclusively uses helicopter for all aircraft operations around the Northstar Unit, with an estimated 800 landings per year. Crew and cargo flights travel daily from May to January to Northstar Island from Deadhorse Airport. Sling-loading equipment and supplies may also occur from May through December. Pipeline inspections via aircraft are performed once weekly—generally with no landings. However, once per quarter, the helicopter lands to inspect the end of the pipeline where it enters the water (N70.404220, W148.692130).

Only winter tundra travel occurs at Northstar. Hilcorp typically builds several unimproved ice trails to Northstar, including a trail along the pipeline corridor from the valve pad near the Dew Line site to Northstar (9.5 km [5.93 mi]); a trail from West Dock to the pipeline shore crossing, grounded ice along the coastline (7.8 km [4.82 mi]); two unimproved ice road paths from the hovercraft tent at the dockhead; one trail under the West Dock Causeway (WDC) bridge to well pad DH3 (1.4 km [0.86 mi]); and a trail around West Dock to intersect the main ice road north of the STP (4.6 km [2.85 mi]). Hilcorp may also construct any number of shorter trails into undisturbed areas to avoid unstable/unsafe areas throughout the ice season. These detours may be constructed after March 1st due to safety considerations and may deviate approximately 23–46 m (75–150 ft) from the original road or trail.

Hilcorp typically constructs an approximately 11.7-km (7.3-mi) long ice road each year between Northstar and Prudhoe Bay (specifically West Dock) to allow for the transportation of personnel, equipment, materials, and supplies. This ice road generally allows standard vehicles (sport-utility vehicles (SUVs), pickup trucks, buses, other trucks) to transport crew and equipment to and from the island; however, Hilcorp may elect to construct an ice trail that supports only light-weight

vehicles depending on operational needs and weather conditions.

During December or January before ice roads are built, Tucker tracked vehicles transport cargo and crew daily. During ice road construction, work will occur for 24 hours a day, 7 days a week, and is stopped only when unsafe conditions are presented (e.g., high winds, extremely low temperatures). Ice road construction typically begins around January 1st when the ice is considered thick enough (minimum of 61 cm [24 in]) and is typically completed within 45 days of the start date.

Once the ice road is built, tractor-trailer trucks transport freight, chemicals for resupplies (occurs every 2 weeks using 10 truckloads), diesel, and other equipment. Additional personnel and smaller freight travel multiple times a day in light passenger traffic buses and pickup trucks. A grader and snow blower maintain the ice road daily, and in the event of cracks in the ice road, a loader may be used. Tucker tracked vehicles and hovercraft are used beginning mid-May as ice becomes unstable, then, as weather warms, boats and helicopters are used. Hilcorp uses hovercraft daily between West Dock and Northstar Island to transport crew and cargo (October through January and May through July) when broken-ice conditions are present. Crew boats have also been used to carry crew and cargo daily from West Dock to Northstar Island during open-water months (July to September) when hovercraft are not in use. Tugs and barges transport fuel and cargo from West Dock and Endicott to Northstar Island during the open-water season (July through September) and may be used once a year to transport workover rigs. There are typically between 6–30 trips per year.

Northstar performs emergency response and oil spill trainings during both open-water and ice-cover seasons. Smaller vessels (i.e., zodiacs, aluminum work boats, air boats, and bay-class boats) typically participate in these exercises. Future classes may utilize other additional equipment or vessels (e.g., the ARKTOS amphibious emergency escape vehicle) as needed. However, the ARKTOS training will not be conducted during the summer.

Oooguruk Unit

The Oooguruk Unit was originally developed in 2008 and is operated by Eni, consisting of several developments and facilities including the Oooguruk Drill site (ODS), a 13-km (8.1-mi) long pipeline bundle, and the Oooguruk Tie-in Pad (OTP). The OTP is an onshore production facility that consists of

tanks, flowlines, support infrastructure, and power generation facilities. The pipeline bundle consists of two oil pipelines, a 30.5-cm (12-in) inner diameter production flowline, and a 5.1-cm (2-in) inner diameter diesel/base oil flowline. The bundle sits about 61 m (200 ft) from the shoreline when onshore and runs about 3.8 km (2.4 mi) on vertical supports to the OTP. A 30.5-cm (12-in) product sales line enters a metering skid on the southeast side of the OTP. This metering skid represents the point where the custody of the oil is transferred to ConocoPhillips Alaska, Inc. Diesel fuels and base oil are stored at the OTP to resupply the ODS as needed.

The ODS is a manmade island located approximately 9.2 km (5.7 mi) offshore and measuring approximately 5.7 ha (14 ac) and is found approximately 12.9 km (8 mi) northwest of the OTP. The site includes living quarters with 150 beds, a helicopter landing site, various production and injection wells, and a grind and inject facility. A Nabors rig is also located on the pad and the rig is currently not in use. The ocean surrounding the island is about 3.05 m (10 ft) in depth and considered relatively shallow.

Oooguruk relies on interconnected gravel roads maintained by Kuparuk to gain access to the Dalton Highway throughout the year. Equipment and supplies travel from Anchorage and Fairbanks to the OTP through Deadhorse. The ODS is connected to the road system only when an ice road is developed and available from February to May.

Eni uses helicopters from May to January for cargo transport, which is limited to flights between the OTP and the ODS. Work personnel depart from the Nikaitchuq Unit's NOC pad; Eni estimates about 700 flights occur during the helicopter season for both crew and field personnel.

Eni occasionally utilizes off-road vehicles (e.g., Rolligons and track vehicles) during the summer tundra months with activities limited to cleanup on ice roads or required maintenance of the pipeline bundle. During winter months, track vehicles transport personnel, equipment, and supplies between the OTP and ODS during the ice road construction period. The ice road is approximately 9.8-m (32-ft) wide, and traffic and activity are constant—most notably from light vehicles (pickup trucks, SUVs), high-capacity personnel transport (buses), ice road construction equipment (road graders, water tankers, snow blowers, front-end loaders, dump trucks), and well maintenance equipment (coil

tubing units, wire-line units, hot oil trucks). Eni estimates over 3,500 roundtrips occur annually.

Eni will add 2,294 cubic m (3,000 cubic yd) of gravel to facilitate a hovercraft landing zone on island east and will also conduct additional gravel maintenance at the “shoreline crossing” of the pipeline or the area where the pipeline transitions from the above-ground section to the subsea pipeline. Maintenance in these areas is necessary to replace gravel lost to erosion from ocean wave action. Additionally, Eni performs gravel placement on the subsea pipeline to offset strudel scour—pending the results of annual surveys. Island “armor” (i.e., gravel bags) requires maintenance throughout the year as well.

Eni utilizes some in-water vessel traffic to transport crew and cargo from Oliktok Point to the ODS during the open-water season (typically July to September). These trips occur daily (or less if hovercraft are used). Additionally, Eni uses tugs and barges to transport cargo from Oliktok Point to the ODS from July to September. These vessels make varying amounts of trips, from a few trips annually up to 50 trips depending on operational needs at the time.

Like the trainings performed at the Nikaitchuq Unit, Eni would also conduct emergency and oil spill response trainings throughout the proposed ITR period at various times. Trainings will be conducted during both open-water and ice-covered seasons with training exercises occurring on both the land and the water depending on current ice conditions. Further information on these trainings can be found on the submitted AOGA request for 2021–2026.

Point Thomson Unit

The Point Thomson Unit (PTU) is located approximately 32 km (20 mi) east of the Badami field and 96 km (60 mi) east of Deadhorse and is operated by ExxonMobil. The Unit includes the Point Thomson initial production system (IPS), Sourdough Wells, and legacy exploration sites (i.e. PTU 1–4, Alaska C–1, West Staines State 2 and 18–9–23). The total Point Thomson IPS area is approximately 91 ha (225 ac), including 12.4 km (7.7 mi) of gravel roads, 35 km (22 mi) of pipelines, one gravel mine site, and three gravel pads (Central, West, and C–1).

The Point Thomson IPS facilities are interconnected by gravel roads but are not connected to other oilfields or developments. Equipment and supplies are brought in via air, barge, ice road, or tundra travel primarily from Deadhorse.

Traffic on gravel roads within the PTU occurs daily with roads from Central Pad to the airstrip experiencing the heaviest use. This consistent heavy use is not influenced by time of year. Vehicle types include light passenger trucks/vans, heavy tractor-trailer trucks, and heavy equipment usage on pads, particularly for snow removal and dust control.

Personnel and most cargo are transported to Point Thomson using aircraft departing from Deadhorse. During normal operations, an average of two to four passenger flights per week land at the Point Thomson Airport. Typically, there are 12 cargo flights per year (or one per month) that may land at Point Thomson but frequency is reduced January to April when tundra is open. Aerial pipeline inspection surveys are conducted weekly, and environmental surveys and operations typically occur for 1 to 2 weeks each summer. The environmental surveys are generally performed at remediation sites such as West Staines State 2 and 18–9–23, areas of pipeline maintenance, and tundra travel routes.

Off-road vehicles (*e.g.*, Rolligons and track vehicles) are only during the summer tundra months for emergency purposes such as accessing the pipeline. During winter months, off-road vehicles provide access to spill response conexas, deliver cargo supplies from Deadhorse, and maintain and inspect the PTU. Tundra travel includes a route south of the pipeline from Deadhorse to Point Thomson, a route along the pipeline right-of-way (ROW), spur roads as needed between the southern route and the pipeline ROW, and a route to spill conexas totaling approximately 146.5 km (91 mi). Travel along these routes can occur at any time of day.

Temporary ice roads and pads near the Point Thomson Facility are built to move heavy equipment to areas otherwise inaccessible for maintenance and construction activities. Ice road and ice pad construction typically begins in December or January. An ice road to Point Thomson is typically needed in the event that a drilling rig needs to be mobilized and extends east from the Endicott Road, connects to the Badami facilities, and continues east along the coast to Point Thomson.

Barging usually occurs from mid-July through September. In the event additional barging operations are needed, dredging and screeding activities may occur to allow barges to dock at Point Thomson. If dredging and screeding activities are necessary, the work would take place during the open-water season and would last less than a week. ExxonMobil also performs

emergency response and oil spill trainings during the summer season. On occasion, spill response boats are used to transport operations and maintenance personnel to Badami for pipeline maintenance.

Expansion activities are expected to occur over 4 years and would consist of new facilities and new wells on the Central Pad to increase gas and condensate production. The Central Pad would require a minor expansion of only 2.8 ha (7 ac) to the southwest. Minor size increases on infield pipelines will also occur, but the facility footprint would not otherwise increase. To support this project, an annual ice road would be constructed, and summer barging activities would occur to transport a drilling rig, additional construction camps, field personnel, fuel, equipment, and other supplies or materials. Gravel would be sourced from an existing stockpile, supplemented by additional gravel volume that would be sourced offsite as necessary. Drilling of wells is expected to occur during the later years of construction, and new modular production facilities would be fabricated offsite and then delivered via sealift.

A small number of barge trips (<10 annually) are expected to deliver equipment, fuel, and supplies during the open-water season (mid-July through September) from Deadhorse and may occur at any time of day. Additional development activities are planned within PTU and are described in section *Alaska Liquefied Natural Gas Project (Alaska LNG)*.

Prudhoe Bay Unit

The Prudhoe Bay Unit (PBU) is the largest producing oilfield in North America and is operated by Hilcorp. The PBU includes satellite oilfields Aurora, Borealis, Midnight Sun, Polaris, and Orion. The total development area is approximately 1,778 ha (4,392 ac), including 450 km (280 mi) of gravel roads, 2,543 km (1,580 mi) of pipelines, 4 gravel mines, and over 113 gravel pads. Camp facilities such as the Prudhoe Bay Operations Center, Main Construction Camp, Base Operations Center, and Tarmac camp are also within the PBU.

PBU facilities are connected by gravel roads and can be accessed from the Dalton Highway year-round. Equipment and supplies are flown or transported over land from Anchorage and Fairbanks to Deadhorse before they are taken to the PBU over land. Traffic is constant across the PBU with arterial routes between processing facilities and camps experiencing the heaviest use while drill site access roads are traveled

far less except during active drilling, maintenance or other projects. Traffic is not influenced by the time of year. Vehicle types include light passenger trucks, heavy tractor-trailer trucks, heavy equipment, and very large drill rigs.

Personnel and cargo are transported to the PBU on regularly scheduled, commercial passenger flights through Deadhorse and then transported to camp assignments via bus. Pipeline surveys are flown every 7 days departing from CPAI's Alpine airstrip beginning the flight route at Pump Station 1 and covering a variety of routes in and around the Gathering Center 2, Flow Station 2, Central Compressor Pad, West Gas Injection, and East Sag facilities. Pipelines are also surveyed once per day from the road system using a truck-mounted forward-looking infrared camera system. Various environmental studies are also conducted using aircraft. Surveys include polar bear den detection and tundra rehabilitation and revegetation studies. Tundra environmental studies occur annually each summer in July and August with field personnel being transported to sites over an average of 4 days. Flights take off and return to Deadhorse airport, and field landings include seven tundra sites an average of 25.7 km (16 mi) from Deadhorse airport. Only four of the seven tundra landing sites are within 8 km (5 mi) of the Beaufort coast. Unmanned aerial systems (UAS) are used for subsidence, flare, stack, and facility inspections from June to September as well as annual flood surveillance in the spring. UAS depart and arrive at the same location and only fly over roads, pipeline ROWs, and/or within 1.6 km (1 mi) or line of sight of the pad.

Off-road vehicles (such as Rolligons and Tuckers) are used for maintenance and inspection activities during the summer to access pipelines and/or power poles that are not located adjacent to the gravel roads. These vehicles typically operate near the road (152 m [500 ft]) and may operate for 24 hours a day during summer months. During winter months, temporary ice roads and pads are built to move heavy equipment to areas that may be inaccessible. Winter tundra travel distances and cumulative ice road lengths average about 120.7 and 12.1 km (75 and 7.5 mi), respectively, and may occur at any hour of the day. An additional 0.8 ha (2 ac) of ice pads are constructed each winter.

West Dock is the primary marine gateway to the greater Prudhoe Bay area with users including Industry vessels, cargo ships, oil spill responders,

subsistence users, and to a lesser degree, public and commercial vessels. Routine annual maintenance dredging of the seafloor around the WDC occurs to maintain navigational access to DH2 and DH3 and to insure continued intake of seawater to the existing STP. Approximately 15,291 cubic m (20,000 cubic yd) of material is anticipated to be dredged over 56.6 ha (140 ac); however, up to the 172,024 cubic m (225,000 cubic yd) of material is authorized to be removed in a single year. All dredged material is placed as fill on the WDC for beach replenishment and erosion protection. Some sediments are moved but remain on the seafloor as part of the screeding process. Much of the dredging work takes place during the open-water season between May and October and will be completed in less than 30 working days. Annual installation and floats, moorings, and buoys begin at the beginning of the open-water season and are removed at the end of the open-water season. Up to three buoys may be installed to each side of the breach (up to six buoys total).

During the 2021–2022 winter tundra travel period, an additional 8-km (5-mi) ice road, 0.8-ha (2-ac) ice pad, up to 8-km (5-mi) pipeline, and pad space are expected to be constructed to support I-Pad expansion totaling 12.1 ha (30 ac) for the ice road and ice pad and 8.5 ha (21 ac) for the pad space, pipeline, and VSM footprints. Other pad expansions include approximately 0.8 ha (2 ac) per year 2021–2026 at DS3–DS0 and P-Pad.

Additionally, the construction of up to a 56.7-ha (140-ac) mine site is expected. Construction will occur on a need-based, phased approach over 40 years with no more than 24.3 ha (60 ac) of gravel developed by 2026. A 4.3-km (2.7-mi) long and 24.4-m (80-ft) wide gravel access road will also be built for a total impacted area of 10.5 ha (26 ac) over one year.

Trans-Alaska Pipeline System (TAPS)

TAPS is a 122-cm (48-in) diameter crude oil transportation pipeline system that extends 1,287 km (800 mi) from Pump Station 1 in Prudhoe Bay Oilfield to the Valdez Marine Terminal. The lands occupied by TAPS are State-owned, and the ROWs are leased through April 2034. Alyeska Pipeline Service Company operates the pipeline ROW. Approximately 37 km (23 mi) of pipeline are located within 40 km (25 mi) of the Beaufort Sea coastline. A 238-km (148-mi) natural gas line that extends from Pump Station 1 provides support for pipeline operations and facilities. The TAPS mainline pipe ROW includes a gravel work pad and drive lane that crosses the Dalton Highway

approximately 29 km (18 mi) south of Pump Station 1.

Travel primarily occurs along established rounds, four pipeline access roads, or along the pipeline ROW work pad. Ground-based surveillance on the TAPS ROW occurs once per week throughout the year. Equipment and supplies are transported via commercial carriers on the Dalton Highway. In the summer, travel is primarily restricted to the gravel work pad and access roads. There are occasional crossings of unvegetated gravel bars to repair remote flood control structures on the Sagavanirktok River. Transport of small-volume gravel material from the active river floodplain to the TAPS work pad may occur. Vehicles used during the summer include typical highway vehicles, maintenance equipment, and off-road trucks for gravel material transport. In the winter, travel occurs in similar areas compared to summer in addition to maintenance activities, such as subsurface pipeline excavations. Short (<0.4 km, <0.25 mi) temporary ice roads and ice pads are built to move heavy equipment when necessary. Vehicles used during the winter include off-road tracked vehicles so that snow plowing on the ROW is not required. The amount of traffic is generally not influenced by the time of year.

The Deadhorse Airport is the primary hub used for personnel transport and airfreight to TAPS facilities in the northern pipeline area. Commercial and charter flights are used for personnel transport, and crew change-outs generally occur every 2 weeks. Other aviation activities include pipeline surveillance, oil spill exercise/training/response, and seasonal hydrology observations. Aerial surveillance of the pipeline occurs once each week during daylight hours throughout the year. Approximately 50 hours per year are flown within 40 km (25 mi) of the Beaufort Sea coastline.

No TAPS-related in-water activities occur in the Beaufort Sea. Instead, these activities will be limited to the Sagavanirktok River and its tributaries. In-water construction and dredging may take place occasionally, and they are generally associated with flood control structures and repairs to culverts, low water crossings, and eroded work pads. Gravel mining may also occur on dry unvegetated bars of the active floodplain or in established gravel pits. On river bars, up to a 0.9-m (3-ft) deep layer of alluvial gravel is removed when the river is low, and this layer is allowed to naturally replenish. Additional construction of flood structures may be needed to address changes in the hydrology of the Sagavanirktok River

and its tributaries during the 2021–2026 period.

Western North Slope—Colville River and Greater Mooses Tooth Units

The Western North Slope (WNS) consists of the CPAI's Alpine and Colville River Unit (CRU) and the Greater Mooses Tooth Unit (GMTU). The Alpine reservoir covers 50,264 ha (124,204 ac), but the total developed area is approximately 153 ha (378 ac), which contains 45 km (28 mi) of gravel roads, 51.5 km (32 mi) of pipelines, and 14 gravel pads. The CRU has a combined production pad/drill site and four additional drill sites. The GMTU contains one producing drill site and a second drill site undergoing construction. Roads and pads are generally constructed during winter.

There are no permanent roads connecting WNS to industrial hubs or other oilfields. Gravel roads connect four of the five CRU drill sites. An ice road is constructed each winter to connect to the fifth CRU drill site. Gravel roads also connect the GMTU drill sites to the CRU, and gravel roads connect the two GMTU drill sites to each other. Each drill site with gravel road access is visited at least twice during a 24-hour period, depending on the weather. Drill site traffic levels increase during active drilling, maintenance, or other projects. Vehicles that use the gravel roads include light passenger trucks, heavy tractor-trailer trucks, heavy equipment, and very large drill rigs. The amount of traffic is generally not influenced by the time of year, but there may be increased amounts of traffic during the exploration season.

In the winter, off-road vehicles are used to access equipment for maintenance and inspections. Temporary ice roads and ice pads are built to move heavy equipment for maintenance and construction activities. An ice road is constructed to connect WNS to the Kuparuk oilfield (KRU) to move supplies for the rest of the year. More than 1,500 truckloads of modules, pipeline, and equipment are moved to WNS over this ice road, which is approximately 105 km (65 mi) in length. As mentioned previously, an ice road is constructed each winter to connect one of the CRU drill sites to the other CRU facilities in order to facilitate maintenance, drilling, and operations at this drill site. WNS ice roads typically operate from mid-January until late-April.

The Alpine Airstrip is a private runway that is used to transport personnel and cargo. An average of 60

to 80 personnel flights to/from the Alpine Airstrip occur each week. Within the CRU, the Alpine Airport transports personnel and supplies to and from the CRU drill site that is only connected by an ice road during the winter. There are approximately 700 cargo flights into Alpine each year. Cargo flight activity varies throughout the year with October through December being the busiest months. Aerial visual surveillance of the Alpine crude pipeline is conducted weekly for sections of the pipeline that are not accessible either by road or during winter months. These aerial surveillance inspections generally occur one to two times each week, and they average between two and four total flight hours each week. CPAI also uses aircraft to conduct environmental studies, including polar den detection surveys in the winter and caribou and bird surveys in the summer. These environmental surveys cover approximately 1,287 linear km (800 linear mi) over the CRU each year. In the summer from mid-May to mid-September, CPAI uses helicopters to transport personnel and equipment within the CRU (approximately 2,000 flights) and GMTU (approximately 650 flights).

There are no offshore or coastal facilities in the CRU. However, there are multiple bridges in the CRU and GMTU that required pilings which were driven into stream/riverbeds during construction. In-water activities may occur during emergency and oil spill response training exercises. During the ice-covered periods, training exercises may involve using equipment to detect, contain, and recover oil on and under ice. During the open-water season, air boats, shallow-draft jet boats and possibly other vessels may be used in the Nigliq Channel, the Colville River Main Channel, and other channels and tributaries connected to the Colville River. Vessels may occasionally enter the nearshore Beaufort Sea to transit between channels and/or tributaries of the Colville River Delta.

In the 2021–2026 period, two 4-ha (10-ac) multiseason ice pads would be located in the WNS in order to support the Willow Development construction in the NPR–A. Possible expansion activities for this period may include small pad expansions or new pads (<6.1 ha (15 ac)) to accommodate additional drilling and development of small pads and gravel roads to accommodate additional facilities and operational needs. Two gravel mine sources in the Tiḡmiaqsiugvik area have been permitted to supply gravel for the Willow Development. The new gravel

source would be accessed seasonally by an ice road. Increases in the amount of traffic within WNS are expected from 2023 to 2026. The increase in traffic is due to the transport of freight, equipment, and support crew between the Willow Development, the Oliktok Dock, and the Kuparuk Airport. The planned Willow Development is projected to add several flights to/from the Alpine Airstrip from 2021 to 2026. It is estimated that the number of annual flights may increase by a range of 49 to 122 flights. There are plans to replace passenger flights connecting Alpine and Kuparuk oilfields in 2021 with direct flights to these oilfields. This change would reduce the number of connector flights between these oilfields from 18 flights to 5 flights each week.

Planned Activities at New Oil and Gas Facilities for 2021–2026

The AOGA's submitted request includes several new oil and gas facilities being planned for leases obtained by Industry (see the section about *Lease Sales*) in which development and exploration activities would occur. The information discussed below was provided by AOGA and is the best available information at the time AOGA's request was finalized.

Bear Tooth Unit (Willow)

Located 45.1 km (28 mi) from Alpine, the Willow Development is currently owned and operated by ConocoPhillips Alaska, Inc. Willow is found in the Bear Tooth Unit (BTU) located within the northeastern area of the NPR–A. Discovered in 2016 after the drilling of the Tiḡmiaq 2 and 6 wells, Willow is estimated to contain between 400–750 million barrels of oil and has the potential to produce over 100,000 barrels of oil per day. The Willow Project would require the development of several different types of infrastructure, including gravel roads, airstrips, ice roads, and ice pads, that would benefit seismic surveys, drilling, operations, production, pile-driving, dredging, and construction.

ConocoPhillips plans to develop the hydrocarbon resources within the BTU during the 2021–2026 timeline under this ITR. The proposed development at Willow would consist of five drill sites along with associated infrastructure, including flowlines, a CPF, a personnel camp, an airstrip, a sales oil pipeline, and various roads across the area. Additionally, Willow would require the development of a new gravel mine site and would use sea lifts for large modules at Oliktok Dock requiring transportation over gravel and ice roads in the winter.

Access to the Willow Development project area to Alpine, Kuparuk, or Deadhorse would be available by ground transportation along ice roads. Additionally, access to the Alpine Unit would occur by gravel road. The Development Plan requires 61.5 km (38.2 mi) of gravel road and seven bridges to connect the five drill sites to the Greater Mooses Tooth 2 (GMT2). The Willow Development would also require approximately 59.7 km (37.1 mi) or 104 ha (257.2 ac) of gravel roads to the Willow Central Processing Facility (WCF), the WCF to the Greater Mooses Tooth 2 (GMT2), to water sources, and to airstrip access roads. The gravel needed for any gravel-based development would be mined from a newly developed gravel mine site and then placed for the appropriate infrastructure during winter for the first 3 to 4 years of the construction.

Gravel mining and placement would occur almost exclusively in the winter season. Prepacked snow and ice road construction will be developed to access the gravel mine site, the gravel road, and pad locations in December and January yearly from 2021 to 2024, and again in 2026. Ice roads would be available for use by February 1 annually. The Willow plan would require gravel for several facilities, including Bear Tooth 1 (BT1), Bear Tooth 2 (BT2), Bear Tooth 3 (BT3), Bear Tooth 4 (BT4), roads, WCF, Willow Operations Center (WOC), and the airstrip. Additionally, an all-season gravel road would be present from the GMT2 development and extend southwest towards the Willow Development area. This access road would end at BT3, located west from the WCF, WOC, and the airstrip. More gravel roads are planned to extend to the north, connecting BT1, BT2, and BT4. An infield road at BT3 would provide a water-source access road that would extend to the east to a freshwater reservoir access pad and water intake system developed by ConocoPhillips. Further east from the planned airstrip, an infield road is planned to extend north to BT1, continue north to BT2, and end at BT4. This road would intersect Judy (Iqalliqpik) Creek and Fish (Uvlutuuq) Creek at several points. Culvert locations would be identified and installed during the first construction season prior to breakup. Gravel pads would be developed before on-pad facilities are constructed. Gravel conditions and re-compaction would occur later in the year.

The Willow area is expected to have year-round aircraft operations and access from the Alpine Unit, Kuparuk Unit, Deadhorse, Anchorage, Fairbanks, and several other locations. Aircraft

would primarily be used for support activities and transporting workers, materials, equipment, and waste from the Willow Development to Fairbanks, Anchorage, Kuparuk, and Deadhorse. To support these operations, a 1,890-m (6,200-ft)-long gravel airstrip would be developed and is expected to be located near the WOC. Aircraft flight paths would be directed to the north of Nuiqsut. The construction for the airstrip is expected to begin during the 2021 winter season and completed by the summer of 2022. Before its completion, ConocoPhillips would utilize the airstrip at the Colville Delta 1 at the Alpine Central Processing Facility. After completion of the airstrip, helicopters would be used to support various projects within the Willow Development starting in 2023. An estimated 82 helicopter flights would occur annually during 2023–2026 between April and August. After the development of planned gravel roads and during activities such as drilling and related operations, helicopters would be limited to support environmental monitoring and spill response support. ConocoPhillips estimates that 50 helicopter trips to and from Alpine would occur in 2021, and 25 helicopter trips would occur from Alpine in 2022.

ConocoPhillips plans to develop and utilize ice roads to support gravel infrastructure and pipeline construction to access lakes and gravel sources and use separate ice roads for construction and general traffic due to safety considerations regarding traffic frequency and equipment size. The ice road used to travel to the Willow Development is estimated to be shorter in length than previously built ice roads at Kuparuk and Alpine, and ConocoPhillips expects the ice road use season at Willow to be approximately 90 days, from January 25 to April 25. In the winter ice road season (February through April), material resupply and waste would be transported to Kuparuk and to the rest of the North Slope gravel road system via the annual Alpine Resupply Ice Road. Additionally, during drilling and operations, there would be seasonal ground access from Willow to Deadhorse and Kuparuk from the annually constructed Alpine Resupply Ice Road and then to the Alpine and GMT gravel roads.

Seasonal ice roads would be developed and used during construction at Willow's gravel mine, bridge crossings, horizontal directional drilling crossing, and other locations as needed. A 4-ha (10-ac) multiseason ice pad would be developed and used throughout construction. This ice pad

would be constructed near the WOC from 2021 to 2022 and rotated on an annual basis.

Pipelines for the Willow Development would be installed during the winter season from ice roads. Following VSMs and horizontal support members (HSMs) assembly and installation; pipelines would be placed, welded, tested, and installed on pipe saddles on top of the HSMs. ConocoPhillips expects that the Colville River horizontal directional drilling pipeline crossing would be completed during the 2022 winter season. Pipeline installation would take approximately 1 to 3 years per pipeline, depending on several parameters such as pipeline length and location.

In 2024 at BT1, a drill rig would be mobilized, and drilling would begin prior to the WCF and drill site facilities being completed. ConocoPhillips estimates about 18 to 24 months of “pre-drilling” activities to occur, allowing the WCF to be commissioned immediately after its construction. Wells would be drilled consecutively from BT1, BT3, and BT2; however, the timing and order is based upon drill rig availability and economic decision-making. A second drilling rig may be utilized during the drilling phase of the Willow Development as well. ConocoPhillips estimates that drilling would occur year-round through 2030, with approximately 20 to 30 days of drilling per well.

Post-drilling phase and WCF startup, standard production and operation activities would take place. ConocoPhillips estimates that production would begin in the fourth quarter of 2025 with well maintenance operations occurring intermittently throughout the oilfield's lifespan.

ConocoPhillips plans to develop several bridges, installed via in-water pile-driving at Judy Creek, Fish Creek, Judy Creek Kayyaaq, Willow Creek 2, and Willow Creek 4. Pilings would be located above the ordinary high-water level and consist of sheet pile abutments done in sets of four, positioned approximately 12.2 to 21.3 m (40 to 70 ft) apart. Crossings over Willow Creek 4a and Willow Creek 8 would be constructed as single-span bridges, approximately 15.2 to 18.3 m (50 to 60 ft) apart using sheet pile abutments. Additionally, bridges would be constructed during the winter season from ice roads and pads. Screeding activities and marine traffic for the Willow project may also take place at the Oliktok Dock in the KRU.

Liberty Drilling and Production Island

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). Hilcorp plans to build a gravel island situated over the reservoir with a full on-island processing facility (similar to Northstar). The Liberty pipeline includes an offshore segment that would be buried in the seafloor for approximately 9.7 km (6 mi), and an onshore, VSM-mounted segment extending from the shoreline approximately 3.2 km (2 mi) to the Badami tie-in. Onshore infrastructure would include a gravel mine site, a 0.29-ha (0.71-ac) gravel pad at the Badami pipeline tie-in and a 6.1-ha (0.15-ac) gravel pad to allow for winter season ice road crossing. Environmental, archeological, and geotechnical work activities would take place to support the development and help inform decision-making. Development of the Liberty Island would include impact driving for conductor pipes/foundation pipes, vibratory drilling for conductor pipes, and vibratory and impact driving for sheet pile.

Road vehicles would use the Alaska Highway System to transport material and equipment from supply points in Fairbanks, Anchorage, or outside of Alaska to the supply hub of Deadhorse. Additionally, North Slope gravel roads would be used for transport from Deadhorse to the Endicott SDI. Existing gravel roads within the Endicott field between the MPI and the SDI would also be used to support the project.

During the winter seasons, workers would access the Liberty Island area from existing facilities via gravel roads and the ice road system. Construction vehicles would be staged at the construction sites, including the gravel mine. Access to the Liberty Drilling and Production Island (LDPI) by surface transportation is limited by periods when ice roads can be constructed and used. Additionally, surface transportation to the onshore pipeline can take place in winter on ice roads and can also occur in summer by approved tundra travel vehicles (e.g., Rolligons). The highest volume of traffic would occur during gravel hauls to create the LDPI. Gravel hauling to the island would require approximately 14 trucks working for 76 days (BOEM 2018). An estimated 21,400 surface vehicle trips would occur per season during island construction.

In general, ice roads would be used in the winter seasons, marine vessels would be used in the summer seasons, helicopters would be used across both seasons, and hovercraft (if necessary)

would be used during the shoulder season when ice roads and open water are not available. By spring breakup, all materials needed to support the ongoing construction would have been transported over the ice road system. Additionally, personnel would access the island by helicopter (likely a Bell 212) or if necessary, via hovercraft. During the open-water season, continued use of helicopter and hovercraft would be utilized to transport personnel—however, crew boats may also be used.

Construction materials and supplies would be mobilized to the site by barge from West Dock or Endicott. Larger barges and tugs can over-winter in the Prudhoe Bay area and travel to the LDPI in the open-water season, generally being chartered on a seasonal basis or long-term contract. Vessels would include coastal and ocean-going barges and tugs to move large modules and equipment and smaller vessels to move personnel, supplies, tools, and smaller equipment. Barge traffic consisting of large ocean-going barges originating from Dutch Harbor is likely to consist of one-to-two vessels, approximately two-to-five times per year during construction, and only one trip every 5 years during operations. During the first 2 years following LDPI construction, hovercraft may make up to three trips per day from Endicott SDI to LDPI. After those 2 years, hovercraft may make up to two trips per day from Endicott SDI to LDPI (approximately 11.3 km [7 mi]).

Air operations are often limited by weather conditions and visibility. In general, air access would be used for movement of personnel and foodstuffs and for movement of supplies or equipment when necessary. Fixed-wing aircraft may be used on an as-needed basis for purposes of spill response (spill delineation) and aerial reconnaissance of anomalous conditions or unless otherwise required by regulatory authority. Helicopter use is planned for re-supply during the broken-ice seasons and access for maintenance and inspection of the onshore pipeline system. In the period between completion of hydro-testing and facilities startup, an estimated one-to-two helicopter flights per week are also expected for several weeks for personnel access and to transport equipment to the tie-in area. Typically, air traffic routing is as direct as possible from departure locations such as the SDI, West Dock, or Deadhorse to the LDPI, with routes and altitude adjusted to accommodate weather, other air traffic, and subsistence activities. Hilcorp would minimize potential disturbance to mammals from helicopter

flights to support LDPI construction by limiting the flights to an established corridor from the LPDI to the mainland and except during landing and takeoff, would maintain a minimum altitude of 457 m (1,500 ft) above ground level (AGL) unless inclement weather requires deviation. Equipment located at the pipeline tie-in location and the pipeline shore landing would be accessed by helicopter or approved tundra travel vehicles to minimize impacts to the tundra.

Additionally, Hilcorp may use unmanned aerial surveys (UASs) during pile driving, pipe driving, and slope shaping and armament activities during the open-water season in Year 2 of construction and subsequently during decommissioning to monitor for whales or seals that may occur in incidental Level B harassment zones as described in the 2019 LOA issued by the National Marine Fisheries Service (NMFS 2020). Recent developments in the technical capacity and civilian use of UASs (defined as vehicles flying without a human pilot on board) have led to some investigations into potential use of these systems for monitoring and conducting aerial surveys of marine mammals (Koski *et al.* 2009; Hodgson *et al.* 2013). UASs, operating under autopilot and mounted with Global Positioning System (GPS) and imaging systems, have been used and evaluated in the Arctic (Koski *et al.* 2009) and have potential to replace traditional manned aerial surveys and provide an improved method for monitoring marine mammal populations. Hilcorp plans to seek a waiver, if necessary, from the Federal Aviation Administration (FAA) to operate the UAS above 122 m (400 ft) and beyond the line of sight of the pilot. Ground control for the UAS would be located at Liberty Island, Endicott, or another shore-based facility close to Liberty (NMFS 2020).

After construction, aircraft, land vehicle, and marine traffic may be at similar levels as those described for Northstar Island, although specific details beyond those presented here are not presently known.

Ice roads would be used for onshore and offshore access, installing the pipeline, hauling gravel used to construct the island, moving equipment on/off island, and personnel and supply transit. Ice road construction can typically be initiated in mid- to late-December and can be maintained until mid-May, weather depending. Ice road #1 would extend approximately 11.3 km (7 mi) over shorefast sea ice from the Endicott SDI to the LDPI (the SDI to LDPI ice road). It would be approximately 37 m wide (120 ft) with

a driving lane of approximately 12 m (40 ft) and cover approximately 64.8 ha (160 ac) of sea ice. Ice road #2 (approximately 11.3 km [7 mi]) would connect the LDPI to the proposed Kadleroshilik River gravel mine site and then would continue to the juncture with the Badami ice road (which is ice road #4). It would be approximately 15 m (50 ft) wide. Ice road #3 (approximately 9.6 km [6 mi]), termed the “Midpoint Access Road”) would intersect the SDI to LDPI ice road and the ice road between the LDPI and the mine site. It would be approximately 12 m (40 ft) wide. Ice road #4 (approximately 19.3 km [12 mi]), located completely onshore, would parallel the Badami pipeline and connect the mine site with the Endicott road.

All four ice roads would be constructed for the first 3 years to support pipeline installation and transportation from existing North Slope roads to the proposed gravel mine site, and from the mine site to the proposed LDPI location in the Beaufort Sea. After Year 3, only ice road #1 would be constructed to allow additional materials and equipment to be mobilized to support LDPI, pipeline, and facility construction activities as all island construction and pipeline installation should be complete by Year 3. In addition to the ice roads, three ice pads are proposed to support construction activities (Year 2 and Year 3). These would be used to support LDPI, pipeline (including pipe stringing and two stockpile/disposal areas), and facilities construction. A fourth staging area ice pad (approximately 107 by 213 m (350 by 700 ft) would be built on the sea ice on the west side of the LDPI during production well drilling operations.

Other on-ice activities occurring prior to March 1 may include spill training exercises, pipeline surveys, snow clearing, and work conducted by other snow vehicles such as a Pisten Bully, snow machine, or Rolligon. Prior to March 1, these activities would occur outside of the delineated ice road/trail and shoulder areas.

The LDPI would include a self-contained offshore drilling and production facility located on an artificial gravel island with a subsea pipeline to shore. The LDPI would be located approximately 8 km (5 mi) offshore in Foggy Island Bay and 11.7 km (7.3 mi) southeast of the existing SDI on the Endicott causeway. The LDPI would be constructed of reinforced gravel in 5.8 m (19 ft) of water and have a working surface of approximately 3.8 ha (9.3 ac). A steel sheet pile wall would

surround the island to stabilize the placed gravel, and the island would include a slope protection bench, dock and ice road access, and a seawater intake area.

Hilcorp would begin constructing the LDPI during the winter immediately following construction of the ice road from the mine site to the island location. Sections of sea ice at the island's location would be cut using a ditchwitch and removed. A backhoe and support trucks using the ice road would move ice away. Once the ice is removed, gravel would be poured through the water column to the sea floor, building the island structure from the bottom up. A conical pile of gravel (hailed in from trucks from the mine site using the ice road) would form on the sea floor until it reaches the surface of the ice. Gravel hauling over the ice road to the LDPI construction site is estimated to continue for 50 to 70 days and conclude mid-April or earlier depending on road conditions. The construction would continue with a sequence of removing additional ice and pouring gravel until the surface size is achieved.

Following gravel placement, slope armoring and protection installation would occur. Using island-based equipment (e.g., backhoe, bucket-dredge) and divers, Hilcorp would create a slope protection profile consisting of an 18.3-m (60-ft)-wide bench covered with a linked concrete mat that extends from a sheet pile wall surrounding the island to slightly above medium lower low water. The linked concrete mat requires a high-strength, yet highly permeable, woven polyester fabric under layer to contain the gravel island fill. The filter fabric panels would be overlapped and tied together side-by-side (requiring diving operations) to prevent the panels from separating and exposing the underlying gravel fill. Because the fabric is overlapped and tied together, no slope protection debris would enter the water column should it be damaged. Above the fabric under layer, a robust geo-grid would be placed as an abrasion guard to prevent damage to the fabric by the linked mat armor. The concrete mat system would continue at a 3:1 slope another 26.4 m (86.5 ft) into the water, terminating at a depth of 5.8 m (19 ft). In total, from the sheet pile wall, the bench and concrete mat would extend 44.7 m (146.5 ft). Island slope protection is required to assure the integrity of the gravel island by protecting it from the erosive forces of waves, ice ride-up, and currents. A detailed inspection of the island slope protection system would be conducted annually during the open-water season to document changes in the condition of

this system that have occurred since the previous year's inspection. Any damaged material would be removed. Above-water activities would consist of a visual inspection of the dock and sheet pile enclosure that would document the condition of the island bench and ramps. The below-water slopes would be inspected by divers or, if water clarity allows, remotely by underwater cameras contracted separately by Hilcorp. The results of the below-water inspection would be recorded for repair if needed. No vessels would be required. Multi-beam bathymetry and side-scan sonar imagery of the below-water slopes and adjacent sea bottom would be acquired using a bathymetry vessel. The sidescan sonar would operate at a frequency between 200 and 400 kHz. The single-beam echosounder would operate at a frequency of about 210 kHz.

Once the slope protection is in place, Hilcorp would install the sheet pile wall around the perimeter of the island using vibratory and, if necessary, impact hammers. Sheet pile driving is anticipated to be conducted between March and August, during approximately 4 months of the ice-covered season and, if necessary, approximately 15 days during the open-water season. Sheet pile driving methods and techniques are expected to be similar to the installation of sheet piles at Northstar during which all pile driving was completed during the ice-covered season. Therefore, Hilcorp anticipates most or all sheet pile would be installed during ice-covered conditions. Hilcorp anticipates driving up to 20 piles per day to a depth of 7.62 m (25 ft). A vibratory hammer would be used first, followed by an impact hammer to "proof" the pile. Hilcorp anticipates each pile needing 100 hammer strikes over approximately 2 minutes (100 strikes) of impact driving to obtain the final desired depth for each sheet pile. To finish installing up to 20 piles per day, the impact hammer would be used a maximum of 40 minutes per day with an anticipated duration of 20 minutes per day.

For vibratory driving, pile penetration speed can vary depending on ground conditions, but a minimum sheet pile penetration speed is 0.5 m (20 in) per minute to avoid damage to the pile or hammer (NASSPA 2005). For this project, the anticipated duration is based on a preferred penetration speed greater than 1 m (40 in) per minute, resulting in 7.5 minutes to drive each pile. Given the high storm surge and larger waves that are expected to arrive at the LDPI site from the west and northwest, the wall would be higher on

the west side than on the east side. At the top of the sheet-pile wall, overhanging steel "parapet" would be installed to prevent wave passage over the wall.

Within the interior of the island, 16 steel conductor pipes would be driven to a depth of 49 m (160 ft) to provide the initial stable structural foundation for each oil well. They would be set in a well row in the middle of the island. Depending on the substrate, the conductor pipes would be driven by impact or vibratory methods or both. During the construction of the nearby Northstar Island (located in deeper water), it took 5 to 8.5 hours to drive one conductor pipe (Blackwell *et al.* 2004). For the Liberty LDPI, based on the 20 percent impact hammer usage factor (USDOT 2006.), it is expected that 2 cumulative hours of impact pipe driving (4,400 to 3,600 strikes) would occur over a 10.5 non-consecutive hour day. Conductor pipe driving is anticipated to be conducted between March and August and take 16 days total, installing one pipe per day. In addition, approximately 700 to 1,000 foundation piles may also be installed within the interior of the island should engineering determine they are necessary for island support.

The LDPI layout includes areas for staging, drilling, production, utilities, a camp, a relief well, a helicopter landing pad, and two docks to accommodate barges, a hovercraft, and small crew boats. It would also have ramps for ice road and amphibious vehicle access. An STP would also be located at the facility to treat seawater and then commingle it with produced water to be injected into the Liberty Reservoir to maintain reservoir pressure. Treated seawater would be used to create potable water and utility water for the facility. A membrane bioreactor would treat sanitary wastewater, and remaining sewage solids would be incinerated on the island or stored in enclosed tanks prior to shipment to Deadhorse for treatment.

All modules, buildings, and material for onsite construction would be trucked to the North Slope via the Dalton Highway and staged at West Dock, Endicott SDI, or in Deadhorse. Another option is to use ocean-going barges from Dutch Harbor to transport materials or modules to the island during the open-water season.

Depending on the season, equipment and material would be transported via coastal barges in open water, or ice roads from SDI in the winter. The first modules would be delivered in the third quarter of Year 2 to support the installation of living, drilling, and

production facilities. Remaining process modules would be delivered to correspond with first oil and the ramp-up in drilling capacity.

Onsite facility installation would commence in August of Year 2 and be completed by the end of Year 4 (May) to accommodate the overall construction and production ramp-up schedule. Some facilities that are required early would be barged in the third quarter of Year 2 and would be installed and operational by the end of the fourth quarter of Year 2. Other modules would be delivered as soon as the ice road from SDI is in place. The drilling unit and associated equipment would be transferred by barge through Dutch Harbor or from West Dock to the LDPI during the open-water season in Year 2 using a seagoing barge and ocean class tug. The seagoing barge is ~30.5 m (100 ft) wide and ~122 m (400 ft) long, and the tug is ~30.5 m (100 ft) long. Although the exact vessels to be used are unknown, Crowley lists Ocean class tugs at <1,600 gross registered tonnage. The weight of the seagoing barge is not known at this time.

Hilcorp would install a pipe-in-pipe subsea pipeline consisting of a 30.5-cm (12-in)-diameter inner pipe and a 40.6-cm (16-in)-diameter outer pipe to transport oil from the LDPI to the existing Badami pipeline. Pipeline construction is planned for the winter after the island is constructed. A schematic of the pipeline can be found in Figure 2–3 of BOEM's Final EIS available at <https://www.boem.gov/Hilcorp-Liberty/>. The pipeline would extend from the LDPI, across Foggy Island Bay, and terminate onshore at the existing Badami Pipeline tie-in location. For the marine segment, construction would progress from shallower water to deeper water with multiple construction spreads.

To install the pipeline, a trench would be excavated using ice-road based long-reach excavators with pontoon tracks. The pipeline bundle would be lowered into the trench using side booms to control its vertical and horizontal position, and the trench would be backfilled by excavators using excavated trench spoils and select backfill. Hilcorp intends to place all material back in the trench slot. All work would be done from ice roads using conventional excavation and dirt-moving construction equipment. The target trench depth is 2.7 to 3.4 m (9 to 11 ft) with a proposed maximum depth of cover of approximately 2.1 m (7 ft). The pipeline would be approximately 9 km (5.6 mi) long.

At the pipeline landfall (where the pipeline transitions from onshore to

offshore), Hilcorp would construct an approximately 0.6-ha (1.4-ac) trench to protect against coastal erosion and ice ride-up associated with onshore sea ice movement and to accommodate the installation of thermosiphons (heat pipes that circulate fluid based on natural convection to maintain or cool ambient ground temperature) along the pipeline. The onshore pipeline would cross the tundra for almost 2.4 km (1.5 mi) until it intersects the existing Badami pipeline system. The single wall 30.5-cm (12-in) pipeline would rest on 150 to 170 VSMs, spaced approximately 15 m (50 ft) apart to provide the pipeline a minimum 2.1-m (7-ft) clearance above the tundra. Hydro-testing (pressure testing using sea water) of the entire pipeline would be required to complete pipeline commissioning.

The final drill rig has yet to be chosen but has been narrowed to 2 options and would accommodate drilling of 16 wells. The first option is the use of an existing platform-style drilling unit that Hilcorp owns and operates in the Cook Inlet. Designated as Rig 428, the rig has been used recently and is well suited in terms of depth and horsepower rating to drill the wells at Liberty. A second option that is being investigated is a new build drilling unit that would be built not only to drill Liberty development wells but would be more portable and more adaptable to other applications on the North Slope. Regardless of drill rig type, the well row arrangement on the island is designed to accommodate up to 16 wells. While Hilcorp is proposing a 16-well design, only 10 wells would be drilled. The six additional well slots would be available as backups or for potential in-fill drilling if needed during the project life.

Drilling would be done using a conventional rotary drilling rig, initially powered by diesel, and eventually converted to fuel gas produced from the third well. Gas from the third well would also replace diesel fuel for the grind-and-inject facility and production facilities. A location on the LDPI is designated for drilling a relief well, if needed.

Process facilities on the island would separate crude oil from produced water and gas. Gas and water would be injected into the reservoir to provide pressure support and increase recovery from the field. A single-phase subsea pipe-in-pipe pipeline would transport sales-quality crude from the LDPI to shore, where an aboveground pipeline would transport crude to the existing Badami pipeline. From there, crude would be transported to the Endicott Sales Oil Pipeline, which ties into Pump

Station 1 of the TAPS for eventual delivery to a refinery.

North Slope Gas Development

The AOGA request discusses two projects currently submitted for approval and permitting that would transport natural gas from the North Slope via pipeline. Only a small fraction of this project would fall within the 40-km (25-mi) inland jurisdiction area of this proposed ITR. The two projects are the Alaska Liquefied Natural Gas Project (Alaska LNG) and the Alaska Stand Alone Pipeline (ASAP). Both of these projects are discussed below and their effects analyzed in this proposed ITR, but only one project could be constructed during the 2021–2026 period.

Alaska Liquefied Natural Gas Project (Alaska LNG)

The Alaska LNG project has been proposed by the Alaska Gasline Development Corporation (AGDC) to serve as a single integrated project with several facilities designed to liquefy natural gas. The fields of interest are the Point Thomson Unit (PTU) and PBU production fields. The Alaska LNG project would consist of a Gas Treatment Plant (GTP); a Point Thomson Transmission Line (PTTL) to connect the GTP to the PTU gas production facility; a Prudhoe Bay Transmission Line (PBTL) to connect the GTP to the PBU gas production facility; a liquefaction facility in southcentral Alaska; and a 1,297-km (807-mi)-long, 107-cm (42-in)-diameter pipeline (called the Mainline) that would connect the GTP to the liquefaction facility. Only the GTP, PTTL, PBTL, a portion of the Mainline, and related ancillary facilities would be located within the geographic scope of AOGA's Request. Related components would require the construction of ice roads, ice pads, gravel roads, gravel pads, camps, laydown areas, and infrastructure to support barge and module offloading.

Barges would be used to transport GTP modules at West Dock at Prudhoe Bay several times annually, with GTP modules being offloaded and transported by land to the proposed GTP facility in the PBU. However, deliveries would require deep draft tug and barges to a newly constructed berthing site at the northeast end of West Dock. Additionally, some barges would continue to deliver small modules and supplies to Point Thomson. Related activities include screeding, shallow draft tug use, sea ice cutting, gravel placement, sea ice road and sea ice pad development, vibratory

and impact pile driving, and the use of an offshore barge staging area.

A temporary bridge (developed from ballasted barges) would be developed to assist in module transportation. Barges would be ballasted when the area is ice-free and then removed and overwintered at West Dock before the sea freezes over. A staging area would then be used to prepare modules for transportation, maintenance, and gravel road development. Installation of ramps and fortification would utilize vibratory and impact pile driving. Seabed preparations and level surface preparations (*i.e.*, ice cutting, ice road development, gravel placement, screeding) would take place as needed. Breasting/mooring dolphins would be installed at the breach point via pile driving to anchor and stabilize the ballasted barges.

A gravel pad would be developed to assist construction of the GTP, adjacent camps, and other relevant facilities where work crews utilize heavy equipment and machinery to assemble, install, and connect the GTP modules. To assist, gravel mining would use digging and blasting, and gravel would be placed to create pads and develop or improve ice and gravel roads.

Several types of development and construction would be required at different stages of the project. The construction of the Mainline would require the use of ice pads, ice roads, gravel roads, chain trenchers, crane booms, backhoes, and other heavy equipment. The installation of the PTTL and PBTL would require ice roads, ice pads, gravel roads, crane booms, mobile drills or augers, lifts, and other heavy equipment. After installation, crews would work on land and streambank restoration, revegetation, hydrostatic testing, pipeline security, and monitoring efforts. The development of the ancillary facility would require the construction of ice roads, ice pads, as well as minimal transportation and gravel placement.

Alaska Stand Alone Pipeline (ASAP)

The ASAP is the alternative project option that AGDC could utilize, allowing North Slope natural gas to be supplied to Alaskan communities. ASAP would require several components, including a Gas Conditioning Facility (GCF) at Prudhoe Bay; a 1,180-km (733-mi)-long, 0.9-m (36-in)-diameter pipeline that would connect the GCF to a tie-in found in southcentral Alaska (called the Mainline); and a 48-km (30-m), 0.3-m (12-in)-diameter lateral pipeline connecting the Mainline pipeline to Fairbanks (referred to as the Fairbanks

Lateral). Similar to the Alaska LNG pipeline, only parts of this project would fall within the geographic scope of this proposed ITR. These relevant project components are the GCF, a portion of the ASAP Mainline, and related ancillary facilities. Construction would include the installation of supporting facilities and infrastructure, ice road and pad development, gravel road and pad development, camp establishment, laydown area establishment, and additional infrastructure to support barge and module offloading.

Barges would be used to transport the GCF modules to West Dock in Prudhoe Bay and would be offloaded and transported by ground to the proposed facility site within the PBU. Module and supply deliveries would utilize deep draft tugs and barges to access an existing berthing location on the northeast side of West Dock called DH3. Maintenance on DH3 would be required to accommodate the delivery of larger loads and would consist of infrastructure reinforcement and elevation increases on one of the berths. In the winter, a navigational channel and turn basin would be dredged to a depth of 2.7 m (9 ft). Dredged material would be disposed of on ground-fast ice found in 0.6012;1.2 m (2012;4 ft) deep water in Prudhoe Bay. An offshore staging area would be developed approximately 4.8 2012;8 km (32012;5 mi) from West Dock to allow deep draft tugs and barges to stage before further transportation to DH3 and subsequent offload by shallow draft tugs. Other activities include seabed screeding, gravel placement, development of a sea ice road and pads, and pile driving (vibratory and impact) to install infrastructure at West Dock.

A temporary bridge (composed of ballasted barges and associated infrastructure), paralleling an existing weight-limited bridge would be developed to assist in transporting large modules off West Dock. Barges would be ballasted when the area is ice-free and then removed and overwintered at West Dock before the sea freezes over. A staging area would be used to prepare modules for transportation, maintenance, and gravel road development. The bridge construction would require ramp installation, fortification through impact, and vibratory pile driving. Support activities (development of ice roads and pads, gravel roads and pads, ice cutting, seabed screeding) would also take place. Breasting/mooring dolphins would be installed at the breach point via pile driving to anchor and stabilize the ballasted barges.

A gravel facility pad would be formed to assist in the construction of the GCF. Access roads would then be developed to allow crews and heavy equipment to install and connect various GCF modules. Gravel would be obtained through digging, blasting, transportation, gravel pad placement, and improvements to other ice and gravel roads.

The construction of the Mainline pipeline would require the construction of ice pads, ice roads, and gravel roads along with the use of chain trenchers, crane booms, backhoes, and other heavy equipment. Block valves would be installed above ground along the length of the Mainline. After installation, crews would work on land and streambank restoration, revegetation, hydrostatic testing, pipeline security, and monitoring efforts.

Pikka Unit

The Pikka Development (formally known as the Nanshuk Project) is located approximately 83.7 km (52 mi) west of Deadhorse and 11.3 km (7 mi) northeast of Nuiqsut. Oil Search Alaska operates leases held jointly between the State of Alaska and ASRC located southeast of the East Channel of the Colville River. Pikka is located further southwest from the existing Oooguruk Development Project, west of the existing KRU, and east of Alpine and Alpine's Satellite Development Projects. Most of the infrastructure is located over 8 km (5 mi) from the coast within the Pikka Unit; however, Oil Search Alaska expects some smaller projects and activities to occur outside the unit to the south, east, and at Oliktok Point.

The Pikka Project would include a total of three drill-sites for approximately 150 (production, injectors, underground injection) wells, as well as the Nanshuk Processing Facility (NPF), the Nanushuk Operations Pad, a tie-in pad (TIP), various camps, warehouses, facilities on pads, infield pipelines, pipelines for import and export activities, various roads (ice, infield, access), a boat ramp, and a portable water system. Additionally, there are plans to expand the Oliktok Dock and to install an STP adjacent to the already existing infrastructure. A make-up water pipeline would also be installed from the STP to the TIP. Oil Search Alaska also plans to perform minor upgrades and maintenance, as necessary, to the existing road systems to facilitate transportation of sealift modules from Oliktok Point to the Pikka Unit.

Oil Search Alaska plans to develop a pad to station the NPF and all relevant equipment and operations (*i.e.*, phase

separation; heating and cooling; pumping; gas treatment and compression for gas injections; water treatment for injection). All oil procured, processed, and designated for sale would travel from the NPF to the TIP near Kuparuk's CPF 2 via the Pikka Project pipeline that would tie in to the Kuparuk Sales Pipeline and would then be transported to TAPS. Construction of the pad would allow for additional space that could be repurposed for drilling or for operational use during the development of the Pikka Project. This pad would contain other facilities required for project operation and development, including: Metering and pigging facilities; power generation facilities; a truck fill station; construction material staging areas; equipment staging areas; a tank farm (contains diesel, refined fuel, crude oil, injection water, production chemicals, glycol, and methanol storage tanks); and a central control room. All major components required for the development of the NPF would be constructed off-site and brought in via truck or barge during the summer season. Barges would deliver and offload necessary modules at Oliktok Dock, which would travel to the NPF site during summer months. Seabed screeding would occur at Oliktok Point to maintain water depth for necessary barges.

Pikka would use gravel roads to the Unit, which would allow year-round access from the Dalton Highway. All gravel needed for project activities (approximately 112 ha [276 ac]) would be sourced from several existing gravel mine sites. A majority of gravel acquisition and laying would occur during the winter season and then be compacted in the summer. All equipment and supplies necessary would be brought in on existing roads from Anchorage or Fairbanks to Deadhorse. Supplies and equipment would then be forwarded to the Pikka Unit; no aerial transportation for supplies is expected. Regular traffic is expected once construction of the roads is completed; Oil Search Alaska expects arterial routes between the processing facilities and camps to experience the heaviest use of traffic. Drill-site access roads are expected to experience the least amount of traffic; however, drill-site traffic is expected to increase temporarily during periods of active drilling, maintenance, or other relevant aspects of the project. Standard vehicles would include light passenger trucks, heavy tractor-trailer trucks, heavy equipment, and oil rigs.

Several types of aircraft operations are expected at the Pikka Unit throughout

the 2021–2026 period. Personnel would be transported to Pikka via commercial flights from Deadhorse Airport and by ground-based vehicle transport. Currently, there is no plan to develop an airstrip at Pikka. Personnel flights are expected to be infrequent to and from the Pikka Unit; however, Oil Search Alaska expects that some transport directly to the Unit may be required. Several environmental studies performed via aircraft are expected during the ITR period. Some of these include AIR surveys, cultural resources, stick-picking, and hydrology studies. AIR surveys in support of the Pikka Unit would occur annually to locate polar bear dens.

Summer travel would utilize vehicles such as Rolligons and Tuckers to assess pipelines not found adjacent to the gravel roads. During 24-hour sunlight periods, these vehicles would operate across all hours. Stick-picking and thermistor retrieval would also occur in the summer. In the winter, ice roads would be constructed across the Unit. These ice roads would be developed to haul gravel from existing mine sites to haul gravel for road and pad construction. Ice roads would also be constructed to support the installation of VSM and pipelines. Off-road winter vehicles would be used when the tundra is frozen and covered with snow to provide maintenance and access for inspection. Temporary ice roads and ice pads would be built to allow for the movement and staging of heavy equipment, maintenance, and construction. Oil Search Alaska would perform regular winter travel to support operations across the Pikka Unit.

Oil Search Alaska plans to install a bridge over the Kachemach River (more than 8 km [5 mi] from the coast) and install the STP at Oliktok Point. Both projects would require in-water pile driving, which is expected to take place during the winter seasons. In-water pile driving (in the winter), placement of gravel fill (open-water period), and installation of the STP barge outfall structure (open-water period) would take place at Oliktok Point. Dredging and screeding activities would prepare the site for STP and module delivery via barge. Annual maintenance screeding and dredging (expected twice during the request period) may be needed to maintain the site. Dredging spoils would be transported away, and all work would occur during the open-water season between May and October. Screeding activities are expected to take place annually over the course of a 2-week period, depending on stability and safety needs.

Gas Hydrate Exploration and Research

The U.S. Geological Survey estimates that the North Slope contains over 54 trillion cubic feet of recoverable gas assets (Collette *et al.* 2019). Over the last 5 years, Industry has demonstrated a growing interest in the potential to explore and extract these reserves. Federal funds from the Department of Energy have been provided in the past to support programs on domestic gas hydrate exploration, research, and development. Furthermore, the State of Alaska provides support for gas hydrate research and development through the development of the Eileen hydrate trend deferred area near Milne Point, with specific leases being offered for gas hydrate research and exploration.

As of 2021, a few gas hydrate exploration and test wells have been drilled within the Beaufort Sea region. Due to the support the gas hydrate industry has received, AOGA expects continued interest to grow over the years. As such, AOGA expects that a relatively low but increasing amount of gas hydrate exploration and research is expected throughout the 2021–2026 period.

Environmental Studies

Per AOGA's Request, Industry would continue to engage in various environmental studies throughout the life of the proposed ITR. Such activities include: Geological and geotechnical surveys (*i.e.*, seismic surveys); surveys on geomorphology (soils, ice content, permafrost), archeology and cultural resources; vegetation mapping; analysis of fish, avian, and mammal species and their habitats; acoustic monitoring; hydrology studies; and various other freshwater, marine, and terrestrial studies of the coastal and offshore regions within the Arctic. These studies typically include various stakeholders, including consultants and consulting companies; other industries; government; academia (university-level); nonprofits and nongovernmental organizations; and local community parties. However, AOGA's 2021–2026 ITR request requests coverage only for environmental studies directly related to Industry activities (*e.g.*, monitoring studies in response to regulatory requirements). No third-party studies will be covered except by those mentioned in this proposed ITR and the AOGA request.

During the 2021–2026 lifespan of the proposed ITR, Industry would continue studies that are conducted for general monitoring purposes for regulatory and/or permit requirements and for expected or planned exploration and

development activities within the Beaufort Sea region. Environmental studies are anticipated to occur during the summer season as to avoid overlap with any denning polar bears. Activities may utilize vessels, fixed-wing aircrafts, or helicopters to access research sites.

Mitigation Measures

AOGA has included in their Request a number of measures to mitigate the effects of the proposed activities on Pacific walrus and polar bears. Many of these measures have been historically used by oil and gas entities throughout the North Slope of Alaska, and have been developed as a part of past coordination with the Service. Measures include: Development and adherence to polar bear and Pacific walrus interaction plans; design of facilities to reduce the possibility of polar bears reaching attractants; avoidance of operating equipment near potential den locations; flying aircraft at a minimum altitude and distance from polar bears and hauled out Pacific walrus; employing trained protected species observers; and reporting all polar bear or Pacific walrus encounters to the Service. Additional descriptions of these measures can be found in the AOGA Request for an ITR at: www.regulations.gov in Docket No. FWS-R7-ES-2021-0037.

Maternal Polar Bear Den Survey Flights

Per AOGA's Request, Industry will also conduct aerial infrared (AIR) surveys to locate maternal polar bear dens in order to mitigate potential impacts to mothers and cubs during the lifetime of this ITR. AIR surveys are used to detect body heat emitted by polar bears, which, in turn, is used to determine potential denning polar bears. AIR surveys are performed in winter months (December or January) before winter activities commence. AIR imagery is analyzed in real-time during the flight and then reviewed post-flight with the Service to identify any suspected maternal den locations, ensure appropriate coverage, and check the quality of the images and recordings. Some sites may need to be resurveyed if a suspected hotspot (heat signature detectable in a snowdrift) is observed. These followup surveys of hotspots are conducted in varying weather conditions or using an electro-optical camera during daylight hours. On-the-ground reconnaissance or the use of scent-training dogs may also be used to recheck the suspected den.

Surveys utilize aerial infrared cameras on fixed-wing aircrafts with flights typically flown between 245–457 meters (800 to 1,500 feet) above ground level at a speed of <185 km/h (<115 mph).

Surveys typically occur twice a day (weather permitting) during periods of darkness (civil twilight) across the North Slope for less than 4.5 hours per survey. Surveys are highly dependent on the weather as it can affect the image quality of the AIR video and the safety of the participants. These surveys do not follow a typical transect configuration; instead they are concentrated on areas that would be suitable for polar bear denning activity such as drainages, banks, bluffs, or other areas of topographic relief around sites where Industry has winter activities, tundra travel, or ice road construction planned or anticipated. As part of the AOGA's Request and as described the mitigation measures included in this proposed ITR, all denning habitat within one mile of the ice-season industrial footprint will be surveyed twice each year. In years where seismic surveys are proposed, all denning habitat within the boundaries of the seismic surveys will be surveyed three times, and a third survey will be conducted on denning habitat along the pipeline between Badami and the road to Endicott Island. Greater detail on the timing of these surveys can be found in *Methods for Modeling the Effects of Den Disturbance*.

A suspected heat signature observed in a potential den found via AIR is classified into three categories: A hotspot, a revisit, or a putative den. The following designations are discussed below.

A "hotspot" is a warm spot found on the AIR camera indicative of a polar bear den through the examination of the size and shape near the middle of the snow drift. Signs of wildlife presence (e.g., digging, tracks) may be present and visible. Suspected dens that are open (i.e., not drifted closed by the snow) are considered hotspots because polar bears may dig multiple test evacuation sites when searching for an appropriate place to den and unused dens will cool down and be excluded from consideration. Hotspots are reexamined and either eliminated or upgraded to a "putative den" designation. Industry representatives, in coordination and compliance with the Service, may utilize other methods outside of AIR to gather additional information on a suspected hotspot.

A "revisit" is a designation for a warm spot in a snowdrift but lacking signs of a polar bear den (e.g., tailings pile, signs of animal activity, appropriate shape or size). These categorizations are often revisited during a subsequent survey, upgraded to a "hotspot" designation, or eliminated from further consideration pending the evidence presented.

A "putative den" is a hotspot with a distinct heat signature, found within the appropriate habitat, and that may continue to be present for several days as noted by revisits. The area may show evidence of an animal's presence that may not definitively be attributed to a non-polar bear species or cause (e.g., a fox or other animal digging). The final determination is often unknown as these sites are not investigated further, monitored, or revisited in the spring.

When and if a putative den is found near planned or existing infrastructure or activities, the Industry representatives will immediately cease operations within one mile of the location and coordinate with the Service to mitigate any potential disturbances while further information is obtained.

Evaluation of the Nature and Level of Activities

The annual level of activity at existing production facilities in the Request will be similar to that which occurred under the previous regulations. The increase the area of the industrial footprint with the addition of new facilities, such as drill pads, pipelines, and support facilities, is at a rate consistent with prior 5-year regulatory periods. Additional onshore and offshore facilities are projected within the timeframe of these regulations and will add to the total permanent activities in the area. This rate of expansion is similar to prior production schedules.

Description of Marine Mammals in the Specified Geographic Region

Polar Bear

Polar bears are distributed throughout the ice-covered seas and adjacent coasts of the Arctic region. The current total polar bear population is estimated at approximately 26,000 individuals (95 percent Confidence Interval (CI) = 22,000–31,000, Wiig *et al.* 2015; Regehr *et al.* 2016) and comprises 19 stocks ranging across 5 countries and 4 ecoregions that reflect the polar bear dependency on sea-ice dynamics and seasonality (Amstrup *et al.* 2008). Two stocks occur in the United States (Alaska) with ranges that extend to adjacent countries: Canada (the Southern Beaufort Sea stock) and the Russia Federation (the Chukchi/Bering Seas stock). The discussion below is focused on the Southern Beaufort Sea stock of polar bears, as the proposed activities in this ITR would overlap only their distribution.

Polar bears typically occur at low, uneven densities throughout their circumpolar range (DeMaster and Stirling 1981, Amstrup *et al.* 2011,

Hamilton and Derocher 2019) in areas where the sea is ice-covered for all or part of the year. They are typically most abundant on sea-ice, near polynyas (*i.e.*, areas of persistent open water) and fractures in the ice, and over relatively shallow continental shelf waters with high marine productivity (Durner *et al.* 2004). This sea-ice habitat favors foraging for their primary prey, ringed seals (*Pusa hispida*), and other species such as bearded seals (*Erignathus barbatus*) (Thiemann *et al.* 2008, Cherry *et al.* 2011, Stirling and Derocher 2012). Although over most of their range polar bears prefer to remain on the sea-ice year-round, an increasing proportion of stocks are spending prolonged periods of time onshore (Rode *et al.* 2015, Atwood *et al.* 2016b). While time spent on land occurs primarily in late summer and autumn (Rode *et al.* 2015, Atwood *et al.* 2016b), they may be found throughout the year in the onshore and nearshore environments. Polar bear distribution in coastal habitats is often influenced by the movement of seasonal sea ice (Atwood *et al.* 2016b, Wilson *et al.* 2017) and its direct and indirect effects on foraging success and, in the case of pregnant females, also dependent on availability of suitable denning habitat (Durner *et al.* 2006, Rode *et al.* 2015, Atwood *et al.* 2016b).

In Alaska during the late summer/fall period (July through November), polar bears from the Southern Beaufort Sea stock often occur along the coast and barrier islands, which serve as travel corridors, resting areas, and to some degree, foraging areas. Based on Industry observations and coastal survey data acquired by the Service (Wilson *et al.* 2017), encounter rates between humans and polar bears are higher during the fall (July to November) than in any other season, and an average of 140 polar bears may occur on shore during any week during the period July through November between Utqiagvik and the Alaska-Canada border (Wilson *et al.* 2017). The length of time bears spend in these coastal habitats has been linked to sea ice dynamics (Rode *et al.* 2015, Atwood *et al.* 2016b). The remains of subsistence-harvested bowhead whales at Cross and Barter islands provide a readily available food attractant in these areas (Schliebe *et al.* 2006). However, the contribution of bowhead carcasses to the diet of Southern Beaufort Sea (SBS) polar bears varies annually (*e.g.*, estimated as 11–26 percent and 0–14 percent in 2003 and 2004, respectively) and by sex, likely depending on carcass and seal availability as well as ice conditions (Bentzen *et al.* 2007).

Polar bears have no natural predators (though cannibalism is known to occur; Stirling *et al.* 1993, Amstrup *et al.* 2006b). However, their life-history (*e.g.*, late maturity, small litter size, prolonged breeding interval) is conducive to low intrinsic population growth (*i.e.*, growth in the absence of human-caused mortality), which was estimated at 6 percent to 7.5 percent for the SBS stock during 2004–2006 (Regehr *et al.* 2010; Hunter *et al.* 2010). The lifespan of wild polar bears is approximately 25 years (Rode *et al.* 2020). Females reach sexual maturity at 3–6 years old giving birth 1 year later (Ramsay and Stirling 1988). In the SBS region, females typically give birth at 5 years old (Lentfer & Hensel 1980). On average, females in the SBS produce litter sizes of 1.9 cubs (SD=0.5; Smith *et al.* 2007, 2010, 2013; Robinson 2014) at intervals that vary from 1 to 3 or more years depending on cub survival (Ramsay and Stirling 1988) and foraging conditions. For example, when foraging conditions are unfavorable, polar bears may delay reproduction in favor of survival (Derocher and Stirling 1992; Eberhardt 2002). The determining factor for growth of polar bear stocks is adult female survival (Eberhardt 1990). In general, rates above 90 percent are essential to sustain polar bear stocks (Amstrup and Durner 1995) given low cub litter survival, which was estimated at 50 percent (90 percent CI: 33–67 percent) for the SBS stock during 2001–2006 (Regehr *et al.* 2010). In the SBS, the probability that adult females will survive and produce cubs-of-the-year is negatively correlated with ice-free periods over the continental shelf (Regehr *et al.* 2007a). In general, survival of cubs-of-the-year is positively related to the weight of the mother and their own weight (Derocher and Stirling 1996; Stirling *et al.* 1999).

Females without dependent cubs typically breed in the spring (Amstrup 2003, Stirling *et al.* 2016). Pregnant females enter maternity dens between October and December (Durner *et al.* 2001; Amstrup 2003), and young are usually born between early December and early January (Van de Velde *et al.* 2003). Only pregnant females den for an extended period during the winter (Rode *et al.* 2018). Other polar bears may excavate temporary dens to escape harsh winter conditions; however, shelter denning is rare for Alaskan polar bear stocks (Olson *et al.* 2017).

Typically, SBS females denning on land, emerge from the den with their cubs around mid-March (median emergence: March 11, Rode *et al.* 2018, USGS 2018), and commonly begin weaning when cubs are approximately

2.3–2.5 years old (Ramsay and Stirling 1986, Arnould and Ramsay 1994, Amstrup 2003, Rode 2020). Cubs are born blind, with limited fat reserves, and are able to walk only after 60–70 days (Blix and Lentfer 1979; Kenny and Bickel 2005). If a female leaves a den during early denning, cub mortality is likely to occur due to a variety of factors including susceptibility to cold temperatures (Blix and Lentfer 1979, Hansson and Thomassen 1983, Van de Velde 2003), predation (Derocher and Wiig 1999, Amstrup *et al.* 2006b), and mobility limitations (Lentfer 1975). Therefore, it is thought that successful denning, birthing, and rearing activities require a relatively undisturbed environment. A more detailed description of the potential consequences of disturbance to denning females can be found below in Potential Effects of Oil and Gas Industry Activities on Pacific Walrus, Polar Bear, and Prey Species: *Polar Bear: Effects to Denning Bears*. Radio and satellite telemetry studies indicate that denning can occur in multiyear pack ice and on land (Durner *et al.* 2020). The proportion of dens on land has been increasing along the Alaska region (34.4 percent in 1985–1995 to 55.2 percent in 2007–2013; Olson *et al.* 2017) likely in response to reductions in stable old ice, which is defined as sea ice that has survived at least one summer's melt (Bowditch 2002), increases in unconsolidated ice, and lengthening of the melt season (Fischbach *et al.* 2007, Olson *et al.* 2017). If sea-ice extent in the Arctic continues to decrease and the amount of unstable ice increases, a greater proportion of polar bears may seek to den on land (Durner *et al.* 2006, Fischbach *et al.* 2007, Olson *et al.* 2017).

In Alaska, maternal polar bear dens occur on 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, and deltas (*e.g.*, those associated with the Colville and Canning Rivers), much of the North Slope coastal plain (in particular within the 1002 Area, *i.e.*, the land designated in section 1002 of the Alaska National Interest Lands Conservation Act—part of the Arctic National Wildlife Refuge in northeastern Alaska; Amstrup 1993, Durner *et al.* 2006), and coastal bluffs that occur at the interface of mainland and marine habitat (Durner *et al.* 2006, 2013, 2020; Blank 2013; Wilson and Durner 2020). These types of terrestrial habitat are also designated as critical habitat for the polar bear under the Endangered Species Act (75 FR 76086, December 7, 2010). Management and

conservation concerns for the SBS and Chukchi/Bering Seas (CS) polar bear stocks include sea-ice loss due to climate change, human-bear conflict, oil and gas industry activity, oil spills and contaminants, marine shipping, disease, and the potential for overharvest (Regehr *et al.* 2017; U.S. Fish and Wildlife Service 2016). Notably, reductions in physical condition, growth, and survival of polar bears have been associated with declines in sea-ice (Rode *et al.* 2014, Bromaghin *et al.* 2015, Regehr *et al.* 2007, Lunn *et al.* 2016). The attrition of summer Arctic sea-ice is expected to remain a primary threat to polar bear populations (Amstrup *et al.* 2008, Stirling and Derocher 2012), since projections indicate continued climate warming at least through the end of this century (Atwood *et al.* 2016a, IPCC 2014) (see section on Climate Change for further details).

In 2008, the Service listed polar bears as threatened under the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*; ESA) due to the loss of sea-ice habitat caused by climate change (73 FR 28212, May 15, 2008). The Service later published a final rule under section 4(d) of the ESA for the polar bear, which was vacated and then reinstated when procedural requirements were satisfied (78 FR 11766, February 20, 2013). This section 4(d) rule provides for measures that are necessary and advisable for the conservation of polar bears. Specifically, the 4(d) rule: (a) Adopts the conservation regulatory requirements of the MMPA and the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) for the polar bear as the appropriate regulatory provisions, in most instances; (b) provides that incidental, nonlethal take of polar bears resulting from activities outside the bear's current range is not prohibited under the ESA; (c) clarifies that the special rule does not alter the section 7 consultation requirements of the ESA; and (d) applies the standard ESA protections for threatened species when an activity is not covered by an MMPA or CITES authorization or exemption.

The Service designated critical habitat for polar bear populations in the United States effective January 6, 2011 (75 FR 76086, December 7, 2010). The designation of 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. Under section 7 of the ESA, if there is a Federal action, the Service will analyze the potential impacts of the action upon polar bears and any

designated critical habitat. Polar bear critical habitat units include 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; it is used for denning, refuge from human disturbance, access to maternal dens and feeding habitat, and travel along the coast. Sea-ice habitat is located over the continental shelf and includes water 300 m (~984 ft) or less in depth. Terrestrial denning habitat includes lands within 32 km (~20 mi) of the northern coast of Alaska between the Canadian border and the Kavik River and within 8 km (~5 mi) between the Kavik River and Utqiagvik. The total area designated under the ESA as critical habitat covers approximately 484,734 km² (~187,157 mi²) and is entirely within the lands and waters of the United States. Polar bear critical habitat is described in detail in the final rule that designated polar bear critical habitat (75 FR 76086, December 7, 2010). A digital copy of the final critical habitat rule is available at: http://www.fws.gov/r7/fisheries/mmm/polarbear/pdf/federal_register_notice.pdf.

Stock Size and Range

In Alaska, polar bears have historically been observed as far south in the Bering Sea as St. Matthew Island and the Pribilof Islands (Ray 1971). A detailed description of the SBS polar bear stock can be found in the draft revised Polar Bear (*Ursus maritimus*) Stock Assessment Reports published in the **Federal Register** on June 22, 2017 (82 FR 28526). Digital copies of these draft revised Stock Assessment Reports are available at: <https://www.fws.gov/r7/fisheries/mmm/polarbear/pdf/Southern%20Beaufort%20Sea%20Draft%20SAR%20%20for%20public%20comment.pdf> And https://www.fws.gov/r7/fisheries/mmm/polarbear/pdf/Chukchi_Bering%20Sea%20Draft%20SAR%20for%20public%20comment.pdf.

Southern Beaufort Sea Stock

The SBS polar bear stock is shared between Canada and Alaska. Radio-telemetry data, combined with ear tag returns from harvested bears, suggest that the SBS stock occupies a region with a western boundary near Icy Cape, Alaska (Scharf *et al.* 2019), and an eastern boundary near Tuktoyaktuk, Northwest Territories, Canada (Durner *et al.* 2018).

The most recent population estimates for the Alaska SBS stock were produced by the U.S. Geological Survey (USGS) in 2020 (Atwood *et al.* 2020) and are based on mark-recapture and collared bear data collected from the SBS stock from 2001 to 2016. The SBS stock declined from 2003 to 2006 (this was also reported by Bromaghin *et al.* 2015) but stabilized from 2006 through 2015. The stock may have increased in size from 2009 to 2012; however, low survival in 2013 appears to have offset those gains. Atwood *et al.* (2020) provide estimates for the portion of the SBS stock only within the State of Alaska; however, their updated abundance estimate from 2015 is consistent with the estimate from Bromaghin *et al.* (2015) for 2010. Thus, the number of bears in the SBS stock is thought to have remained constant since the Bromaghin *et al.* (2015) estimate of 907 bears. This number is also supported by survival rate estimates provided by Atwood *et al.* (2020) that were relatively high in 2001–2003, decreased during 2004–2008, then improved in 2009, and remained high until 2015, except for much lower rates in 2012.

Pacific Walrus

Pacific walrus constitute a single panmictic population (Beatty *et al.* 2020) primarily inhabiting the shallow continental shelf waters of the Bering and Chukchi Seas where their distribution is largely influenced by the extent of the seasonal pack ice and prey densities (Lingqvist *et al.* 2009; Berta and Churchill 2012; USFWS 2017). From April to June, most of the population migrates from the Bering Sea through the Bering Strait and into the Chukchi Sea along lead systems that develop in the sea-ice and that, are closely associated with the edge of the seasonal pack ice during the open-water season (Truhkin and Simokon 2018). By July, tens of thousands of animals can be found along the edge of the pack ice from Russian waters to areas west of Point Barrow, Alaska (Fay 1982; Gilbert *et al.* 1992; Belikov *et al.* 1996; USFWS 2017). The pack ice has historically advanced rapidly southward in late fall, and most walrus return to the Bering Sea by mid- to late-November. During the winter breeding season, walrus are found in three concentration areas in the Bering Sea where open leads, polynyas, or thin ice occur (Fay 1982; Fay *et al.* 1984, Garlich-Miller *et al.* 2011a; Duffy-Anderson *et al.* 2019). While the specific location of these groups varies annually and seasonally depending upon the extent of the sea-ice, generally one group occurs near the Gulf of Anadyr, another south of St.

Lawrence Island, and a third in the southeastern Bering Sea south of Nunivak Island into northwestern Bristol Bay (Fay 1982; Mymrin *et al.* 1990; Garlich-Miller *et al.* 2011 USFWS 2017).

Although most walrus remain either in the Chukchi (for adult females and dependent young) or Bering (for adult males) Seas throughout the summer months, a few occasionally range into the Beaufort Sea in late summer (Mymrin *et al.* 1990; Garlich-Miller and Jay 2000; USFWS 2017). Industry monitoring reports have observed no more than 38 walrus in the Beaufort Sea ITR region geographic between 1995 and 2015, with only a few instances of disturbance to those walrus (AES Alaska 2015, Kalxdorff and Bridges 2003, USFWS unpubl. data). The USGS and the Alaska Department of Fish and Game (ADF&G) have fitted between 30–60 walrus with satellite transmitters each year during spring and summer since 2008 and 2013 respectively. In 2014, a female tagged by ADF&G spent about 3 weeks in Harrison Bay, Beaufort Sea (ADF&G 2014). The USGS tracking data indicates that at least one tagged walrus ventured into the Beaufort Sea for brief periods in all years except 2011. Most of these movements extend northeast of Utqiagvik to the continental shelf edge north of Smith Bay (USGS 2015). All available information indicates that few walrus currently enter the Beaufort Sea and those that do, spend little time there. The Service and USGS are conducting multiyear studies on the walrus population to investigate movements and habitat use patterns, as it is possible that as sea-ice diminishes in the Chukchi Sea beyond the 5-year period of this proposed rule, walrus distribution and habitat use may change.

Walrus are generally found in waters of 100 m (328 ft) or less where they utilize sea-ice for passive transportation and rest over feeding areas, avoid predators, and birth and nurse their young (Fay 1982; Ray *et al.* 2006; Rosen 2020). The diet of walrus consists primarily of benthic invertebrates, most notably mollusks (Class Bivalvia) and marine worms (Class Polychaeta) (Fay 1982; Fay 1985; Bowen and Siniff 1999; Born *et al.* 2003; Dehn *et al.* 2007; Sheffield and Grebmeier 2009; Maniscalco *et al.* 2020). When foraging, walrus are capable of diving to great depths with most dives lasting between 5 and 10 minutes with a 1–2-minute surface interval (Fay 1982; Bowen and Siniff 1999; Born *et al.* 2003; Dehn *et al.* 2007; Sheffield and Grebmeier 2009). The foraging activity of walrus is thought

to have a significant influence on the ecology of the Bering and Chukchi Seas by disturbing the sea floor, thereby releasing nutrients into the water column that provide food for scavenger organisms and contributing to the diversity of the benthic community (Oliver *et al.* 1983; Klaus *et al.* 1990; Ray *et al.* 2006). In addition to feeding on benthic invertebrates, native hunters have also reported incidences of walrus preying on seals, fish, and other vertebrates (Fay 1982; Sheffield and Grebmeier 2009; Seymour *et al.* 2014).

Walrus are social and gregarious animals that often travel and haul-out onto ice or land in groups where they spend approximately 20–30 percent of their time out of the water (Gilbert 1999; Kastelien 2002; Jefferson *et al.* 2008; Monson *et al.* 2013; USFWS 2017). Hauled-out walrus tend to be in close physical contact, with groups ranging from a few animals up to 10s of thousands of individuals—the largest aggregations occurring at land haul-outs (Gilbert 1999; Monson *et al.* 2013; MacCracken 2017). In recent years, the barrier islands north of Point Lay, Alaska, have held large aggregations of walrus (20,000 – 40,000) in late summer and fall (Monson *et al.* 2013; USFWS 2017).

The size of the 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 following European contact fluctuated markedly in response to varying levels of human exploitation. Large-scale commercial harvests are thought to have reduced the population to 50,000–100,000 animals in the mid-1950s (Fay *et al.* 1989). Following the implementation of harvest regulations in the 1960s and 1970s, which limited the take of females, the population increased rapidly and likely reached or exceeded the food-based carrying capacity of the region by 1980 (Fay *et al.* 1989, Fay *et al.* 1997, Garlich-Miller *et al.* 2006, MacCracken *et al.* 2014).

Between 1975 and 1990, aerial surveys conducted jointly by the United States and Russia at 5-year intervals produced population estimates ranging from about 200,000 to 255,000 individuals with large confidence intervals (Fay 1957; Fay 1982; Speckman *et al.* 2011). Efforts to survey the walrus population were suspended by both countries after 1990 following problems with survey methods that severely limited their utility. In 2006,

the United States and Russia conducted another joint aerial survey in the pack ice of the Bering Sea using thermal imaging systems to more accurately count walrus hauled out on sea-ice and applied satellite transmitters to account for walrus in the water (Speckman *et al.* 2011). In 2013, the Service began a genetic mark-recapture study to estimate population size. An initial analysis of data from 2013–2015 led to the most recent estimate of 283,213 Pacific walrus with a 95% credible interval of 93,000 to 478,975 individuals (Beatty 2017). Although this is the most recent estimate of Pacific walrus population size, it should be used with caution as it is preliminary.

Taylor and Udevitz (2015) used data from five aerial surveys and with ship-based age and sex composition counts that occurred in 1981–1984, 1998, and 1999 (Citta *et al.* 2014) in a Bayesian integrated population model to estimate population trends and vital rates in the period 1975–2006. They recalculated the 1975–1990 aerial survey estimates based on a lognormal distribution for inclusion in their model. Their results generally agreed with the large-scale population trends identified by Citta *et al.* (2014) but with slightly different population estimates in some years along with more precise confidence intervals. Ultimately, Taylor and Udevitz (2015) concluded (i) that though their model provides improved clarity on past walrus population trends and vital rates, it cannot overcome the large uncertainties in the available population size data, and (ii) that the absolute size of the Pacific walrus population will continue to be speculative until accurate empirical estimation of the population size becomes feasible.

A detailed description of the Pacific walrus stock can be found in the Pacific Walrus (*Odobenus rosmarus divergens*) Species Status Assessment (USFWS 2017). A digital copy of the Species Status Assessment is available at: <https://ecos.fws.gov/ServCat/DownloadFile/132114?Reference=86869>.

Polar bears are known to prey on walrus, particularly calves, and killer whales (*Orcinus orca*) have been known to take all age classes of walrus (Frost *et al.* 1992, Melnikov and Zagrebina 2005; Rode *et al.* 2014; Truhkin and Simokon 2018). Predation rates are unknown but are thought to be highest near terrestrial haul-out sites where large aggregations of walrus can be found, however, few observations exist of predation upon walrus further offshore.

Walrus have been hunted by coastal Alaska Natives and native people of the Chukotka, Russian Federation, for thousands of years (Fay *et al.* 1989). Exploitation of the walrus population by Europeans has also occurred in varying degrees since the arrival of exploratory expeditions (Fay *et al.* 1989). Commercial harvest of walrus ceased in the United States in 1941, and sport hunting ceased in 1972 with the passage of the MMPA and ceased in 1990 in Russia. Presently, walrus hunting in Alaska is restricted to subsistence use by Alaska Natives. Harvest mortality during 2000–2018 for both the United States and Russian Federation averaged 3,207 (SE = 194) walrus per year. This mortality estimate includes corrections for under-reported harvest and struck and lost animals. Harvests have been declining by about 3 percent per year since 2000 and were exceptionally low in the United States in 2012–2014. Resource managers in Russia have concluded that the population has declined and have reduced harvest quotas in recent years accordingly (Kochnev 2004; Kochnev 2005; Kochnev 2010; pers. comm.; Litovka 2015, pers. comm.) based in part on the lower abundance estimate generated from the 2006 survey. Total harvest quotas in Russia were further decreased in 2020 to 1,088 walrus (Ministry of Agriculture of the Russian Federation Order of March 23, 2020).

Intra-specific trauma at coastal haul-outs is also a known source of injury and mortality (Garlich-Miller *et al.* 2011). The risk of stampede-related injuries increases with the number of animals hauled out and with the duration spent on coastal haulouts, with calves and young being the most vulnerable to suffer injuries and/or mortality (USFWS 2017). However, management and protection programs in both the United States and the Russian Federation have been somewhat successful in reducing disturbances and large mortality events at coastal haul-outs (USFWS 2015).

Climate Change

Global climate change will impact the future of both Pacific walrus and polar bear populations. As atmospheric greenhouse gas concentrations increase so will global temperatures (Pierrehumbert 2011; IPCC 2014) with substantial implications for the Arctic environment and its inhabitants (Bellard *et al.* 2012, Scheffers *et al.* 2016, Harwood *et al.* 2001, Nunez *et al.* 2019). The Arctic has warmed at twice the global rate (IPCC 2014), and long-term data sets show that substantial reductions in both the extent and

thickness of Arctic sea-ice cover have occurred over the past 40 years (Meier *et al.* 2014, Frey *et al.* 2015). Stroeve *et al.* (2012) estimated that, since 1979, the minimum area of fall Arctic sea-ice declined by over 12 percent per decade through 2010. Record low minimum areas of fall Arctic sea-ice extent were recorded in 2002, 2005, 2007, and 2012. Further, observations of sea-ice in the Beaufort Sea have shown a trend since 2004 of sea-ice break-up earlier in the year, reformation of sea-ice later in the year, and a greater proportion of first-year ice in the ice cover (Galley *et al.* 2016). The overall trend of decline of Arctic sea-ice is expected to continue for the foreseeable future (Stroeve *et al.* 2007, Amstrup *et al.* 2008, Hunter *et al.* 2010, Overland and Wang 2013, 73 FR 28212, May 15, 2008, IPCC 2014). Decline in Arctic sea ice affects Arctic species through habitat loss and altered trophic interactions. These factors may contribute to population distribution changes, population mixing, and pathogen transmission (Post *et al.* 2013), which further impact population health.

For polar bears, sea-ice habitat loss due to climate change has been identified as the primary cause of conservation concern (*e.g.*, Stirling and Derocher 2012, Atwood *et al.* 2016b, USFWS 2016). A 42 percent loss of optimal summer polar bear habitat throughout the Arctic is projected for the decade of 2045–2054 (Durner *et al.* 2009). A recent global assessment of the vulnerability of the 19 polar bear stocks to future climate warming ranked the SBS as one of the three most vulnerable stocks (Hamilton and Derocher 2019). The study, which examined factors such as the size of the stock, continental shelf area, ice conditions, and prey diversity, attributed the high vulnerability of the SBS stock primarily to deterioration of ice conditions. The SBS polar bear stock occurs within the Polar Basin Divergent Ecoregion (PBDE), which is characterized by extensive sea-ice formation during the winters and the sea ice melting and pulling away from the coast during the summers (Amstrup *et al.* 2008). Projections show that polar bear stocks within the PBDE may be extirpated within the next 45–75 years at current rates of sea-ice declines (Amstrup *et al.* 2007, Amstrup *et al.* 2008). Atwood *et al.* (2016) also predicted that polar bear stocks within the PBDE will be more likely to greatly decrease in abundance and distribution as early as the 2020–2030 decade primarily as a result of sea-ice habitat loss.

Sea-ice habitat loss affects the distribution and habitat use patterns of the SBS polar bear stock. When sea ice

melts during the summer, polar bears in the PBDE may either stay on land throughout the summer or move with the sea ice as it recedes northward (Durner *et al.* 2009). The SBS stock, and to a lesser extent the Chukchi Sea stock, are increasingly utilizing marginal habitat (*i.e.*, land and ice over less productive waters) (Ware *et al.* 2017). Polar bear use of Beaufort Sea coastal areas has increased during the fall open-water period (June through October). Specifically, the percentage of radio-collared adult females from the SBS stock utilizing terrestrial habitats has tripled over 15 years, and SBS polar bears arrive onshore earlier, stay longer, and leave to the sea ice later (Atwood *et al.* 2016b). This change in polar bear distribution and habitat use has been correlated with diminished sea ice and the increased distance of the pack ice from the coast during the open-water period (*i.e.*, the less sea ice and the farther from shore the leading edge of the pack ice is, the more bears are observed onshore) (Schliebe *et al.* 2006; Atwood *et al.* 2016b).

The current trend for sea-ice in the SBS region will result in increased distances between the ice edge and land, likely resulting in more bears coming ashore during the open-water period (Schliebe *et al.* 2008). More polar bears on land for a longer period of time may increase both the frequency and the magnitude of polar bear exposure to human activities, including an increase in human–bear interactions (Townes *et al.* 2009, Schliebe *et al.* 2008, Atwood *et al.* 2016b). Polar bears spending more time in terrestrial habitats also increases their risk of exposure to novel pathogens that are expanding north as a result of a warmer Arctic (Atwood *et al.* 2016b, 2017). Heightened immune system activity and more infections (indicated by elevated number of white blood cells) have been reported for the SBS polar bears that summer on land when compared to those on sea ice (Atwood *et al.* 2017; Whiteman *et al.* 2019). The elevation in immune system activity represents additional energetic costs that could ultimately impact stock and individual fitness (Atwood *et al.* 2017; Whiteman *et al.* 2019). Prevalence of parasites such as the nematode *Trichinella nativa* in many Arctic species, including polar bears, pre-dates the recent global warming. However, parasite prevalence could increase as a result of changes in diet (*e.g.*, increased reliance on conspecific scavenging) and feeding habits (*e.g.*, increased consumption of seal muscle) associated with climate-induced reduction of

hunting opportunities for polar bears (Penk *et al.* 2020, Wilson *et al.* 2017).

The continued decline in sea-ice is also projected to reduce connectivity among polar bear stocks and potentially lead to the impoverishment of genetic diversity that is key to maintaining viable, resilient wildlife populations (Derocher *et al.* 2004, Cherry *et al.* 2013, Kutcher *et al.* 2016). The circumpolar polar bear population has been divided into six genetic clusters: The Western Polar Basin (which includes the SBS and CS stocks), the Eastern Polar Basin, the Western and Eastern Canadian Archipelago, and Norwegian Bay (Malenfant *et al.* 2016). There is moderate genetic structure among these clusters, suggesting polar bears broadly remain in the same cluster when breeding. While there is currently no evidence for strong directional gene flow among the clusters (Malenfant *et al.* 2016), migrants are not uncommon and can contribute to gene flow across clusters (Kutschera *et al.* 2016). Changing sea-ice conditions will make these cross-cluster migrations (and the resulting gene flow) more difficult in the future (Kutschera *et al.* 2016).

Additionally, habitat loss from decreased sea-ice extent may impact polar bear reproductive success by reducing or altering suitable denning habitat and extending the polar bear fasting season (Rode *et al.* 2018, Stirling and Derocher 2012, Molnár *et al.* 2020). In the early 1990s, approximately 50 percent of the annual maternal dens of the SBS polar bear stock occurred on land (Amstrup and Gardner 1994). Along the Alaskan region the proportion of terrestrial dens increased from 34.4 percent in 1985–1995 to 55.2 percent in 2007–2013 (Olson *et al.* 2017). Polar bears require a stable substrate for denning. As sea-ice conditions deteriorate and become less stable, sea-ice dens can become vulnerable to erosion from storm surges (Fischbach *et al.* 2007). Under favorable autumn snowfall conditions, SBS females denning on land had higher reproductive success than SBS females denning on sea-ice. Factors that may influence the higher reproductive success of females with land-based dens include longer denning periods that allow cubs more time to develop, higher snowfall conditions that strengthen den integrity throughout the denning period (Rode *et al.* 2018), and increased foraging opportunities on land (*e.g.*, scavenging on Bowhead whale carcasses) (Atwood *et al.* 2016b). While SBS polar bear females denning on land may experience increased reproductive success, at least under favorable snowfall conditions, it is possible that

competition for suitable denning habitat on land may increase due to sea-ice decline (Fischbach *et al.* 2007) and land-based dens may be more vulnerable to disturbance from human activities (Linnell *et al.* 2000).

Polar bear reproductive success may also be impacted by declines in sea ice through an extended fasting season (Molnár *et al.* 2020). By 2100, recruitment is predicted to become jeopardized in nearly all polar bear stocks if greenhouse gas emissions remain uncurbed (RCP8.5 [Representative Concentration Pathway 8.5] scenario) as fasting thresholds are increasingly exceeded due to declines in sea-ice across the Arctic circumpolar range (Molnár *et al.* 2020). As the fasting season increases, most of these 12 stocks, including in the SBS, are expected to first experience significant adverse effects on cub recruitment followed by effects on adult male survival and lastly on adult female survival (Molnár *et al.* 2020). Without mitigation of greenhouse gas emissions and assuming optimistic polar bear responses (*e.g.*, reduced movement to conserve energy), cub recruitment in the SBS stock has possibly been already adversely impacted since the late 1980s while detrimental impacts on male and female survival are forecasted to possibly occur in the late 2030s and 2040s, respectively.

Extended fasting seasons are associated with poor body condition (Stirling and Derocher 2012), and a female's body condition at den entry is a critical factor that determines whether the female will produce cubs and the cubs' chance of survival during their first year (Rode *et al.* 2018). Additionally, extended fasting seasons will cause polar bears to depend more heavily on their lipid reserves for energy, which can release lipid-soluble contaminants, such as persistent organic pollutants and mercury, into the bloodstream and organ tissues. The increased levels of contaminants in the blood and tissues can affect polar bear health and body condition, which has implications for reproductive success and survival (Jenssen *et al.* 2015).

Changes in sea-ice can impact polar bears by altering trophic interactions. Differences in sea-ice dynamics such as the timing of ice formation and breakup, as well as changes in sea-ice type and concentration may impact the distribution of polar bears and/or their prey's occurrence and reduce polar bears' access to prey. A climate-induced reduction in overlap between female polar bears and ringed seals was detected after a sudden sea-ice decline in Norway that limited the ability of

females to hunt on sea-ice (Hamilton *et al.* 2017). While polar bears are opportunistic and hunt other species, their reliance on ringed seals is prevalent across their range (Thiemann *et al.* 2007, 2008; Florko *et al.* 2020; Rode *et al.* 2021). Male and female polar bears exhibit differences in prey consumption. Females typically consume more ringed seals compared to males, which is likely related to more limited hunting opportunities for females (*e.g.*, prey size constraints) (McKinney *et al.* 2017, Bourque *et al.* 2020). Female body condition has been positively correlated with consumption of ringed seals, but negatively correlated with the consumption of bearded seals (Florko *et al.* 2020). Consequently, females are more prone to decreased foraging and reproductive success than males during years in which unfavorable sea-ice conditions limit polar bears' access to ringed seals (Florko *et al.* 2020).

In the SBS stock, adult female and juvenile polar bear consumption of ringed seals was negatively correlated with winter Arctic oscillation, which affects sea-ice conditions. This trend was not observed for male polar bears. Instead, male polar bears consumed more bowhead whale as a result of scavenging the carcasses of subsistence-harvested bowhead whales during years with a longer ice-free period over the continental shelf. It is possible that these alterations in sea-ice conditions may limit female polar bears' access to ringed seals, and male polar bears may rely more heavily on alternative onshore food resources in the southern Beaufort Sea region (McKinney *et al.* 2017). Changes in the availability and distribution of seals may influence polar bear foraging efficiency. Reduction in sea ice is expected to render polar bear foraging energetically more demanding, as moving through fragmented sea ice and open-water swimming require more energy than walking across consolidated sea ice (Cherry *et al.* 2009, Pagano *et al.* 2012, Rode *et al.* 2014, Durner *et al.* 2017). Inefficient foraging can contribute to nutritional stress and poor body condition, which can have implications for reproductive success and survival (Regehr *et al.* 2010).

The decline in Arctic sea ice is associated with the SBS polar bear stock spending more time in terrestrial habitats (Schliebe *et al.* 2008). Recent changes in female denning habitat and extended fasting seasons as a result of sea-ice decline may affect the reproductive success of the SBS polar bear stock (Rode *et al.* 2018; Stirling and Derocher 2012; Molnár *et al.* 2020). Other relevant factors that could

negatively affect the SBS polar bear stock include changes in prey availability, reduced genetic diversity through limited population connectivity and/or hybridization with other bear species, increased exposure to disease and parasite prevalence and/or dissemination, impacts of human activities (oil and gas exploration/extraction, shipping, harvesting, etc.) and pollution (Post *et al.* 2013; Hamilton and Derocher 2019). Based on the projections of sea-ice decline in the Beaufort Sea region and demonstrated impacts on SBS polar bear utilization of sea-ice and terrestrial habitats, the Service anticipates that polar bear use of the Beaufort Sea coast will continue to increase during the open-water season.

For walrus, climate change may affect habitat and prey availability. The loss of Arctic sea ice has affected walrus distribution and habitat use in the Bering and Chukchi Seas (Jay *et al.* 2012). Walrus use sea ice as a breeding site, a location to birth and nurse young, and a protective cover from storms and predation, however, if the sea ice retreats north of the continental shelf break in the Chukchi Sea, walrus can no longer use it for these purposes. Thus, loss of sea ice is associated with increased use of coastal haul-outs during the summer, fall, and early winter (Jay *et al.* 2012). Coastal haul-outs are potentially dangerous for walrus, as they can stampede toward the water when disturbed, resulting in injuries and mortalities (Garlich-Miller *et al.* 2011). Use of land haul-outs is also more energetically costly, with walrus hauled out on land spending more time in water but not foraging than those hauled out on sea ice. This difference has been attributed to an increase in travel time in the water from land haul-outs to foraging areas (Jay *et al.* 2017). Higher walrus abundance at these coastal haul-outs may also increase exposure to environmentally and density-dependent pathogens (Post *et al.* 2013). Climate change impacts through habitat loss and changes in prey availability could affect walrus population stability. It is unknown if walrus will utilize the Beaufort Sea more heavily in the future due to climate change effects; however, considering the low number of walrus observed in the Beaufort Sea (see *Take Estimates for Pacific Walrus and Polar Bears*), it appears that walrus will remain uncommon in the Beaufort Sea for the next 5 years.

Potential Effects of the Specified Activities on Subsistence Uses

Polar Bear

Based on subsistence harvest reports, polar bear hunting is less prevalent in communities on the north coast of Alaska than it is in west coast communities. There are no quotas under the MMPA for Alaska Native polar bear harvest in the Southern Beaufort Sea; however, there is a Native-to-Native agreement between the Inuvialuit in Canada and the Inupiat in Alaska. This agreement, the Inuvialuit-Inupiat Polar Bear Management Agreement, established quotas and recommendations concerning protection of denning females, family groups, and methods of take. Although this Agreement is voluntary in the United States and does not have the force of law, legally enforceable quotas are administered in Canada. In Canada, users are subject to provincial regulations consistent with the Agreement. Commissioners for the Agreement set the original quota at 76 bears in 1988, split evenly between the Inuvialuit in Canada and the Inupiat in the United States. In July 2010, the quota was reduced to 70 bears per year. Subsequently, in Canada, the boundary of the SBS stock with the neighboring Northern Beaufort Sea stock was adjusted through polar bear management bylaws in the Inuvialuit Settlement Region in 2013, affecting Canadian quotas and harvest levels from the SBS stock. The current subsistence harvest established under the Agreement of 56 bears total (35 in the United States and 21 in Canada) reflect this change.

The Alaska Native subsistence harvest of polar bears from the SBS population has declined. From 1990 to 1999, an average of 42 bears were taken annually. The average subsistence harvest decreased to 21 bears annually from 2000–2010 and 11 bears annually from 2015–2020. The reason for the decline of harvested polar bears from the SBS population is unknown. Alaska Native subsistence hunters and harvest reports have not indicated a lack of opportunity to hunt polar bears or disruption by Industry activity.

Pacific Walrus

Few walrus are harvested in the Beaufort Sea along the northern coast of Alaska since their primary range is in the Bering and Chukchi Seas. Walrus constitute a small portion of the total marine mammal harvest for the village of Utqiagvik. Hunters from Utqiagvik have harvested 407 walrus since the year 2000 with 65 harvested since 2015.

Walrus harvest from Nuiqsut and Kaktovik is opportunistic. They have reported taking four walrus since 1993. None of the walrus harvests for Utqiagvik, Nuiqsut, or Kaktovik from 2014 to 2020 occurred within the Beaufort Sea ITR region.

Evaluation of Effects of the Specified Activities on Subsistence Uses

There are three primary Alaska Native communities on the Beaufort Sea whose residents rely on Pacific walrus and polar bears for subsistence use: Utqiagvik, Nuiqsut, and Kaktovik. Utqiagvik and Kaktovik are expected to be less affected by the Industry's proposed activities than Nuiqsut. Nuiqsut is located within 5 mi of ConocoPhillips' Alpine production field to the north and ConocoPhillips' Alpine Satellite development field to the west. However, Nuiqsut hunters typically harvest polar bears from Cross Island during the annual fall bowhead whaling. Cross Island is approximately 16 km (~10 mi) offshore from the coast of Prudhoe Bay. We have received no evidence or reports that bears are altering their habitat use patterns, avoiding certain areas, or being affected in other ways by the existing level of oil and gas activity near communities or traditional hunting areas that would diminish their availability for subsistence use. However, as is discussed in *Evaluation of Effects of Specified Activities on Pacific Walrus, Polar Bears, and Prey Species* below, the Service has found some evidence of fewer maternal polar bear dens near industrial infrastructure than expected.

Changes in Industry activity locations may trigger community concerns regarding the effect on subsistence uses. Industry must remain proactive to address potential impacts on the subsistence uses by affected communities through consultations and, where warranted, POCs. Evidence of communication with the public about proposed activities will be required as part of a LOA. Current methods of communication are variable and include venues such as public forums, which allow communities to express feedback prior to the initiation of operations, the employ of subsistence liaisons, and presentations to regional commissions. If community subsistence use concerns arise from new activities, appropriate mitigation measures, such as cessation of activities in key locations during hunting seasons, are available and will be applied as a part of the POC.

No unmitigable concerns from the potentially affected communities regarding the availability of walrus or polar bears for subsistence uses have

been identified through Industry consultations with the potentially affected communities of Utqiagvik, Kaktovik, or Nuiqsut. During the 2016–2021 ITR period, Industry groups have communicated with Native communities and subsistence hunters through subsistence representatives, community liaisons, and village outreach teams as well as participation in community and commission meetings. Based on information gathered from these sources, it appears that subsistence hunting opportunities for walruses and polar bears have not been affected by past Industry activities conducted pursuant to the 2016–2021 Beaufort ITR, and are not likely to be affected by the proposed activities described in this proposed ITR. Given the similarity between the nature and extent of Industry activities covered by the prior Beaufort Sea ITR and those specified in AOGA's pending Request, and the continued requirement for Industry to consult and coordinate with Alaska Native communities and representative subsistence hunting and co-management organizations (and develop a POC if necessary), we do not anticipate that the activities specified in AOGA's pending Request will have any unmitigable effects on the availability of Pacific walruses or polar bears for subsistence uses.

Potential Effects of the Specified Activities on Pacific Walruses, Polar Bears, and Prey Species

Industry activities can affect individual walruses and polar bears in numerous ways. Below, we provide a summary of the documented and potential effects of oil and gas industrial activities on both polar bears and walruses. The effects analyzed included harassment, lethal take, and exposure to oil spills.

Polar Bear: Human-Polar Bear Encounters

Oil and gas industry activities may affect individual polar bears in numerous ways during the open-water and ice-covered seasons. Polar bears are typically distributed in offshore areas associated with multiyear pack ice from mid-November to mid-July. From mid-July to mid-November, polar bears can be found in large numbers and high densities on barrier islands, along the coastline, and in the nearshore waters of the Beaufort Sea, particularly on and around Barter and Cross Islands. This distribution leads to a significantly higher number of human-polar bear encounters on land and at offshore

structures during the open-water period than other times of the year. Bears that remain on the multiyear pack ice are not typically present in the ice-free areas where vessel traffic occurs, as barges and vessels associated with Industry activities travel in open water and avoid large ice floes.

On land, the majority of Industry's bear observations occur within 2 km (1.2 mi) of the coastline. Industry facilities within the offshore and coastal areas are more likely to be approached by polar bears and may act as physical barriers to movements of polar bears. As bears encounter these facilities, the chances for human-bear interactions increase. The Endicott and West Dock causeways, as well as the facilities supporting them, have the potential to act as barriers to movements of polar bears because they extend continuously from the coastline to the offshore facility. However, polar bears have frequently been observed crossing existing roads and causeways. Offshore production facilities, such as Northstar, Spy Island, and Oooguruk, have frequently been approached by polar bears but appear to present only a small-scale, local obstruction to the bears' movement. Of greater concern is the increased potential for human-polar bear interaction at these facilities. Encounters are more likely to occur during the fall at facilities on or near the coast. Polar bear interaction plans, training, and monitoring required by past ITRs have proven effective at reducing human-polar bear encounters and the risks to bears and humans when encounters occur. Polar bear interaction plans detail the policies and procedures that Industry facilities and personnel will implement to avoid attracting and interacting with polar bears as well as minimizing impacts to the bears. Interaction plans also detail how to respond to the presence of polar bears, the chain of command and communication, and required training for personnel. Industry uses technology to aid in detecting polar bears including bear monitors, closed-circuit television, video cameras, thermal cameras, radar devices, and motion-detection systems. In addition, some companies take steps to actively prevent bears from accessing facilities by using safety gates and fences.

The noises, sights, and smells produced by the proposed project activities could disturb and elicit variable responses from polar bears. Noise disturbance can originate from either stationary or mobile sources. Stationary sources include construction,

maintenance, repair and remediation activities, operations at production facilities, gas flaring, and drilling operations. Mobile sources include aircraft traffic, geotechnical surveys, ice road construction, vehicle traffic, tracked vehicles, and snowmobiles.

The potential behavioral reaction of polar bears to the proposed activities can vary by activity type. Camp odors may attract polar bears, potentially resulting in human-bear encounters, unintentional harassment, intentional hazing, or possible lethal take in defense of human life (see 50 CFR 18.34 for further guidance on passive polar bear deterrence measures). Noise generated on the ground by industrial activity may cause a behavioral (*e.g.*, escape response) or physiologic (*e.g.*, increased heart rate, hormonal response) (Harms *et al.* 1997; Tempel and Gutierrez 2003) response. The available studies of polar bear behavior indicate that the intensity of polar bear reaction to noise disturbance may be based on previous interactions, sex, age, and maternal status (Anderson and Aars 2008; Dyck and Baydack 2004).

Polar Bear: Effects of Aircraft Overflights

Bears on the surface experience increased noise and visual stimuli when planes or helicopters fly above them, both of which may elicit a biologically significant behavioral response. Sound frequencies produced by aircraft will likely fall within the hearing range of polar bears (see Nachtigall *et al.* 2007) and will thus be audible to animals during flyovers or when operating in proximity to polar bears. Polar bears likely have acute hearing with previous sensitivities demonstrated between 1.4–22.5 kHz (tests were limited to 22.5 kHz; Nachtigall *et al.* 2007). This range, which is wider than that seen in humans, supports the idea that polar bears may experience temporary (called temporary threshold shift, or TTS) or permanent (called permanent threshold shift, or PTS) hearing impairment if they are exposed to high-energy sound. While species-specific TTS and PTS thresholds have not been established for polar bears, thresholds have been established for the general group “other marine carnivores” which includes both polar bears and walruses (Southall *et al.* 2019). Through a series of systematic modeling procedures and extrapolations, Southall *et al.* (2019) have generated modified noise exposure thresholds for both in-air and underwater sound (Table 1).

TABLE 1—TEMPORARY THRESHOLD SHIFT (TTS) AND PERMANENT THRESHOLD SHIFT (PTS) THRESHOLDS ESTABLISHED BY SOUTHALL *et al.* (2019) THROUGH MODELING AND EXTRAPOLATION FOR “OTHER MARINE CARNIVORES,” WHICH INCLUDES BOTH POLAR BEARS AND WALRUSES, IN DECIBELS (dB). IMPULSIVE THRESHOLDS ARE PROVIDED FOR SOUND ONSET.

	TTS		PTS	
	non-impulsive	impulsive	non-impulsive	impulsive
Air	157 dB	146 dB	177 dB	161 dB
Water	199 dB	188 dB	219 dB	203 dB

During an FAA test, test aircraft produced sound at all frequencies measured (50 Hz to 10 kHz) (Healy 1974; Newman 1979). At frequencies centered at 5 kHz, jets flying at 300 m (984 ft) produced $\frac{1}{3}$ octave band noise levels of 84 to 124 dB, propeller-driven aircraft produced 75 to 90 dB, and helicopters produced 60 to 70 dB (Richardson *et al.* 1995). Thus, the frequency and level of airborne sounds typically produced by Industry is unlikely to cause temporary or permanent hearing damage unless marine mammals are very close to the sound source. Although temporary or permanent hearing damage is not anticipated, impacts from aircraft overflights have the potential to elicit biologically significant behavioral responses from polar bears. Observations of polar bears during fall coastal surveys, which flew at much lower altitudes than typical Industry flights (see *Estimating Take Rates of Aircraft Activities*), indicate that the reactions of non-denning polar bears is typically varied but limited to short-term changes in behavior ranging from no reaction to running away. Bears associated with dens have been shown to increase vigilance, initiate rapid movement, and even abandon dens when exposed to low-flying aircraft (see *Effects to Denning Bears* for further discussion). Aircraft activities can impact bears over all seasons; however, during the summer and fall seasons, aircraft have the potential to disturb both individuals and congregations of polar bears. These onshore bears spend most of their time resting and limiting their movements on land. Exposure to aircraft traffic is expected to result in changes in behavior, such as going from resting to walking or running and therefore, has the potential to be energetically costly. Mitigation measures, such as minimum flight elevations over polar bears and habitat areas of concern as well as flight restrictions around known polar bear aggregations when safe, are included in this proposed ITR to achieve least

practicable adverse impact to polar bears by aircraft.

Polar Bear: Effects of In-Water Activities

In-water sources of sound, such as pile driving, screeding, dredging, or vessel movement, may disturb polar bears. In the open-water season, Industry activities are generally limited to relatively ice-free, open water. During this time in the Beaufort Sea, polar bears are typically found either on land or on the pack ice, which limits the chances of the interaction of polar bears with offshore Industry activities. Though polar bears have been observed in open water miles from the ice edge or ice floes, the encounters are relatively rare (although the frequency of such observations may increase due to sea ice change). However, if bears come in contact with Industry operations in open water, the effects of such encounters likely include no more than short-term behavioral disturbance.

While polar bears swim in and hunt from open water, they spend less time in the water than most marine mammals. Stirling (1974) reported that polar bears observed near Devon Island during late July and early August spent 4.1 percent of their time swimming and an additional 0.7 percent engaged in aquatic stalking of prey. More recently, application of tags equipped with time-depth recorders indicate that aquatic activity of polar bears is greater than was previously thought. In a study published by Lone *et al.* (2018), 75 percent of polar bears swam daily during open-water months, with animals spending 9.4 percent of their time in July in the water. Both coastal and pack-ice-dwelling animals were tagged, and there were no significant differences in the time spent in the water by animals in the two different habitat types. While polar bears typically swim with their ears above water, Lone *et al.* (2018) found polar bears in this study that were fitted with depth recorders (n=6) spent approximately 24 percent of their time in the water with their head underwater.

The pile driving, screeding, dredging, and other in-water activities proposed

by Industry introduce substantial levels of noise into the marine environment. Underwater sound levels from construction along the North Slope have been shown to range from 103 decibels (dB) at 100 m (328 ft) for auguring to 143 dB at 100 m (328 ft) for pile driving (Greene *et al.* 2008) with most of the energy below 100 Hz. Airborne sound levels from these activities range from 65 dB at 100 m (328 ft) for a bulldozer and 81 dB at 100 m (328 ft) for pile driving, with most of the energy for in-air levels also below 100 Hz (Greene *et al.* 2008). Therefore, in-water activities are not anticipated to result in temporary or permanent damage to polar bear hearing.

In 2012, during the open-water season, Shell vessels encountered a few polar bears swimming in ice-free water more than 70 mi (112.6 km) offshore in the Chukchi Sea. In those instances, the bears were observed to either swim away from or approach the Shell vessels. Sometimes a polar bear would swim around a stationary vessel before leaving. In at least one instance a polar bear approached, touched, and investigated a stationary vessel from the water before swimming away.

Polar bears are more likely to be affected by on-ice or in-ice Industry activities versus open-water activities. From 2009 through 2014, there were a few Industry observation reports of polar bears during on-ice activities. Those observations were primarily of bears moving through an area during winter seismic surveys on near-shore ice. The disturbance to bears moving across the surface is frequently minimal, short-term, and temporary due to the mobility of such projects and limited to small-scale alterations to bear movements.

Polar Bear: Effects to Denning Bears

Known polar bear dens in the Beaufort Sea ITR region, whether discovered opportunistically or as a result of planned surveys such as tracking marked bears or den detection surveys, are monitored by the Service. However, these known denning sites are only a small percentage of the total

active polar bear dens for the SBS stock in any given year. Each year, Industry coordinates with the Service to conduct surveys to determine the location of Industry's activities relative to known dens and denning habitat. Under past ITRs Industry activities have been required to avoid known polar bear dens by 1.6 km (1 mi). However, occasionally an unknown den may be encountered during Industry activities. When a previously unknown den is discovered in proximity to Industry activity, the Service implements mitigation measures such as the 1.6-km (1-mi) activity exclusion zone around the den and 24-hour monitoring of the site.

The responses of denning bears to disturbance and the consequences of these responses can vary throughout the denning process. Consequently, we divide the denning period into four stages when considering impacts of disturbance: Den establishment, early denning, late denning, and post-emergence.

Den Establishment

The den establishment period begins in autumn near the time of implantation when pregnant females begin scouting for, excavating, and occupying a den. The timing of den establishment is likely governed by a variety of environmental factors, including snowfall events (Zedrosser *et al.* 2006; Evans *et al.* 2016; Pigeon *et al.* 2016), accumulation of snowpack (Amstrup and Gardner 1994; Durner *et al.* 2003, 2006), temperature (Rode *et al.* 2018), and timing of sea ice freeze-up (Webster *et al.* 2014). Spatial and temporal variation in these factors may explain variability in the timing of den establishment, which occurs between October and December in the SBS stock (Durner *et al.* 2001; Amstrup 2003). Rode *et al.* (2018) estimated November 15 as the mean date of den entry for bears in the SBS stock.

The den establishment period ends with the birth of cubs in early to mid-winter (Ramsay and Stirling 1988) after a gestation period that is likely similar to the ~60-day period documented for brown bears (Tsubota *et al.* 1987). Curry *et al.* (2015) found the mean and median birth dates for captive polar bears in the Northern Hemisphere were both November 29. Similarly, Messier *et al.* (1994) estimated that most births had occurred by December 15 in the Canadian Arctic Archipelago based on activity levels recorded by sensors on females in maternity dens.

Much of what is known of the effects of disturbance during the den establishment period comes from studies of polar bears captured by

researchers in autumn. Although capture is a severe form of disturbance atypical of events likely to occur during oil and gas activities, responses to capture can inform our understanding of how polar bears respond to substantial levels of disturbance. Ramsay and Stirling (1986) reported that 10 of 13 pregnant females that were captured and collared at dens in October or November abandoned their existing dens. Within 1–2 days after their release, these bears moved a median distance of 24.5 km and excavated new maternal dens. The remaining three polar bears reentered their initial dens or different dens <2 km from their initial den soon after being released. Amstrup (1993, 2003) documented a similar response in Alaska and reported 5 of 12 polar bears abandoned den sites and subsequently denned elsewhere following disturbance during autumn, with the remaining 7 bears remaining at their original den site.

The observed high rate of den abandonment during autumn capture events suggests that polar bears have a low tolerance threshold for intense disturbance during den initiation and are willing to expend energy to avoid further disturbance. Energy expenditures during den establishment are not replenished because female ursids do not eat or drink during denning and instead rely solely on stored body fat (Nelson *et al.* 1983; Sady *et al.* 2007). Consequently, because female body condition during denning affects the size and subsequent survival of cubs at emergence from the den (Derocher and Stirling 1996; Robbins *et al.* 2012), disturbances that cause additional energy expenditures in fall could have latent effects on cubs in the spring.

The available published research does not conclusively demonstrate the extent to which capture or den abandonment during den initiation is consequential for survival and reproduction. Ramsay and Stirling (1986) reported that captures (also known as handling) of females did not significantly affect numbers and mean weights of cubs, but the overall mean litter size and weights of cubs born to previously handled mothers consistently tended to be slightly lower than those of mothers not previously handled. Amstrup (1993) found no significant effect of handling on cub weight, litter size, or survival. Similarly, Seal *et al.* (1970) reported no loss of pregnancy among captive ursids following repeated chemical immobilization and handling. However, Lunn *et al.* (2004) concluded that handling and observations of pregnant female polar bears in the autumn

resulted in significantly lighter female, but not male, cubs in spring. Swenson *et al.* (1997) found that pregnant female grizzly bears (*U. arctos horribilis*) that abandoned excavated dens pre-birth lost cubs at a rate 10 times higher (60%) than bears that did not abandon dens (6%).

Although disturbances during the den establishment period can result in pregnant females abandoning a den site and/or incurring energetic or reproductive costs, fitness consequences are relatively small during this period compared to after the birth of cubs because females are often able to identify and excavate new sites within the temporal period that den establishment occurs under undisturbed conditions (Amstrup 1993; Lunn *et al.* 2004). Consequently, prior to giving birth, disturbances are unlikely to result in injury or a reduction in the probability of survival of a pregnant female or her cubs. However, responses by polar bears to anthropogenic activities can lead to the disruption of biologically-important behaviors associated with denning.

Early Denning

The second denning period we identified, early denning, begins with the birth of cubs and ends 60 days after birth. Polar bear cubs are altricial and are among the most undeveloped placental mammals at birth (Ramsay and Dunbrack 1986). Newborn polar bears weigh ~0.6 kg, are blind, and have limited fat reserves and fur, which provides little thermoregulatory value (Blix and Lentfer 1979; Kenny and Bickel 2005). Roughly 2 weeks after birth, their ability to thermoregulate begins to improve as they grow longer guard hairs and an undercoat (Kenny and Bickel 2005). Cubs first open their eyes at approximately 35 days after birth (Kenny and Bickel 2005) and achieve sufficient musculoskeletal development to walk at 60–70 days (Kenny and Bickel 2005), but movements may still be clumsy at this time (Harington 1968). At approximately 2 months of age, their capacity for thermoregulation may facilitate survival outside of the den and is the minimum time required for cubs to be able to survive outside of the den. However, further development inside the den greatly enhances the probability of survival (Amstrup 1993, Amstrup and Gardner 1994, Smith *et al.* 2007, Rode *et al.* 2018). Cubs typically weigh 10–12 kg upon emergence from the den in the spring at approximately 3.5 months old (Harington 1968, Lønø 1970).

Based on these developmental milestones, we consider 60 days after birth to mark the end of the early

denning period. Currently, we are not aware of any studies directly documenting birth dates of polar bear cubs in the wild; however, several studies have estimated parturition based on indirect metrics. Van de Velde *et al.* (2003) evaluated historic records of bears legally harvested in dens. Their findings suggest that cubs were born between early December and early January. Additionally, Messier *et al.* (1994) found that the activity levels of radio-collared females dropped significantly in mid-December, leading the authors to conclude that a majority of births occurred before or around 15 December. Because cub age is not empirically known, we consider early denning to end on 13 February, which is 60 days after the estimated average birth date of 15 December.

Although disturbance to denning bears can be costly at any stage in the denning process, consequences in early denning can be especially high because of the vulnerability of cubs early in their development (Elowe and Dodge 1989, Amstrup and Gardner 1994, Rode *et al.* 2018). If a female leaves a den during early denning, cub mortality is likely to occur due to a variety of factors including susceptibility to cold temperatures (Blix and Lentfer 1979, Hansson and Thomassen 1983, Van de Velde 2003), predation (Derocher and Wiig 1999, Amstrup *et al.* 2006b), and mobility limitations (Lentfer 1975). Thus we can expect a high probability that cubs will suffer lethal take if they emerge early during this stage. Further, adult females that depart the den site during early denning are likely to experience physiological stresses such as increased heart rate (Craighead *et al.* 1976, Laske *et al.* 2011) or increased body temperature (Reynolds *et al.* 1986) that can result in significant energy expenditures (Karproovich *et al.* 2009, Geiser 2013, Evans *et al.* 2016) thus likely resulting in Level B take.

Late Denning

The third denning period, late denning, begins when cubs are ≥ 60 days old and ends at den emergence in the spring, which coincides with increases in prey availability (Rode *et al.* 2018b). In the SBS, March 15th is the median estimated emergence date for land-denning bears (Rode *et al.* 2018b). During late denning, cubs develop the ability to travel more efficiently and become less susceptible to heat loss, which enhances their ability to survive after leaving the den (Rode *et al.* 2018b). For example, date of den emergence was identified as the most important variable influencing cub survival in a study of marked polar bears in the CS

and SBS stocks (Rode *et al.* 2018b). The authors reported that all females that denned through the end of March had ≥ 1 cub when re-sighted ≤ 100 days after den emergence. Conversely, roughly half of the females that emerged from dens before the end of February did not have cubs when resighted ≤ 100 days after emergence, suggesting that later den emergence likely results in a greater likelihood of cub survival (Rode *et al.* 2018b). Rode *et al.* (2018b) do note several factors that could affect their findings; for example, it was not always known whether a female emerged from a den with cubs (*i.e.*, cubs died before re-sighting during the spring surveys).

Although the potential responses of bears to disturbance events (*e.g.*, emerging from dens early, abandoning dens, physiological changes) during early and late denning are the same, consequences to cubs differ based on their developmental progress. In contrast to emergences during early denning, which are likely to result in cub mortality, emergences during late denning do not necessarily result in cub mortality because cubs potentially can survive outside the den after reaching approximately 60 days of age. However, because survival increases with time spent in the den during late denning, disturbances that contribute to an early emergence during late denning are likely to increase the probability of cub mortality, thus leading to a serious injury Level A take. Similar to the early denning period, this form of disturbance would also likely lead to Level B take for adult females.

Post-Emergence

The post-emergence period begins at den emergence and ends when bears leave the den site and depart for the sea ice, which can occur up to 30 days after emergence (Harington 1968, Jonkel *et al.* 1972, Kolenoski and Prevet 1980, Hansson and Thomassen 1983, Ovsyanikov 1998, Robinson 2014). During the post-emergence period, bears spend time in and out of the den where they acclimate to surface conditions and engage in a variety of activities, including grooming, nursing, walking, playing, resting, standing, digging, and foraging on vegetation (Harington 1968; Jonkel *et al.* 1972; Hansson and Thomassen 1983; Ovsyanikov 1998; Smith *et al.* 2007, 2013). While mothers outside the den spend most of their time resting, cubs tend to be more active, which likely increases strength and locomotion (Harington 1968, Lentfer and Hensel 1980, Hansson and Thomassen 1983, Robinson 2014). Disturbances that elicit an early departure from the den site may hinder

the ability of cubs to travel (Ovsyanikov 1998), thereby increasing the chances for cub abandonment (Haroldson *et al.* 2002) or susceptibility to predation (Derocher and Wiig 1999, Amstrup *et al.* 2006b).

Considerable variation exists in the duration of time that bears spend at dens post-emergence, and the relationship between the duration and cub survival has not been formally evaluated. However, a maternal female should be highly motivated to return to the sea ice to begin hunting and replenish her energy stores to support lactation, thus, time spent at the den site post emergence likely confers some fitness benefit to cubs. A disturbance that leads the family group to depart the den site early during this period therefore is likely to lead to a non-serious Level A take for the cubs and a Level B take for the adult female.

Walrus: Human-Walrus Encounters

Walrus do not inhabit the Beaufort Sea frequently and the likelihood of encountering walrus during Industry operations is low and limited to the open-water season. During the time period of this proposed ITR, Industry operations may occasionally encounter small groups of walrus swimming in open water or hauled out onto ice floes or along the coast. Industry monitoring data have reported 38 walrus between 1995 and 2015, with only a few instances of disturbance to those walrus (AES Alaska 2015, USFWS unpublished data). From 2009 through 2014, no interactions between walrus and Industry were reported in the Beaufort Sea ITR region. We have no evidence of any physical effects or impacts to individual walrus due to Industry activity in the Beaufort Sea. However, in the Chukchi Sea, where walrus are more prevalent, Level B harassment is known to sometimes occur during encounters with Industry. Thus, if walrus are encountered during the activities proposed in this ITR, the interaction it could potentially result in disturbance.

Human encounters with walrus could occur during Industry activities, although such encounters would be rare due to the limited distribution of walrus in the Beaufort Sea. These encounters may occur within certain cohorts of the population, such as calves or animals under stress. In 2004, a suspected orphaned calf hauled-out on the armor of Northstar Island numerous times over a 48-hour period, causing Industry to cease certain activities and alter work patterns before it disappeared in stormy seas. Additionally, a walrus calf was observed for 15 minutes during

an exploration program 60 ft from the dock at Cape Simpson in 2006. From 2009 through 2020, Industry reported no similar interactions with walrus.

In the nearshore areas of the Beaufort Sea, stationary offshore facilities could produce high levels of noise that have the potential to disturb walrus. These include Endicott, Hilcorp's Saltwater Treatment Plant (located on the West Dock Causeway), Oooguruk, and Northstar facilities. The Liberty project will also have this potential when it commences operations. From 2009 through 2020, there were no reports of walrus hauling out at Industry facilities in the Beaufort Sea ITR region. Previous observations have been reported of walrus hauled out on Northstar Island and swimming near the Saltwater Treatment Plant. In 2007, a female and a subadult walrus were observed hauled-out on the Endicott Causeway. The response of walrus 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 the Chukchi Sea, 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 terrestrial haul-outs are particularly vulnerable to trampling injuries. However, due to the scarcity of walrus haul-outs in the ITR area, the most likely potential impacts of Industry activities include displacement from preferred foraging areas, increased stress, energy expenditure, interference with feeding, and masking of communications. Any impact of Industry presence on walrus is likely to be limited to a few individuals due to their geographic range and seasonal distribution.

The reaction of walrus to vessel traffic is dependent upon vessel type, distance, speed, and previous exposure to disturbances. Walrus in the water appear to be less readily disturbed by vessels than walrus hauled out on land or ice. Furthermore, barges and vessels associated with Industry activities travel in open water and avoid large ice floes or land where walrus are likely to be found. In addition, walrus can use a vessel as a haul-out platform. In 2009, during Industry activities in the Chukchi Sea, an adult walrus was observed hauled out on the stern of a vessel.

Walrus: Effects of In-Water Activities

Walrus hear sounds both in air and in water. They have been shown to hear from 60 hertz (Hz) to 23 kilohertz (kHz) in air (Reichmuth *et al.* 2020). Tests of underwater hearing have shown their range to be between 1 kHz and 12 kHz with greatest sensitivity at 12 kHz (Kastelein *et al.* 2002). The underwater hearing abilities of the Pacific walrus have not been studied sufficiently to develop species-specific criteria for preventing harmful exposure. However, sound pressure level thresholds have been developed for members of the "other carnivore" group of marine mammals (Table 1).

When walrus are present, underwater noise from vessel traffic in the Beaufort Sea may prevent ordinary communication between individuals by preventing them from locating one another. It may also prevent walrus from using potential habitats in the Beaufort Sea and may have the potential to impede movement. Vessel traffic will likely increase if offshore Industry expands and may increase if warming waters and seasonally reduced sea-ice cover alter northern shipping lanes.

The most likely response of walrus to acoustic disturbances in open water will be for animals to move away from the source of the disturbance. Displacement from a preferred feeding area may reduce foraging success, increase stress levels, and increase energy expenditures.

Walrus: Effects of Aircraft Overflights

Aircraft overflights may disturb walrus. Reactions to aircraft vary with range, aircraft type, and flight pattern as well as walrus age, sex, and group size. Adult females, calves, and immature walrus tend to be more sensitive to aircraft disturbance. Walrus 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 walrus in sea-ice habitats have observed little reaction to fixed-winged aircraft above 457 m (1,500 ft) (USFWS unpubl. data). Although the intensity of the reaction to noise is variable, walrus are probably most susceptible to disturbance by fast-moving and low-flying aircraft (100 m (328 ft) above ground level) or aircraft that change or alter speed or direction. In the Chukchi Sea, there are recent examples of walrus being disturbed by aircraft flying in the vicinity of haul-outs. It appears that walrus are more sensitive to disturbance when hauled out on land versus sea-ice.

Effects to Prey Species

Industry activity has the potential to impact walrus prey, which are primarily benthic invertebrates including bivalves, snails, worms, and crustaceans (Sheffield and Grebmeier 2009). The effects of Industry activities on benthic invertebrates would most likely result from disturbance of seafloor substrate from activities such as dredging or screeing, and if oil was illegally discharged into the environment. Substrate-borne vibrations associated with vessel noise and Industry activities, such as pile driving and drilling, can trigger behavioral and physiological responses in bivalves and crustaceans (Roberts *et al.* 2016, Tidau and Briffa 2016). In the case of an oil spill, oil has the potential to impact benthic invertebrate species in a variety of ways including, but not limited to, mortality due to smothering or toxicity, perturbations in the composition of the benthic community, as well as altered metabolic and growth rates. Additionally, bivalves and crustaceans can bioaccumulate hydrocarbons, which could increase walrus exposure to these compounds (Engelhardt 1983). Disturbance from Industry activity and effects from oil exposure may alter the availability and distribution of benthic invertebrate species. An increasing number of studies are examining benthic invertebrate communities and food web structure within the Beaufort Sea (Rand and Logerwell 2011, Divine *et al.* 2015). The low likelihood of an oil spill large enough to affect walrus prey populations (see the section titled *Risk Assessment of Potential Effects Upon Polar Bears from a Large Oil Spill in the Beaufort Sea*) combined with the low density of walrus that feed on benthic invertebrates in this region during open-water season indicates that Industry activities will likely have limited effects on walrus through impacted prey species.

The effects of Industry activity upon polar bear prey, primarily ringed seals and bearded seals, will be similar to that of effects upon walrus and primarily through noise disturbance or exposure to an oil spill. Seals respond to vessel noise and potentially other Industry activities. Some seals exhibited a flush response, entering water when previously hauled out on ice, when noticing an icebreaker vessel that ranged from 100 m to 800 m away from the seal (Lomac-MacNair *et al.* 2019). This disturbance response in addition to other behavioral responses could extend to other Industry vessels and activities, such as dredging (Todd *et al.* 2015). Sounds from Industry activity are

probably audible to ringed seals and harbor seals at distances up to approximately 1.5 km in the water and approximately 5 km in the air (Blackwell *et al.* 2004). Disturbance from Industry activity may cause seals to avoid important habitat areas, such as pupping lairs or haul-outs, and to abandon breathing holes near Industry activity. However, these disturbances appear to have minor, short-term, and temporary effects (NMFS 2013).

Consumption of oiled seals may impact polar bears through their exposure to oil spills during Industry activity (see *Evaluation of Effects on Oil Spills on Pacific Walruses and Polar Bears*). Ingestion of oiled seals would cause polar bears to ingest oil and inhale oil fumes, which can cause tissue and organ damage for polar bears (Engelhardt 1983). If polar bear fur were to become oiled during ingestion of oiled seals, this may lead to thermoregulation issues, increased metabolic activity, and further ingestion of oil during grooming (Engelhardt 1983). Ringed seals that have been exposed to oil or ingested oiled prey can accumulate hydrocarbons in their blubber and liver (Engelhardt 1983). These increased levels of hydrocarbons may affect polar bears even if seals are not oiled during ingestion. Polar bears could be impacted by reduced seal availability, displacement of seals in response to Industry activity, increased energy demands to hunt for displaced seals, and increased dependency on limited alternative prey sources, such as scavenging on bowhead whale carcasses harvested during subsistence hunts. If seal availability were to decrease, then the survival of polar bears may be drastically affected (Fahd *et al.* 2021). However, apart from a large-scale illegal oil spill, impacts from Industry activity on seals are anticipated to be minor and short-term, and these impacts are unlikely to substantially reduce the availability of seals as a prey source for polar bears. The risk of large-scale oil spills is discussed in Risk Assessment of Potential Effects upon Polar Bears from a Large Oil Spill in the Beaufort Sea.

Evaluation of Effects of Specified Activities on Pacific Walruses, Polar Bears, and Prey Species

Definitions of Incidental Take Under the Marine Mammal Protection Act

Below we provide definitions of three potential types of take of Pacific walruses or polar bears. The Service does not anticipate and is not authorizing Lethal take or Level A harassment as a part of the proposed rule; however, the definitions of these

take types are provided for context and background.

Lethal Take

Human activity may result in biologically significant impacts to polar bears or Pacific walruses. In the most serious interactions, human actions can result in mortality of polar bears or Pacific walruses. We also note that, while not considered incidental, in situations where there is an imminent threat to human life, polar bears may be killed. Additionally, though not considered incidental, polar bears have been accidentally killed during efforts to deter polar bears from a work area for safety and from direct chemical exposure (81 FR 52276, August 5, 2016). Incidental lethal take could result from human activity such as a vehicle collision or collapse of a den if it were run over by a vehicle. Unintentional disturbance of a female by human activity during the denning season may cause the female either to abandon her den prematurely with cubs or abandon her cubs in the den before the cubs can survive on their own. Either scenario may result in the incidental lethal take of the cubs. Incidental lethal take of Pacific walrus could occur if the animal were directly struck by a vessel, or trampled by other walruses in a human-caused stampede.

Level A Harassment

Human activity may result in the injury of polar bears or Pacific walruses. Level A harassment, for nonmilitary readiness activities, is defined as any act of pursuit, torment, or annoyance that has the potential to injure a marine mammal or marine mammal stock in the wild. Take by Level A harassment can be caused by numerous actions such as creating an annoyance that separates mothers from dependent cub(s)/calves (Amstrup 2003), results in polar bear mothers leaving the den early (Amstrup and Gardner 1994, Rode *et al.* 2018b), or interrupts the nursing or resting of cubs/calves. For this ITR, we have also distinguished between non-serious and serious Level A take. Serious Level A take is defined as an injury that is likely to result in mortality.

Level A harassment to bears on the surface is extremely rare within the ITR region. From 2012 through 2018, one instance of Level A harassment occurred within the ITR region associated with defense of human life while engaged in non-Industry activity. No Level A harassment to Pacific walruses has been reported in the Beaufort Sea ITR region. Given this information, the Service does not estimate Level A harassment to polar bears or Pacific walruses will

result from the activities specified in AOGA's Request. Nor has Industry anticipated or requested authorization for such take in their Request for ITRs.

Level B Harassment

Level B Harassment for nonmilitary readiness activities means any act of pursuit, torment, or annoyance that has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behaviors or activities, including, but not limited to, migration, breathing, nursing, feeding, or sheltering. Changes in behavior that disrupt biologically significant behaviors or activities for the affected animal meet the criteria for take by Level B harassment under the MMPA. Reactions that indicate take by Level B harassment of polar bears in response to human activity include, but are not limited to, the following:

- Fleeing (running or swimming away from a human or a human activity);
- Displaying a stress-related behavior such as jaw or lip-popping, front leg stomping, vocalizations, circling, intense staring, or salivating;
- Abandoning or avoiding preferred movement corridors such as ice floes, leads, polynyas, a segment of coastline, or barrier islands;
- Using a longer or more difficult route of travel instead of the intended path;
- Interrupting breeding, sheltering, or feeding;
- Moving away at a fast pace (adult) and cubs struggling to keep up;
- Ceasing to nurse or rest (cubs);
- Ceasing to rest repeatedly or for a prolonged period (adults);
- Loss of hunting opportunity due to disturbance of prey; or
- Any interruption in normal denning behavior that does not cause injury, den abandonment, or early departure of the family group from the den site.

This list is not meant to encompass all possible behaviors; other behavioral responses may equate to take by Level B harassment. Relatively minor changes in behavior such as increased vigilance or a short-term change in direction of travel are not likely to disrupt biologically important behavioral patterns, and the Service does not view such minor changes in behavior as resulting in a take by Level B harassment. It is also important to note that depending on the duration, frequency, or severity of the above-described behaviors, such responses could constitute take by Level A harassment (*e.g.*, repeatedly disrupting a polar bear versus a single interruption).

Evaluation of Take

The general approach for quantifying take in this proposed ITR was as follows: (1) Determine the number of animals in the project area; (2) assess the likelihood, nature, and degree of exposure of these animals to project-related activities; (3) evaluate these animals' probable responses; and (4) calculate how many of these responses constitute take. Our evaluation of take included quantifying the probability of either lethal take or Level A harassment (potential injury) and quantifying the number of responses that met the criteria for Level B harassment (potential disruption of a biologically significant behavioral pattern), factoring in the degree to which effective mitigation measures that may be applied will reduce the amount or consequences of take. To better account for differences in how various aspects of the project could impact polar bears, we performed separate take estimates for Surface-Level Impacts, Aircraft Activities, Impacts to Denning Bears, and Maritime Activities. These analyses are described in more detail in the subsections below. Once each of these categories of take were quantified, the next steps were to: (5) Determine whether the total take will be of a small number relative to the size of the stock; and (6) determine whether the total take will have a negligible impact on the stock, both of which are determinations required under the MMPA.

Pacific Walrus: All Interactions

With the low occurrence of walrus in the Beaufort Sea and the adoption of the mitigation measures required by this ITR, if finalized, the Service concludes that the only anticipated effects from Industry noise in the Beaufort Sea would be short-term behavioral

alterations of small numbers of walrus. All walrus encounters within the ITR geographic area in the past 10 years have been of solitary walrus or groups of two. The closest sighting of a grouping larger than two was outside the ITR area in 2013. The vessel encountered a group of 15 walrus. Thus, while it is highly unlikely that a group of walrus will be encountered during the proposed activities, we estimate that no more than one group of 15 Pacific walrus will be taken as a result of Level B harassment each year during the proposed ITR period.

Polar Bear: Surface Interactions

Encounter Rate

The most comprehensive dataset of human-polar bear encounters along the coast of Alaska consists of records of Industry encounters during activities on the North Slope submitted to the Service under existing and previous ITRs. This database is referred to as the "LOA database" because it aggregates data reported by the oil and gas industry to the Service pursuant to the terms and conditions of LOAs issued under current and previous incidental take regulations (50 CFR part 18, subpart J). We have used records in the LOA database in the period 2014–2018, in conjunction with bear density projections for the entire coastline, to generate quantitative encounter rates in the project area. This five-year period was used to provide metrics that reflected the most recent patterns of polar bear habitat use within the Beaufort Sea ITR region. Each encounter record includes the date and time of the encounter, a general description of the encounter, number of bears encountered, latitude and longitude, weather variables, and a take determination made by the Service. If

latitude and longitude were not supplied in the initial report, we georeferenced the encounter using the location description and a map of North Slope infrastructure.

Spatially Partitioning the North Slope Into "Coastal" and "Inland" Zones

The vast majority of SBS polar bear encounters along the Alaskan coast occur along the shore or immediately offshore (Atwood *et al.* 2015, Wilson *et al.* 2017). Thus, encounter rates for inland operations should be significantly lower than those for offshore or coastal operations. To partition the North Slope into "coastal" and "inland" zones, we calculated the distance to shore for all encounter records in the period 2014–2018 in the Service's LOA database using a shapefile of the coastline and the *dist2Line* function found in the R geosphere package (Hijmans 2019). Linked sightings of the same bear(s) were removed from the analysis, and individual records were created for each bear encountered. However, because we were able to identify and remove only repeated sightings that were designated as linked within the database, it is likely that some repeated encounters of the same bear remained in our analysis. Of the 1,713 bears encountered from 2014 through 2018, 1,140 (66.5 percent) of the bears were offshore. While these bears were encountered offshore, the encounters were reported by onshore or island operations (*i.e.*, docks, drilling and production islands, or causeways). We examined the distribution of bears that were onshore and up to 10 km (6.2 mi) inland to determine the distance at which encounters sharply decreased (Figure 2).

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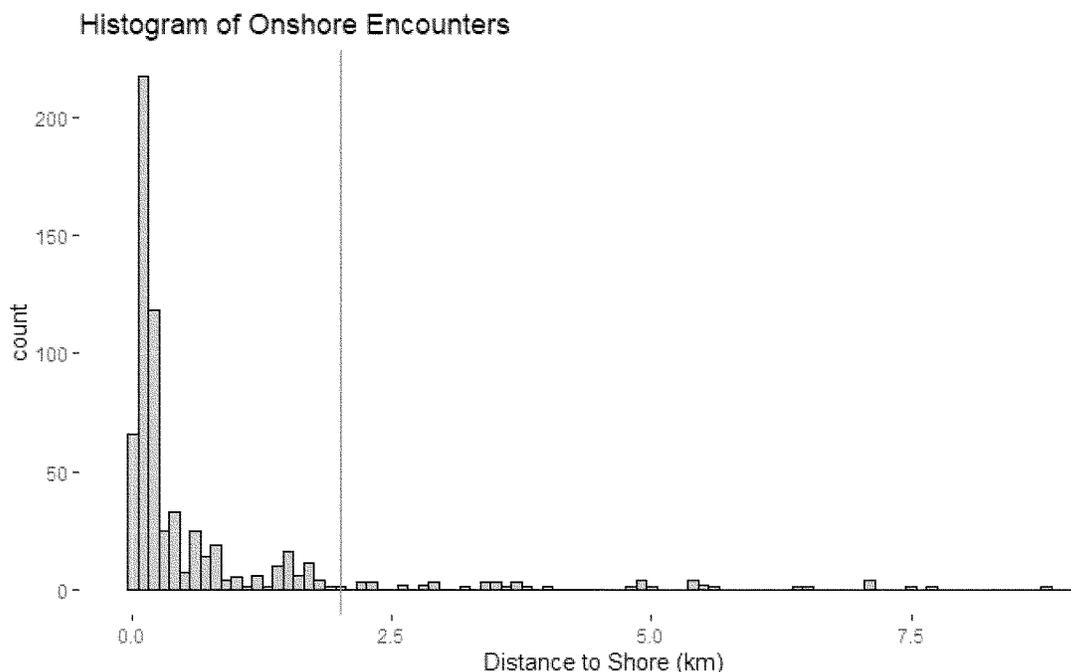


Figure 2—Distribution of onshore polar bear encounters on the North Slope of Alaska in the period 2014–2018 by distance to shore (km). The decrease in encounters was used to designate a “coastal” zone up to 2.0 km (1.2 mi) from shore and an “inland” zone greater than 2.0 km (1.2 mi) from shore.

The histogram illustrates a steep decline in human-polar bear encounters at 2 km (1.2 mi) from shore. Using this data, we divided the North Slope into the “coastal zone,” which includes offshore operations and up to 2 km (1.2 mi) inland, and the “inland zone,” which includes operations more than 2 km (1.2 mi) inland.

Dividing the Year Into Seasons

As we described in our review of polar bear biology above, the majority of

polar bears spend the winter months on the sea ice, leading to few polar bear encounters on the shore during this season. Many of the proposed activities are also seasonal, and only occur either in the winter or summer months. In order to develop an accurate estimate of the number of polar bear encounters that may result from the proposed activities, we divided the year into seasons of high bear activity and low bear activity using the Service’s LOA

database. Below is a histogram of all bear encounters from 2014 through 2018 by day of the year (Julian date). Two clear seasons of polar bear encounters can be seen: An “open-water season” that begins in mid-July and ends in mid-November, and an “ice season” that begins in mid-November and ends in mid-July. The 200th and 315th days of the year were used to delineate these seasons when calculating encounter rates (Figure 3).

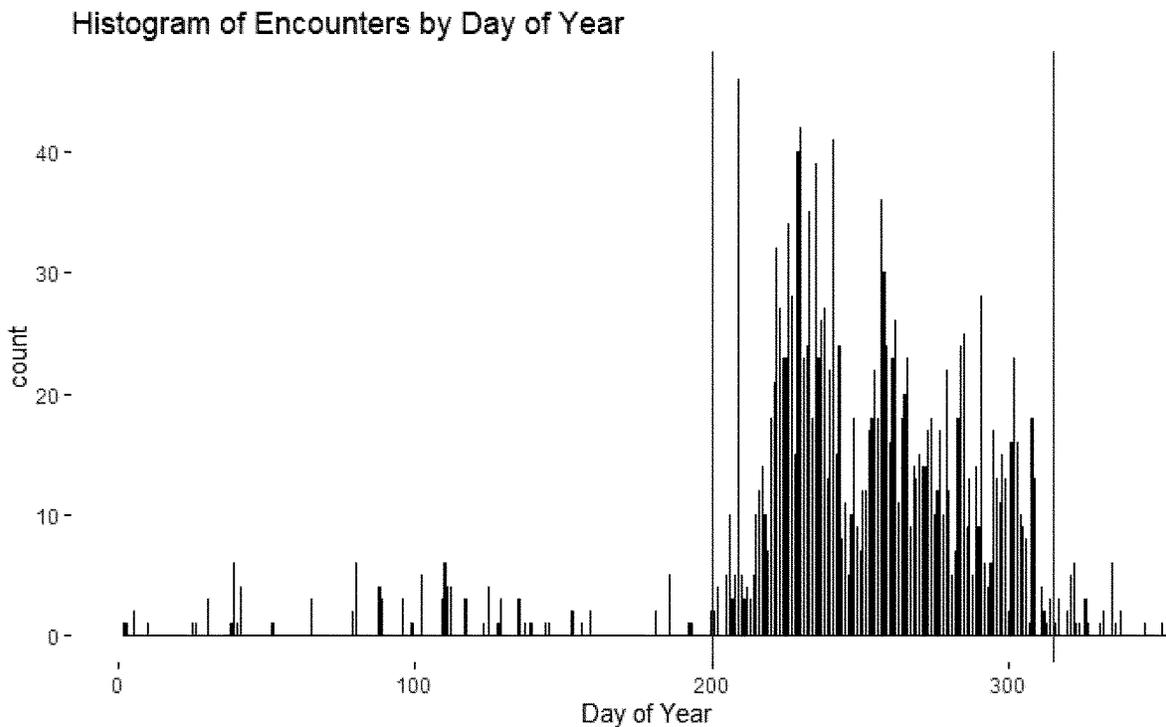


Figure 3—Distribution of polar bear encounters in the Southern Beaufort Sea and adjacent North Slope of Alaska in the period 2014–2018 by Julian day of year. Dotted lines delineate the “open” vs. “ice” seasons. Open season begins on the 200th day of the year (July 19th) and ends on the 315th day of the year (November 11th).

North Slope Encounter Rates

Encounter rates in bears/season/km² were calculated using a subset of the

Industry encounter records maintained in the Service’s LOA database. The

following formula was used to calculate encounter rate (Equation 1):

$$\frac{\text{Bears Encountered by Season}}{\text{Area Occupied (km}^2\text{)}}$$

Equation 1

The subset consisted of encounters in areas that were constantly occupied year-round to prevent artificially inflating the denominator of the equation and negatively biasing the encounter rate. To identify constantly occupied North Slope locations, we gathered data from a number of sources. We used past LOA applications to find descriptions of projects that occurred anywhere within 2014–2018 and the final LOA reports to determine the

projects that proceeded as planned and those that were never completed. Finally, we relied upon the institutional knowledge of our staff, who have worked with operators and inspected facilities on the North Slope. To determine the area around industrial facilities in which a polar bear can be seen and reported, we queried the USFWS LOA database for records that included the distance to an encountered polar bear. It is important to note that

these values may represent the closest distance a bear came to the observer or the distance at initial contact. Therefore, in some cases, the bear may have been initially encountered farther than the distance recorded. The histogram of these values shows a drop in the distance at which a polar bear is encountered at roughly 1.6 km (1 mi) (Figure 4).

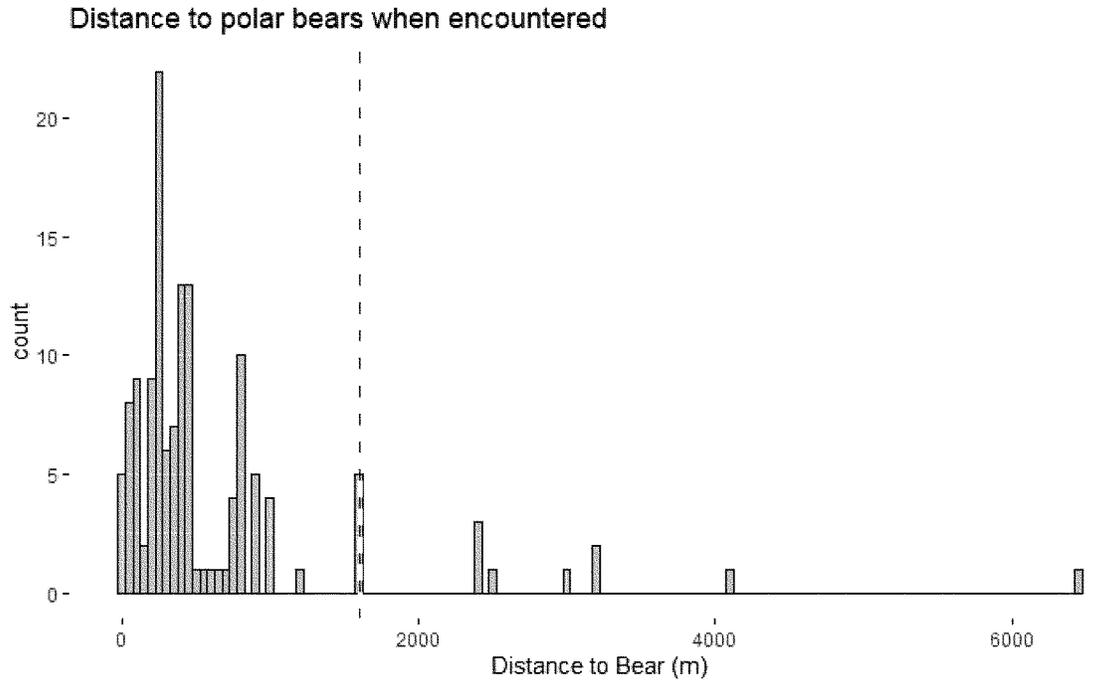


Figure 4—Distribution of polar bear encounters on the North Slope of Alaska in the period 2014–2018 by distance to bear (m).

Using this information, we buffered the 24-hour occupancy locations listed above by 1.6 km (1 mi) and calculated an overall search area for both the coastal and inland zones. The coastal

and inland occupancy buffer shapefiles were then used to select encounter records that were associated with 24-hour occupancy locations, resulting in the number of bears encountered per

zone. These numbers were then separated into open-water and ice seasons (Table 2).

TABLE 2—SUMMARY OF ENCOUNTERS OF POLAR BEARS ON THE NORTH SLOPE OF ALASKA IN THE PERIOD 2014–2018 WITHIN 1.6 KM (1 MI) OF THE 24-HOUR OCCUPANCY LOCATIONS AND SUBSEQUENT ENCOUNTER RATES FOR COASTAL (a) AND INLAND (b) ZONES

Year	Ice season encounters	Open-water season encounters
(A) Coastal Zone (Area = 133 km²)		
2014	2	193
2015	8	49
2016	4	227
2017	7	313
2018	13	205
Average	6.8	197.4
Seasonal Encounter Rate	0.05 bears/km ²	1.48 bears/km ²
(B) Inland Zone (Area = 267 km²)		
2014	3	3
2015	0	0
2016	0	2
2017	3	0
2018	0	2
Average	1.2	1.4
Seasonal Encounter Rate	0.004 bears/km ²	0.005 bears/km ²

Harassment Rate

The Level B harassment rate or the probability that an encountered bear will experience either incidental or intentional Level B harassment, was calculated using the 2014-2018 dataset from the LOA database. A binary logistic regression of harassment regressed upon distance to shore was not significant ($p = 0.65$), supporting the use of a single harassment rate for both the coastal and inland zones. However, a binary logistic regression of harassment regressed upon day of the year was significant. This significance held when encounters were binned into

either ice or open-water seasons ($p < 0.0015$).

We subsequently estimated the harassment rate for each season with a Bayesian probit regression with season as a fixed effect (Hooten and Hefley 2019). Model parameters were estimated using 10,000 iterations of a Markov chain Monte Carlo algorithm composed of Gibbs updates implemented in R (R core team 2021, Hooten and Hefley 2019). We used Normal (0,1) priors, which are uninformative on the prior predictive scale (Hobbs and Hooten 2015), to generate the distribution of open-water and ice-season marginal posterior predictive probabilities of harassment. The upper 99 percent

quantile of each probability distribution can be interpreted as the upper limit of the potential harassment rate supported by our dataset (*i.e.*, there is a 99 percent chance that given the data the harassment rate is lower than this value). We chose to use 99 percent quantiles of the probability distributions to account for any negative bias that has been introduced into the dataset through unobserved harassment or variability in the interpretation of polar bear behavioral reactions by multiple observers. The final harassment rates were 0.19 during the open-water season and 0.37 during the ice season (Figure 5).

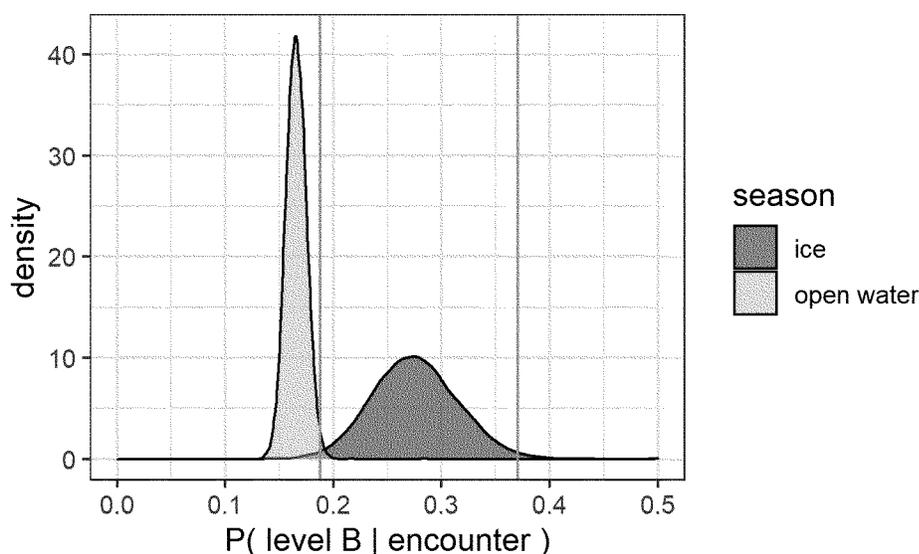


Figure 5—Estimated marginal posterior predictive probabilities from the Bayesian probit regression of Level B harassment of polar bears on the North Slope of Alaska in the period 2014–2018. Vertical grey lines correspond to the upper 99% quantiles for each distribution, which were used as the estimates of harassment rates.

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Impact Area

As noted above, we have calculated encounter rates depending on the distance from shore and season and take rates depending on season. To properly assess the area of potential impact from the project activities, we must calculate the area affected by project activities to such a degree that harassment is possible. This is sometimes referred to as a zone or area of influence. Behavioral response rates of polar bears to disturbances are highly variable, and data to support the relationship between distance to bears and disturbance is limited. Dyck and Baydack (2004) found

sex-based differences in the frequencies of vigilant bouts of polar bears in the presence of vehicles on the tundra. However, in their summary of polar bear behavioral response to ice-breaking vessels in the Chukchi Sea, Smultea *et al.* (2016) found no difference between reactions of males, females with cubs, or females without cubs. During the Service's coastal aerial surveys, 99 percent of polar bears that responded in a way that indicated possible Level B harassment (polar bears that were running when detected or began to run or swim in response to the aircraft) did so within 1.6 km (1 mi), as measured from the ninetieth percentile horizontal detection distance from the flight line.

Similarly, Andersen and Aars (2008) found that female polar bears with cubs (the most conservative group observed) began to walk or run away from approaching snowmobiles at a mean distance of 1,534 m (0.95 mi). Thus, while future research into the reaction of polar bears to anthropogenic disturbance may indicate a different zone of potential impact is appropriate, the current literature suggests 1.6 km (1.0 mi) will likely encompass the majority of polar bear harassment events.

Correction Factor

While the locations that were used to calculate encounter rates are thought to

have constant human occupancy, it is possible that bears may be in the vicinity of industrial infrastructure and not be noticed by humans. These unnoticed bears may also experience Level B harassment. To determine whether our calculated encounter rate should be corrected for unnoticed bears, we compared our encounter rates to Wilson *et al.*'s (2017) weekly average polar bear estimates along the northern coast of Alaska and the South Beaufort Sea.

Wilson *et al.*'s weekly average estimate of polar bears across the coast was informed by aerial surveys conducted by the Service in the period 2000–2014 and supplemented by daily counts of polar bears in three high-density barrier islands (Cross, Barter, and Cooper Islands). Using a Bayesian hierarchical model, the authors estimated 140 polar bears would be along the coastline each week between the months of August and October. These estimates were further partitioned into 10 equally sized grids along the coast. Grids 4–7 overlap the SBS ITR

area, and all three encompass several industrial facilities. Grid 6 was estimated to account for 25 percent of the weekly bear estimate (35 bears); however, 25 percent of the bears in grid 6 were located on Cross Island. Grids 5 and 7 were estimated to contain seven bears each, weekly. Using raw aerial survey data, we calculated the number of bears per km of surveyed mainland and number of bears per km of surveyed barrier islands for each Service aerial survey from 2010 through 2014 to determine the proportion of bears on barrier islands versus the mainland. On average, 1.7 percent, 7.2 percent, and 14 percent of bears were sighted on the mainland in grids 5, 6, and 7, respectively.

While linked encounter records in the LOA database were removed in earlier formatting, it is possible that a single bear may be the focus of multiple encounter records, particularly if the bear moves between facilities operated by different entities. To minimize repeated sightings, we designated a single industrial infrastructure location

in each grid: Oliktok Point in grid 5, West Beach in grid 6, and Point Thomson's CP in grid 7. These locations were determined in earlier analyses to have constant 24-occupancy; thus, if a polar bear were within the viewing area of these facilities, it must be reported as a condition of each entity's LOA.

Polygons of each facility were buffered by 1.6 km (1 mi) to account for the industrial viewing area (see above), and then clipped by a 400-m (0.25-mi) buffer around the shoreline to account for the area in which observers were able to reliably detect polar bears in the Service's aerial surveys (*i.e.*, the specific area to which the Wilson *et al.*'s model predictions applied). Industrial encounters within this area were used to generate the average weekly number of polar bears from August through October. Finally, we divided these numbers by area to generate average weekly bears/km² and multiplied this number by the total coastal Service aerial survey area. The results are summarized in the table below (Table 3).

TABLE 3—COMPARISON OF POLAR BEAR ENCOUNTERS TO NUMBER OF POLAR BEARS PROJECTED BY WILSON *et al.* 2017 AT DESIGNATED POINT LOCATIONS ON THE COAST OF THE NORTH SLOPE OF ALASKA

	Grid 5	Grid 6	Grid 7
Total coastline viewing area (km ²)	34	45	33.4
Industry viewing area (km ²)	0.31	0.49	1.0
Proportion of coastline area viewed by point location	0.009	0.011	0.030
Average number of bears encountered August-October at point location	3.2	4.6	28.8
Number of weeks in analysis	13	13	13
Average weekly number of bears <i>reported</i> at point location	0.246	0.354	2.215
Average weekly number of bears <i>projected</i> in grid*	7	26	7
Average weekly number of bears <i>projected</i> for point location	0.064	0.283	0.210

These comparisons show a greater number of industrial sightings than would be estimated by the Wilson *et al.* 2017 model. There are several potential explanations for higher industrial encounters than projected by model results. Polar bears may be attracted to industrial infrastructure, the encounters documented may be multiple sightings of the same bear, or specifically for the Point Thomson location, higher numbers of polar bears may be travelling past the pad to the Kaktovik whale carcass piles. However, because the number of polar bears estimated within the point locations is lower than the average number of industrial sightings, these findings cannot be used to create a correction factor for industrial encounter rate. To date, the data needed to create such a correction factor (*i.e.*, spatially explicit polar bear densities across the North Slope) have not been generated.

Estimated Harassment

We estimated Level B harassment using the spatio-temporally specific encounter rates and temporally specific take rates derived above in conjunction with AOGA supplied spatially and temporally specific data. Table 4 provides the definition for each variable used in the take formulas.

TABLE 4—DEFINITIONS OF VARIABLES USED IN TAKE ESTIMATES OF POLAR BEARS ON THE COAST OF THE NORTH SLOPE OF ALASKA

Variable	Definition
B_{es}	bears encountered in an area of interest for the entire season.
a_c	coastal exposure area.
a_i	inland exposure area.
f_o	occupancy rate.
e_{co}	coastal open-water season bear-encounter rate in bears/season.

TABLE 4—DEFINITIONS OF VARIABLES USED IN TAKE ESTIMATES OF POLAR BEARS ON THE COAST OF THE NORTH SLOPE OF ALASKA—Continued

Variable	Definition
e_{ci}	coastal ice season bear-encounter rate in bears/season.
e_{io}	inland open-water season bear-encounter rate in bears/season.
e_{ii}	inland ice season bear-encounter rate in bears/season.
t_i	ice season harassment rate.
t_o	open-water season harassment rate.
B_t	number of estimated Level B harassment events.
B_T	total bears harassed for activity type.

The variables defined above were used in a series of formulas to ultimately estimate the total harassment from surface-level interactions.

Encounter rates were originally calculated as bears encountered per square kilometer per season (see *North Slope Encounter Rates* above). As a part of their application, AOGA provided the Service with digital geospatial files that included the maximum expected human occupancy (*i.e.*, rate of occupancy (r_o)) for each individual structure (*e.g.*, each road, pipeline, well pad, etc.) of their proposed activities for each month of the ITR period. Months were averaged to create open-water and ice-season occupancy rates. For example, occupancy rates for July 2022, August 2022, September 2022, October 2022, and November 2022 were averaged to calculate the occupancy rate for a given structure during the open-water 2022

season. Using the buffer tool in ArcGIS, we created a spatial file of a 1.6-km (1-mi) buffer around all industrial structures. We binned the structures according to their seasonal occupancy rates by rounding them up into tenths (10 percent, 20 percent, etc.). We determined impact area of each bin by first calculating the area within the buffers of 100 percent occupancy locations. We then removed the spatial footprint of the 100 percent occupancy buffers from the dataset and calculated the area within the 90 percent occupancy buffers. This iterative process continued until we calculated the area within all buffers. The areas of impact were then clipped by coastal and inland zone shapefiles to determine the

coastal areas of impact (a_c) and inland areas of impact (a_i) for each activity category. We then used spatial files of the coastal and inland zones to determine the area in coastal versus inland zones for each occupancy percentage. This process was repeated for each season from open-water 2021 to open-water 2026.

Impact areas were multiplied by the appropriate encounter rate to obtain the number of bears expected to be encountered in an area of interest per season (B_{es}). The equation below (Equation 3) provides an example of the calculation of bears encountered in the ice season for an area of interest in the coastal zone.

$$B_{es} = a_c * e_{ci}$$

Equation 3

To generate the number of estimated Level B harassments for each area of interest, we multiplied the number of

bears in the area of interest per season by the proportion of the season the area

is occupied, the rate of occupancy, and the harassment rate (Equation 4).

$$B_t = B_{es} * S_p * r_o * t_i$$

Equation 4

The estimated harassment values for the open-water 2021 and open-water 2026 seasons were adjusted to account for incomplete seasons as the proposed regulations will be effective for only 85 and 15 percent of the open-water 2021 and 2026 seasons, respectively.

Aircraft Impact to Surface Bears

Polar bears in the project area will likely be exposed to the visual and auditory stimulation associated with AOGA's fixed-wing and helicopter flight plans; however, these impacts are likely to be minimal and not long-lasting to surface bears. Flyovers may cause disruptions in the polar bear's normal behavioral patterns, thereby resulting in incidental Level B harassment. Sudden changes in direction, elevation, and movement may also increase the level of noise produced from the helicopter, especially at lower altitudes. This increased level of noise could disturb polar bears in the area to an extent that their behavioral patterns are disrupted

and Level B harassment occurs. Mitigation measures, such as minimum flight altitudes over polar bears and restrictions on sudden changes to helicopter movements and direction, will be required if these regulations are finalized to reduce the likelihood that polar bears are disturbed by aircraft. Once mitigated, such disturbances are expected to have no more than short-term, temporary, and minor impacts on individual bears.

Estimating Harassment Rates of Aircraft Activities

To predict how polar bears will respond to fixed-wing and helicopter overflights during North Slope oil and gas activities, we first examined existing data on the behavioral responses of polar bears during aircraft surveys conducted by the Service and U.S. Geological Survey (USGS) between August and October during most years from 2000 to 2014 (Wilson *et al.* 2017, Atwood *et al.* 2015, and Schliebe *et al.*

2008). Behavioral responses due to sight and sound of the aircraft have both been incorporated into this analysis as there was no ability to differentiate between the two response sources during aircraft survey observations. Aircraft types used for surveys during the study included a fixed-wing Aero-Commander from 2000 to 2004, a R-44 helicopter from 2012 to 2014, and an A-Star helicopter for a portion of the 2013 surveys. During surveys, all aircraft flew at an altitude of approximately 90 m (295 ft) and at a speed of 150 to 205 km per hour (km/h) or 93 to 127 mi per hour (mi/h). Reactions indicating possible incidental Level B harassment were recorded when a polar bear was observed running from the aircraft or began to run or swim in response to the aircraft. Of 951 polar bears observed during coastal aerial surveys, 162 showed these reactions, indicating that the percentage of Level B harassments during these low-altitude

coastal survey flights was as high as 17 percent.

Detailed data on the behavioral responses of polar bears to the aircraft and the distance from the aircraft each polar bear was observed were available for only the flights conducted between 2000 to 2004 ($n = 581$ bears). The Aero-Commander 690 was used during this period. The horizontal detection distance from the flight line was recorded for all groups of bears detected. To determine if there was an effect of distance on the probability of a response indicative of potential Level B harassment, we modeled the binary behavioral response by groups of bears to the aircraft with Bayesian probit regression (Hooten and Hefley 2019). We restricted the data to those groups observed less than 10 km from the aircraft, which is the maximum distance at which behavioral responses were likely to be reliably recorded. In nearly all cases when more than one bear was encountered, every member of the group exhibited the same response, so we treated the group as the sampling unit, yielding a sample size of 346 groups. Of those, 63 exhibited behavioral responses. Model parameters were estimated using 10,000 iterations of a Markov chain Monte Carlo algorithm composed of Gibbs updates implemented in R (R core team 2021, Hooten and Hefley 2019). Normal (0,1) priors, which are uninformative on the prior predictive scale (Hobbs and Hooten 2015), were placed on model parameters. Distance to bear as well as squared distance (to account for possible non-linear decay of probability with distance) were included as covariates. However, the 95 percent credible intervals for the estimated coefficients overlapped zero suggesting no significant effect of distance on polar bears' behavioral responses. While it is likely that bears do respond differently to aircraft at different distances, the data available is heavily biased towards very short distances because the coastal surveys are designed to observe bears immediately along the coast. We were thus unable to detect any effect of distance. Therefore, to estimate a single rate of harassment, we fit an intercept-only model and used the distribution of the marginal posterior predictive

probability to compute a point estimate. Because the data from the coastal surveys were not systematically collected to study polar bear behavioral responses to aircraft, the data likely bias the probability of behavioral response low. We, therefore, chose the upper 99th percentile of the distribution as our point estimate of the probability of potential harassment. This equated to a harassment rate of 0.23. Because we were not able to detect an effect of distance, we could not correlate behavioral responses with profiles of sound pressure levels for the Aero-Commander (the aircraft used to collect the survey data). Therefore, we could also not use that relationship to extrapolate behavioral responses to sound profiles for takeoffs and landings nor sound profiles of other aircraft. Accordingly, we applied the single harassment rate to all portions of all aircraft flight paths.

General Approach To Estimating Harassment for Aircraft Activities

Aircraft information was determined using details provided in AOGA's Request, including flight paths, flight take-offs and landings, altitudes, and aircraft type. More information on the altitudes of future flights can be found in the Request. If no location or frequency information was provided, flight paths were approximated based on the information provided. Of the flight paths that were described clearly or were addressed through assumptions, we marked the approximate flight path start and stop points using ArcGIS Pro (version 2.4.3), and the paths were drawn. For flights traveling between two airstrips, the paths were reviewed and duplicated as closely as possible to the flight logs obtained from *www.FlightAware.com* (FlightAware), a website that maintains flight logs in the public domain. For flight paths where airstrip information was not available, a direct route was assumed. Activities such as pipeline inspections followed a route along the pipeline with the assumption the flight returned along the same route unless a more direct path was available.

Flight paths were broken up into segments for landing, take-off, and traveling to account for the length of time the aircraft may be impacting an

area based on flight speed. The distance considered the "landing" area is based on approximately 4.83 km (3 mi) per 305 m (1,000 ft) of altitude descent speed. For all flight paths at or exceeding an altitude of 152.4 m (500 ft), the "take-off" area was marked as 2.41 km (1.5 mi) derived from flight logs found through FlightAware, which suggested that ascent to maximum flight altitude took approximately half the time of the average descent. The remainder of the flight path that stretches between two air strips was considered the "traveling" area. We then applied the exposure area of 1,610 m (1 mi) along the flight paths. The data used to estimate the probability of Level B harassments due to aircraft (see section *Estimating Harassment Rates of Aircraft Activities*) suggested 99% of groups of bears were observed within 1.6 km of the aircraft.

We then differentiated the coastal and inland zones. The coastal zone was the area offshore and within 2 km (1.2 mi) of the coastline (see section *Spatially Partitioning the North Slope into "coastal" and "inland" zones*), and the inland zone was anything greater than 2 km (1.2 mi) from the coastline. We calculated the areas in square kilometers for the exposure area within the coastal zone and the inland zone for all take-offs, landings, and traveling areas. For flights that involve an inland and a coastal airstrip, we considered landings to occur at airstrips within the coastal zone. Seasonal encounter rates developed for both the coastal and inland zones (see section *Search Effort Buffer*) were applied to the appropriate segments of each flight path.

Surface encounter rates were calculated based on the number of bears per season (see section *Search Effort Buffer*). To apply these rates to aircraft activities, we needed to calculate a proportion of the season in which aircraft were flown. However, the assumption involved in using a seasonal proportion is that the area is impacted for an entire day (*i.e.*, for 24 hours). Therefore, to prevent estimating impacts along the flight path over periods of time where aircraft are not present, we calculated a proportion of the day the area will be impacted by aircraft activities for each season (Table 5).

TABLE 5—VARIABLE DEFINITIONS AND CONSTANT VALUES USED IN POLAR BEAR HARASSMENT ESTIMATES FOR WINTER AND SUMMER AIRCRAFT ACTIVITIES ON THE COAST OF THE NORTH SLOPE OF ALASKA

Variable	Definition	Value
d_s	days in each season	open-water season = 116, ice season = 249
S_p	proportion of the season an area of interest is impacted	varies by flight.
f	flight frequency	varies by flight.

TABLE 5—VARIABLE DEFINITIONS AND CONSTANT VALUES USED IN POLAR BEAR HARASSMENT ESTIMATES FOR WINTER AND SUMMER AIRCRAFT ACTIVITIES ON THE COAST OF THE NORTH SLOPE OF ALASKA—Continued

Variable	Definition	Value
$D_{p(LT)}$	proportion of the day landing/take-off areas are impacted by aircraft activities.	varies by flight.
t_{LT}	amount of time an aircraft is impacting landing/take-off areas within a day ...	10 minutes per flight.
$D_{p(TR)}$	proportion of the day traveling areas are impacted by aircraft activities	varies by flight.
t_{TR}	amount of time an aircraft is impacting traveling areas	1.5 minutes per 3.22 km [2 mi] segment per flight.
x	number of 3.22-km (2-mi) segments within each traveling area	varies by flight.
B_{es}	bears encountered in an area of interest for the entire season	varies by flight.
B_i	bears impacted by aircraft activities	varies by flight.
a_c	coastal exposure area	1,610 m (1 mi).
a_i	inland exposure area	1,610 m (1 mi).
e_{co}	coastal open-water season bear-encounter rate in bears/season	3.45 bears/km ² /season.
e_{ci}	coastal ice season bear-encounter rate in bears/season	0.118 bears/km ² /season.
e_{io}	inland open-water season bear-encounter rate in bears/season	0.0116 bears/km ² /season.
e_{ii}	inland ice season bear-encounter rate in bears/season	0.0104 bears/km ² /season.
t_a	aircraft harassment rate	0.23.
B_t	number of estimated level B harassments	varies by flight.

The number of times each flight path was flown (*i.e.*, flight frequency) was determined from the application. We used the description combined with the

approximate number of weeks and months within the open-water season and the ice season to determine the total number of flights per season for each

year (*f*). We then used flight frequency and number of days per season (d_s) to calculate the seasonal proportion of flights (S_p ; Equation 6).

$$S_p = \frac{f}{d_s}$$

Equation 6

After we determined the seasonal proportion of flights, we estimated the amount of time an aircraft would be impacting the landing/take-off areas within a day (t_{LT}). Assuming an aircraft is not landing at the same time another is taking off from the same airstrip, we

estimated the amount of time an aircraft would be present within the landing or take-off zone would be $t_{LT} = 10$ minutes. We then calculated how many minutes within a day an aircraft would be impacting an area and divided by the number of minutes within a 24-hour

period (1,440 minutes). This determined the proportion of the day in which a landing/take-off area is impacted by an aircraft for each season ($D_{p(LT)}$; Equation 7).

$$D_{p(LT)} = \frac{S_p * t_{LT}}{1440}$$

Equation 7

To estimate the amount of time an aircraft would be impacting the travel areas (t_{TR}), we calculated the minimum amount of time it would take for an aircraft to travel the maximum exposure area at any given time, 3.22 km (2.00 mi). We made this estimate using average aircraft speeds at altitudes less than 305 m (1,000 ft) to account for

slower flights at lower altitudes, such as summer cleanup activities and determined it would take approximately 1.5 minutes. We then determined how many 3.22-km (2-mi) segments are present along each traveling path (x). We determined the total number of minutes an aircraft would be impacting any 3.22-km (2-mi) segment along the

travel area in a day and divided by the number of minutes in a 24-hour period. This calculation determined the proportion of the day in which an aircraft would impact an area while traveling during each season ($D_{p(TR)}$; Equation 8).

$$D_{p(TR)} = \frac{S_p * (t_{TR} * x)}{1440}$$

Equation 8

We then used observations of behavioral reactions from aerial surveys (see section *Estimating Harassment Rates of Aircraft Activities*) to determine the appropriate harassment rate in the exposure area (1,610 m (1 mi) from the center of the flight line; see above in this

section). The harassment rate areas were then calculated separately for the landing and take-off areas along each flight path as well as the traveling area for all flights with altitudes at or below 457.2 m (1,500 ft).

To estimate number of polar bears harassed due to aircraft activities, we

first calculated the number of bears encountered (B_{es}) for the landing/take-off and traveling sections using both coastal (e_{ci} or co) and inland (e_{ii} or io) encounter rates within the coastal (a_c) and inland (a_i) exposure areas (Equation 9).

$$B_{es} = (e_{ci \text{ or } co} * a_c) + (e_{ii \text{ or } io} * a_i)$$

Equation 9

Using the calculated number of coastal and inland bears encountered for each season, we applied the daily seasonal proportion for both landings/ take-offs and traveling areas to

determine the daily number of bears impacted due to aircraft activities (B_i). We then applied the aircraft harassment rate (t_a) associated with the exposure area (see section *Estimating Harassment*

Rates of Aircraft Activities), resulting in a number of bears harassed during each season (B_i ; Equation 10). Harassment associated with AIR surveys was analyzed separately.

$$B_t = B_i * t_a$$

Equation 10

Analysis Approach for Estimating Harassment During Aerial Infrared Surveys

Typically, during every ice season Industry conducts polar bear den surveys using AIR. Although the target for these surveys is polar bear dens, bears on the surface can be impacted by the overflights. These surveys are not conducted along specific flight paths and generally overlap previously flown areas within the same trip. Therefore, the harassment estimates for surface bears during AIR surveys were estimated using a different methodology.

Rather than estimate potential flight paths, we used the maximum amount of flight time that is likely to occur for AIR surveys during each year. The period of AIR surveys lasts November 25th to January 15th (52 days), and we

estimated a maximum of 6 hours of flight time per day, resulting in a total of 312 flight hours per year. To determine the amount of time AIR flights are likely to survey coastal and inland zones, we found the area where industry activities and denning habitat overlap and buffered by 1.6 km (1 mi). We then split the buffered denning habitat by zone and determined the proportion of coastal and inland denning habitat. Using this proportion, we estimated the number of flight hours spent within each zone and determined the proportion of the ice season in which AIR surveys were impacting the survey areas (see *General Approach to Estimating Harassment for Aircraft Activities*). We then estimated the aircraft footprint to determine the area that would be impacted at any given time as well as the area accounting for two take-offs and two landings. Using

the seasonal bear encounter rates for the appropriate zones multiplied by the area impacted and the proportion of the season AIR flights were flown, we determined the number of bears encountered. We then applied the aircraft harassment rate to the number of bears encountered per zone to determine number of bears harassed.

Estimated Harassment From Aircraft Activities

Using the approach described in *General Approach to Estimating Harassment for Aircraft Activities* and *Analysis Approach for Estimating Harassment during Aerial Infrared Surveys*, we estimated the total number of bears expected to be harassed by the aircraft activities included in the analyses during the proposed Beaufort Sea ITR period of 2021–2026 (Table 6).

TABLE 6—ESTIMATED LEVEL B HARASSMENT OF POLAR BEARS ON THE NORTH SLOPE OF ALASKA BY YEAR AS A RESULT OF AIRCRAFT OPERATIONS DURING THE 2021–2026 PROPOSED ITR PERIOD

	21–22	22–23	23–24	24–25	25–26	26	Total
Est. Harassment	0.89	0.95	0.95	1.09	1.09	0.15	5.45

Average estimated polar bear harassments per year = 1.09 bears.

Methods for Modeling the Effects of Den Disturbance

Case Studies Analysis

To assess the likelihood and degree of exposure and predict probable responses of denning polar bears to

activities proposed in the AOGA application, we characterized, evaluated, and prioritized a series of rules and definitions towards a predictive model based on knowledge of published and unpublished information on denning ecology, behavior, and cub

survival. Contributing information came from literature searches in several major research databases and data compiled from polar bear observations submitted by the oil and gas Industry. We considered all available scientific and observational data we could find on

polar bear denning behavior and effects of disturbance.

From these sources, we identified 57 case studies representing instances where polar bears at a maternal den may have been exposed to human activities. For each den, we considered the four denning periods separately, and for each period, determined whether adequate information existed to document

whether (1) the human activity met our definition of an exposure and (2) the response of the bear(s) could be classified according to our rules and definitions. From these 57 dens, 80 denning period-specific events met these criteria. For each event, we classified the type and frequency (*i.e.*, discrete or repeated) of the exposure,

the response of the bear(s), and the level of take associated with that response. From this information, we calculated the probability that a discrete or repeated exposure would result in each possible level of take during each denning period, which informed the probabilities for outcomes in the simulation model (Table 7).

TABLE 7—PROBABILITY THAT A DISCRETE OR REPEATED EXPOSURE ELICITED A RESPONSE BY DENNING POLAR BEARS THAT WOULD RESULT IN LEVEL B HARASSMENT, LEVEL A HARASSMENT (INCLUDING SERIOUS AND NON-SERIOUS INJURY), OR LETHAL TAKE

[Level B harassment was applicable to both adults and cubs, if present; Level A harassment and lethal take were applicable to cubs only. Probabilities were calculated from the analysis of 57 case studies of polar bear responses to human activity. Cells with NAs indicate these types of take were not possible during the given denning period]

Exposure type	Period	None	Level B	Non-serious Level A	Serious Level A	Lethal
Discrete	Den Establishment	0.400	0.600	NA	NA	NA
	Early Denning	1.000	0.000	NA	NA	0.000
	Late Denning	0.091	0.000	NA	0.909	0.000
	Post-emergence	0.000	0.000	0.750	NA	0.250
Repeated	Den Establishment	1.000	0.000	NA	NA	NA
	Early Denning	0.800	0.000	NA	NA	0.200
	Late Denning	0.708	0.000	NA	0.292	0.000
	Post-emergence	0.000	0.267	0.733	NA	0.000

Case Study Analysis Definitions

Below, we provide definitions for terms used in this analysis, a general overview of denning chronology and periods (details are provided in the Potential Effects to Pacific Walrus, Polar Bears and Prey Species: *Effects on denning bears*), and the rules established for using the case studies to inform the model.

Exposure and Response Definitions

Exposure: Any human activity within 1.6 km (1 mi) of a polar bear den site. In the case of aircraft, an overflight within 457 m (0.3 mi) above ground level.

Discrete exposure: An exposure that occurs only once and of short duration (<30 minutes). It can also be a short-duration exposure that happens repeatedly but that is separated by sufficient time that exposures can be treated as independent (*e.g.*, aerial pipeline surveys that occur weekly).

Repeated exposure: An exposure that occurs more than once within a time period where exposures cannot be considered independent or an exposure that occurs due to continuous activity during a period of time (*e.g.*, traffic along a road, or daily visits to a well pad).

Response probability: The probability that an exposure resulted in a response by denning polar bears.

We categorized each exposure into categories based on polar bear response:

- **No response:** No observed or presumed behavioral or physiological response to an exposure.
- **Likely physiological response:** An alteration in the normal physiological function of a polar bear (*e.g.*, elevated heart rate or stress hormone levels) that is typically unobservable but is likely to occur in response to an exposure.
- **Behavioral response:** A change in behavior in response to an exposure. Behavioral responses can range from biologically insignificant (*e.g.*, a resting bear raising its head in response to a vehicle driving along a road) to substantial (*e.g.*, cub abandonment) and concomitant levels of take vary accordingly.

Timing Definitions

Entrance date: The date a female first enters a maternal den after excavation is complete.

Emergence date: The date a maternal den is first opened and a bear is exposed directly to external conditions. Although a bear may exit the den completely at emergence, we considered even partial-body exits (*e.g.*, only a bear's head protruding above the surface of the snow) to represent emergence in order to maintain consistency with dates derived from temperature sensors on collared bears (*e.g.*, Rode *et al.* 2018b). For dens located near regularly occurring human activity, we considered the first day a bear was observed near a den to be the emergence

date unless other data were available to inform emergence dates (*e.g.*, GPS collar data).

Departure date: The date when bears leave the den site to return to the sea ice. If a bear leaves the den site after a disturbance but later returns, we considered the initial movement to be the departure date.

Definition of Various Denning Periods

Den establishment period: Period of time between the start of maternal den excavation and the birth of cubs. Unless evidence indicates otherwise, all dens that are excavated by adult females in the fall or winter are presumed to be maternal dens. In the absence of other information, this period is defined as denning activity prior to December 1 (*i.e.*, estimated earliest date cubs are likely present in dens (Derocher *et al.* 1992, Van de Velde *et al.* 2003)).

Early denning period: Period of time from the birth of cubs until they reach 60 days of age and are capable of surviving outside the den. In the absence of other information, this period is defined as any denning activity occurring between December 1 and February 13 (*i.e.*, 60 days after 15 December, the estimated average date of cub birth; Van de Velde *et al.* 2003, Messier *et al.* 1994).

Late denning period: Period of time between when cubs reach 60 days of age and den emergence. In the absence of other information, this period is defined

as any denning activity occurring between 14 February and den emergence.

Post-emergence period: Period of time between den emergence and den site departure. We considered a “normal” duration at the den site between emergence and departure to be greater than or equal to 8 days and classified departures that occurred post emergence “early” if they occurred less than 8 days after emergence.

Descriptions of Potential Outcomes

Cub abandonment: Occurs when a female leaves all or part of her litter, either in the den or on the surface, at any stage of the denning process. We classified events where a female left her cubs but later returned (or was returned by humans) as cub abandonment.

Early emergence: Den emergence that occurs as the result of an exposure (see ‘Rules’ below).

Early departure: Departure from the den site post-emergence that occurs as the result of an exposure (see ‘Rules’ below).

Predictive Model Rules for Determining Den Outcomes and Assigning Take

- We considered any exposure in a 24-hour period that did not result in a Level A harassment or lethal take to potentially be a Level B harassment take if a behavioral response was observed. However, multiple exposures do not result in multiple Level B harassment takes unless the exposures occurred in two different denning periods.

- If comprehensive dates of specific exposures are not available and daily exposures were possible (*e.g.*, the den was located within 1.6 km [1 mi] of an ice road), we assumed exposures occurred daily.

- In the event of an exposure that resulted in a disturbance to denning bears, take was assigned for each bear (*i.e.*, female and each cub) associated with that den. Whereas assigned take for cubs could range from Level B harassment to lethal take, for adult females only Level B harassment was possible.

- In the absence of additional information, we assumed dens did not contain cubs prior to December 1 but did contain cubs on or after December 1.

- If an exposure occurred and the adult female subsequently abandoned her cubs, we assigned a lethal take for each cub.

- If an exposure occurred during the early denning period and bears emerged from the den before cubs reached 60 days of age, we assigned a lethal take for each cub. In the absence of information

about cub age, a den emergence that occurred between December 1 and February 13 was considered to be an early emergence and resulted in a lethal take of each cub.

- If an exposure occurred during the late denning period (*i.e.*, after cubs reached 60 days of age) and bears emerged from the den before their intended (*i.e.*, undisturbed) emergence date, we assigned a serious injury Level A harassment take for each cub. In the absence of information about cub age and intended emergence date (which was known only for simulated dens), den emergences that occurred between (and including) February 14 and March 14 were considered to be early emergences and resulted in a non-serious injury Level A harassment take of each cub. If a den emergence occurred after March 14 but was clearly linked to an exposure (*e.g.*, bear observed emerging from the den when activity initiated near the den), we considered the emergence to be early and resulted in a serious injury Level A harassment take of each cub.

- For dens where emergence was not classified as early, if an exposure occurred during the post-emergence period and bears departed the den site prior to their intended (*i.e.*, undisturbed) departure date, we assigned a non-serious injury Level A harassment take for each cub. In the absence of information about the intended departure date (which was known only for simulated dens), den site departures that occurred less than 8 days after the emergence date were considered to be early departures and resulted in a non-serious injury Level A harassment take of each cub.

Den Simulation

We simulated dens across the entire north slope of Alaska, ranging from the areas identified as denning habitat (Blank 2013, Durner *et al.* 2006, 2013) contained within the National Petroleum Reserve—Alaska (NPR) in the west to the Canadian border in the east. While AOGA’s Request does not include activity inside the Arctic National Wildlife Refuge (ANWR), we still simulated dens in that area to ensure that any activities directly adjacent to the refuge that might impact denning bears inside the refuge would be captured. To simulate dens on the landscape, we relied on the estimated number of dens in three different regions of northern Alaska provided by Atwood *et al.* (2020). These included the NPR, the area between the Colville and Canning Rivers (CC), and ANWR. The mean estimated number of dens in each region during a given winter were

as follows: 12 dens (95% CI: 3–26) in the NPR, 26 dens (95% CI: 11–48) in the CC region, and 14 dens (95% CI: 5–30) in ANWR (Atwood *et al.* 2020). For each iteration of the model (described below), we drew a random sample from a gamma distribution for each of the regions based on the above parameter estimates, which allowed uncertainty in the number of dens in each area to be propagated through the modeling process. Specifically, we used the method of moments (Hobbs and Hooten 2015) to develop the shape and rate parameters for the gamma distributions as follows: NPR (12²/5.8², 12/5.8²), CC (26²/9.5², 26/9.5²), and ANWR (14²/6.3², 14/6.3²).

Because not all areas in northern Alaska are equally used for denning and some areas do not contain the requisite topographic attributes required for sufficient snow accumulation for den excavation, we did not randomly place dens on the landscape. Instead, we followed a similar approach to that used by Wilson and Durner (2020) with some additional modifications to account for differences in denning ecology in the CC region related to a preference to den on barrier islands and a general (but not complete) avoidance of actively used industrial infrastructure. Using the USGS polar bear den catalogue (Durner *et al.* 2020), we identified polar bear dens that occurred on land in the CC region and that were identified either by GPS-collared bears or through systematic surveys for denning bears (Durner *et al.* 2020). This resulted in a sample of 37 dens of which 22 (*i.e.*, 60 percent) occurred on barrier islands. For each iteration of the model, we then determined how many of the estimated dens in the CC region occurred on barrier islands versus the mainland.

To accomplish this, we first took a random sample from a binomial distribution to determine the expected number of dens from the den catalogue (Durner *et al.* 2020) that should occur on barrier islands in the CC region during that given model iteration;

$n_{\text{barrier}} = \text{Binomial}(37, 22/37)$, where 37 represents the total number of dens in the den catalogue (Durner *et al.* 2020) in the CC region suitable for use (as described above) and 22/37 represents the observed proportion of dens in the CC region that occurred on barrier islands. We then divided n_{barrier} by the total number of dens in the CC region suitable for use (*i.e.*, 37) to determine the proportion of dens in the CC region that should occur on barrier islands (*i.e.*, p_{barrier}). We then multiplied p_{barrier} with the simulated number of dens in the CC region (rounded to the nearest whole number) to determine how many dens

were simulated to occur on barrier islands in the region.

In the NPRA, the den catalogue (Durner *et al.* 2020) data indicated that two dens occurred outside of defined denning habitat (Durner *et al.* 2013), so we took a similar approach as with the barrier islands to estimate how many dens occur in areas of the NPRA with the den habitat layer during each iteration of the model;

$n_{habitat}$ ~Binomial(15, 13/15), where 15 represents the total number of dens in NPRA from the den catalogue (Durner *et al.* 2020) suitable for use (as described above), and 13/15 represents the observed proportion of dens in NPRA that occurred in the region with den habitat coverage (Durner *et al.* 2013). We then divided $n_{habitat}$ by the total number of dens in NPRA from the den catalogue (*i.e.*, 15) to determine proportion of dens in the NPRA region that occurred in the region of the den habitat layer ($p_{habitat}$). We then multiplied $p_{habitat}$ with the simulated number of dens in NPRA (rounded to the nearest whole number) to determine the number of dens in NPRA that occurred in the region with the den

habitat layer. Because no infrastructure exists and no activities are proposed to occur in the area of NPRA without the den habitat layer, we only considered the potential impacts of activity to those dens simulated to occur in the region with denning habitat identified (Durner *et al.* 2013).

To account for the potential influence of industrial activities and infrastructure on the distribution of polar bear selection of den sites, we again relied on the subset of dens from the den catalogue (Durner *et al.* 2020) discussed above. We further restricted the dens to only those occurring on the mainland because no permanent infrastructure occurred on barrier islands with identified denning habitat (Durner *et al.* 2006). We then determined the minimum distance to permanent infrastructure that was present when the den was identified. This led to an estimate of a mean minimum distance of dens to infrastructure being 21.59 km (SD = 16.82). From these values, we then parameterized a gamma distribution: Gamma(21.59²/16.82², 21.59/16.82²). We then obtained 100,000 samples from this distribution

and created a discretized distribution of distances between dens and infrastructure. We created 2.5-km intervals between 0 and 45 km, and one bin for areas >45 km greater than 45km from infrastructure and determined the number of samples that occurred within each distance bin. We then divided the number of samples in each bin by the total number of samples to determine the probability of a simulated den occurring in a given distance bin. The choice of 2.5 km for distance bins was based on a need to ensure that kernel density grid cells occurred in each distance bin.

To inform where dens are most likely to occur on the landscape, we developed a kernel density map by using known den locations in northern Alaska identified either by GPS-collared bears or through systematic surveys for denning bears (Durner *et al.* 2020). To approximate the distribution of dens, we used an adaptive kernel density estimator (Terrell and Scott 1992) applied to n observed den locations, which took the form

$$f(\mathbf{s}) \propto \frac{\theta}{n} \sum_i^n k\left(\frac{\mathbf{s}-\mathbf{s}_i}{h(\mathbf{s})}\right), \text{ where the adaptive bandwidth } h(\mathbf{s}) = (\beta_0 + \beta_1 I(\mathbf{s}_i \in \mathcal{M}) I(\mathbf{s} \in \mathcal{M})) \beta_2$$

for the location of the i th den and each location \mathbf{s} in the study area. The indicator functions allowed the bandwidth to vary abruptly between the mainland \mathcal{M} and barrier islands. The kernel k was the Gaussian kernel, and the parameters θ , β_0 , β_1 , β_2 were chosen based on visual assessment so that the density estimate approximated the observed density of dens and our understanding of likely den locations in areas with low sampling effort.

The kernel density map we used for this analysis differs slightly from the version used in previous analyses, specifically our differentiation of barrier islands from mainland habitat. We used this modified version because previous analyses did not require us to consider denning habitat in the CC region, which has a significant amount of denning that occurs on barrier islands compared to the other two regions. If barrier islands were not differentiated for the kernel density estimate, density from the barrier island dens would spill over

onto the mainland, which was deemed to be biologically unrealistic given the clear differences in den density between the barrier islands and the mainland in the region. For each grid cell in the kernel density map within the CC region, we then determined the minimum distance to roads and pads that had occupancy ≥ 0.50 identified by AOGA during October through December (*i.e.*, the core period when bears were establishing their dens). We restricted the distance to infrastructure component to only the CC region because it is the region that contains the vast majority of oil and gas infrastructure and has had some form of permanent industrial infrastructure present for more than 50 years. Thus, denning polar bears have had a substantial amount of time to modify their selection of where to den related to the presence of human activity.

To simulate dens on the landscape, we first sampled in which kernel grid cell a den would occur based on the

underlying relative probability (Figure 6) within a given region using a multinomial distribution. Once a cell was selected, the simulated den was randomly placed on the denning habitat (Blank 2013, Durner *et al.* 2006, 2013) located within that grid cell. For dens being simulated on mainland in the CC region, an additional step was required. We first assigned a simulated den a distance bin using a multinomial distribution of probabilities of being located in a given distance bin based on the discretized distribution of distances described above. Based on the distance to infrastructure bin assigned to a simulated den, we subset the kernel density grid cells that occurred in the same distance bin and then selected a grid cell from that subset based on their underlying probabilities using a multinomial distribution. Then, similar to other locations, a den was randomly placed on denning habitat within that grid cell.

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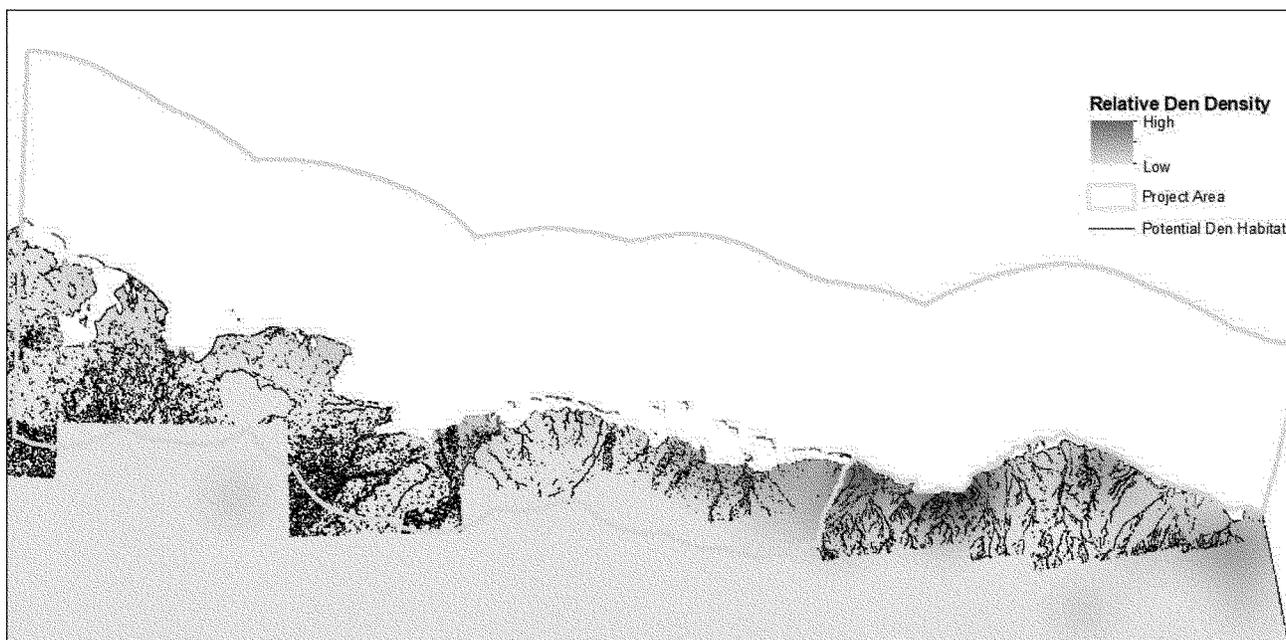


Figure 6—Depiction of the proposed project area with the underlying relative density of polar bear dens and potential polar bear den habitat as identified by Durner *et al.* (2006, 2013) and Blank (2013).

For each simulated den, we assigned dates of key denning events; den entrance, birth of cubs, when cubs reached 60 days of age, den emergence, and departure from the den site after emergence. These represent the chronology of each den under undisturbed conditions. We selected the entrance date for each den from a normal distribution parameterized by entrance dates of radio-collared bears in the Southern Beaufort subpopulation that denned on land included in Rode *et al.* (2018) and published in USGS (2018; $n = 52$, mean = 11 November, SD = 18 days). These data were restricted to those dens with both an entrance and emergence data identified and where a bear was in the den for greater than or equal to 60 days to reduce the chances of including non-maternal bears using shelter dens. Sixty days represents the minimum age of cubs before they have a chance of survival outside of the den. Thus, periods less than 60 days in the den have a higher chance of being shelter dens.

We truncated this distribution to ensure that all simulated dates occurred within the range of observed values (*i.e.*, 12 September to 22 December) identified in USGS (2018) to ensure that entrance dates were not simulated during biologically unreasonable periods given that the normal distribution allows some probability

(albeit small) of dates being substantially outside a biologically reasonable range. We selected a date of birth for each litter from a normal distribution with the mean set to ordinal date 348 (*i.e.*, 15 December) and standard deviation of 10, which allowed the 95 percent CI to approximate the range of birth dates (*i.e.*, December 1 to January 15) identified in the peer-reviewed literature (Messier *et al.* 1994, Van de Velde *et al.* 2003). We ensured that simulated birth dates occurred after simulated den entrance dates. We selected the emergence date as a random draw from an asymmetric Laplace distribution with parameters $\mu = 81.0$, $\sigma = 4.79$, and $p = 0.79$ estimated from the empirical emergence dates in Rode *et al.* (2018) and published in USGS (2018, $n = 52$) of radio-collared bears in the Southern Beaufort Sea stock that denned on land using the mleALD function from package 'ald' (Galarzar and Lachos 2018) in program R (R Core Development Team 2021). We constrained simulated emergence dates to occur within the range of observed emergence dates (January 9 to April 9, again to constrain dates to be biologically realistic) and to not occur until after cubs were 60 days old. Finally, we assigned the number of days each family group spent at the den site post-emergence based on values reported in four behavioral studies,

Smith *et al.* (2007, 2010, 2013) and Robinson (2014), which monitored dens near immediately after emergence ($n = 25$ dens). Specifically, we used the mean (8.0) and SD (5.5) of the dens monitored in these studies to parameterize a gamma distribution using the method of moments (Hobbs and Hooten 2015) with a shape parameter equal to $8.0^2/5.5^2$ and a rate parameter equal to $8.0/5.5^2$; we selected a post-emergence, pre-departure time for each den from this distribution. We restricted time at the den post emergence to occur within the range of times observed in Smith *et al.* (2007, 2010, 2013) and Robinson (2014) (*i.e.*, 2–23 days, again to ensure biologically realistic times spent at the den site were simulated). Additionally, we assigned each den a litter size by drawing the number of cubs from a multinomial distribution with probabilities derived from litter sizes ($n = 25$ litters) reported in Smith *et al.* (2007, 2010, 2013) and Robinson (2014).

Because there is some probability that a female naturally emerges with 0 cubs, we also wanted to ensure this scenario was captured. It is difficult to parameterize the probability of litter size equal to 0 because it is rarely observed. We, therefore, assumed that dens in the USGS (2018) dataset that had denning durations less than the shortest den duration where a female

was later observed with cubs (*i.e.*, 79 days) had a litter size of 0. There were only 3 bears in the USGS (2018) data that met this criteria, leading to an assumed probability of a litter size of 0 at emergence being 0.07. We, therefore, assigned the probability of 0, 1, 2, or 3 cubs as 0.07, 0.15, 0.71, and 0.07, respectively.

Infrastructure and Human Activities

The model developed by Wilson and Durner (2020) provides a template for estimating the level of potential impact to denning polar bears of proposed activities while also considering the natural denning ecology of polar bears in the region. The approach developed by Wilson and Durner (2020) also allows for the incorporation of uncertainty in both the metric associated with denning bears and in the timing and spatial patterns of proposed activities when precise information on those activities is unavailable. Below we describe the different sources of potential disturbance we considered within the

model. We considered infrastructure and human activities only within the area of proposed activity in the ITR request. However, given that activity on the border of this region could still affect dens falling outside of the area defined in the ITR request, we also considered the impacts to denning bears within a 1-mile buffer outside of the proposed activity area.

Roads and Pads

We obtained shapefiles of existing and proposed road and pad infrastructure associated with industrial activities from AOGA. Each attribute in the shapefiles included a monthly occupancy rate that ranged from 0 to 1. For this analysis, we assumed that any road or pad with occupancy greater than 0 for a given month had the potential for human activity during the entire month unless otherwise noted.

Ice Roads and Tundra Travel

We obtained shapefiles of proposed ice road and tundra travel routes from AOGA. We also received information on

the proposed start and end dates for ice roads and tundra routes each winter from AOGA with activity anticipated to occur at least daily along each.

Seismic Surveys

Seismic surveys are planned to occur in the central region of the project area proposed by AOGA (Figure 7). The region where seismic surveys would occur were split into two different portions representing relatively high and relatively low probabilities of polar bear dens being present (Figure 7). During any given winter, no more than 766 km² and 1183 km² will be surveyed in the high- and low-density areas, respectively. Therefore, for this analysis, we estimated take rates by assuming that seismic surveys would occur in the portions of those areas with the highest underlying probabilities of denning occurring and covering the largest area proposed in each (*i.e.*, 766 km² and 1183 km²). All seismic surveys could start as early as January 1 and operate until April 15.

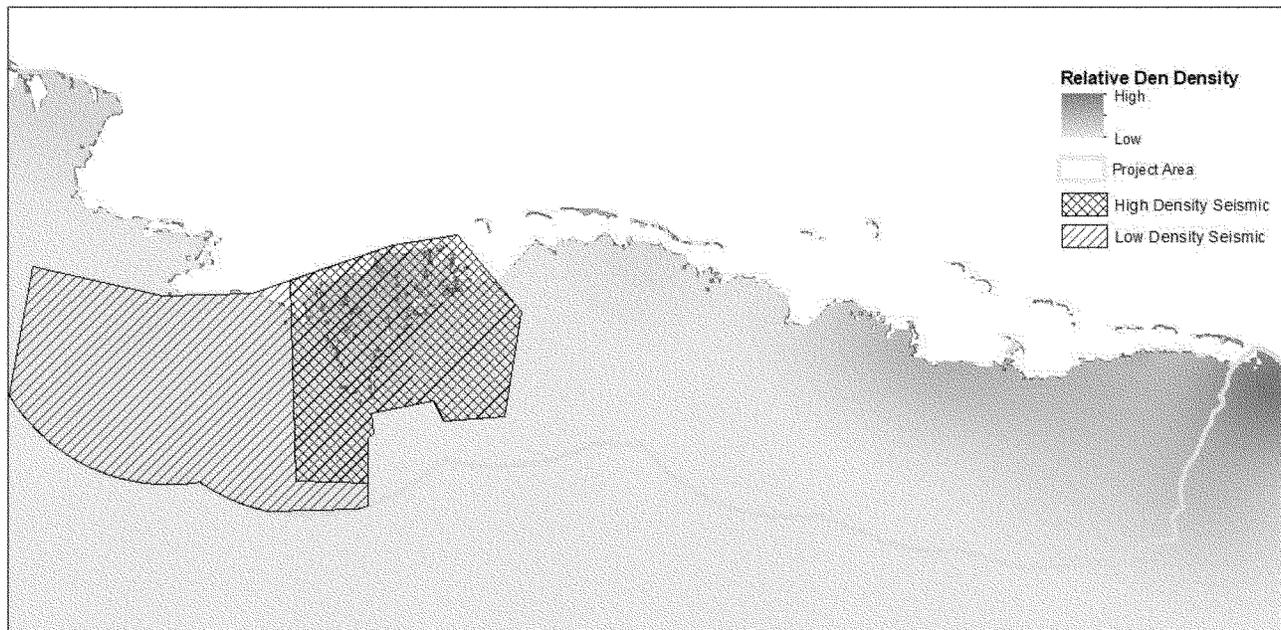


Figure 7—Depiction of areas where seismic surveys occurred in simulations with underlying map of relative den density. The high-density seismic area covers a region with relatively high probability of denning, and the low-density seismic area covers a region with relatively low probability of denning. During any given winter, no more than 766 km² and 1,183 km² will be surveyed in the high-density and low-density areas, respectively.

Pipelines

We obtained shapefiles of existing and proposed pipelines, as well as which months and years each pipeline would be operational, from AOGA. Based on the description in the request, we assumed that all pipelines would have aerial surveys conducted weekly with aircraft flying at altitudes <457.2 m (<1,500 ft) and potentially exposing polar bears to disturbance.

Other Aircraft Activities

Aside from flights to survey pipelines, the majority of aircraft flights are expected to occur at altitudes >457.2 m (>1,500 ft). After reviewing current and proposed flight patterns for flights likely to occur at altitudes <457.2 m (<1,500 ft), we found one flight path that we included in the model. The flight path is between the Ooguruk drill site and the onshore tie-in pad with at least daily flights between September 1 and January 31. We, therefore, also considered these flights as a continuous source of potential exposure to denning bears.

Aerial Infrared Surveys

Based on AOGA's request, we assumed that all permanent infrastructure (*i.e.*, roads, pipelines, and pads), tundra travel routes, and ice roads would receive two aerial infrared (AIR) surveys of polar bear den habitat within 1 mile of those features each

winter. The first survey could occur between December 1 and 25 and the second between December 15 through January 10 with at least 24 hours between the completion of the first survey and the beginning of the second. During winters when seismic surveys occur, additional AIR surveys would be required. A total of three AIR surveys of any den habitat within 1 mile of the seismic survey area would be required prior to any seismic-related activities occurring (*e.g.*, advance crews checking ice conditions). The first AIR survey would need to occur between November 25 and December 15, the second between December 5 and 31, and the third between December 15 and January 15 with the same minimum of 24 hours between subsequent surveys. Similarly, during winters when seismic surveys occur, an additional AIR survey would be required of denning habitat within 1 mile of the pipeline between Badami and the road to Endicott Island. The additional survey of the pipeline (to create a total of three) would need to occur between December 5 and January 10.

During each iteration of the model, each AIR survey was randomly assigned a probability of detecting dens. Whereas previous analyses have used the results of Wilson and Durner (2020) to inform this detection probability, two additional studies (Smith *et al.* 2020, Woodruff *et al.* in prep.) have been

conducted since Wilson and Durner (2020) was published that require an updated approach. The study by Woodruff *et al.* (in prep.) considered the probability of detecting heat signatures from artificial polar bear dens. They did not find a relationship between den snow depth and detection and estimated a mean detection rate of 0.24. A recent study by Smith *et al.* (2020) estimated that the detection rate for actual polar bear dens in northern Alaska was 0.45 and also did not report any relationship between detection and den snow depth. Because the study by Wilson and Durner (2020) reported detection probability only for dens with less than 100 cm snow depth, we needed to correct it to also include those dens with greater than 100 cm snow depth. Based on the distribution of snow depths used by Wilson and Durner (2020) derived from data in Durner *et al.* (2003), we determined that 24 percent of dens have snow depths greater than 100 cm. After taking these into account, the overall detection probability from Wilson and Durner (2020) including dens with snow depths greater than 100 cm was estimated to be 0.54. This led to a mean detection of 0.41 and standard deviation of 0.15 across the three studies. We used these values, and the method of moments (Hobbs and Hooten 2015), to inform a Beta distribution

$$(i.e., Beta \left(\frac{0.41^2 - 0.41^3 - 0.41 \times 0.1539^2}{0.1539^2}, \frac{0.41 - 2 \times 0.41^2 + 0.41^3 - 0.1539^2 + 0.41 \times 0.1539^2}{0.1539^2} \right))$$

from which we drew a detection probability for each of the simulated AIR surveys during each iteration of the model.

Model Implementation

For each iteration of the model, we first determined which dens were exposed to each of the simulated activities and infrastructure. We assumed that any den within 1.6 km (1 mi) of infrastructure or human activities was exposed and had the potential to be disturbed as numerous studies have suggested a 1.6-km buffer is sufficient to reduce disturbance to denning polar bears (MacGillivray *et al.* 2003, Larson *et al.* 2020, Owen *et al.* 2021). If, however, a den was detected by an AIR survey prior to activity occurring within 1.6 km of it, we assumed a 1.6-km buffer would be established to restrict activity adjacent to the den and there would be no potential for future disturbance. If a den was detected by an AIR survey after activity occurred within 1.6 km of it, as

long as the activity did not result in a Level A harassment or lethal take, we assumed a 1.6-km buffer would be applied to prevent disturbance during future denning periods. For dens exposed to human activity (*i.e.*, not detected by an AIR survey), we then identified the stage in the denning cycle when the exposure occurred based on the date range of the activities the den was exposed to. We then determined whether the exposure elicited a response by the denning bear based on probabilities derived from the reviewed case studies (Table 7). Level B harassment was applicable to both adults and cubs, if present, whereas Level A harassment (*i.e.*, serious injury and non-serious injury) and lethal take were applicable only to cubs because the proposed activities had a discountable risk of running over dens and thus killing a female or impacting her future reproductive potential. The majority of proposed activities occur on established, permanent infrastructure

that would not be suitable for denning and therefore, pose no risk of being run over (*i.e.*, an existing road). For those activities off permanent infrastructure (*i.e.*, ice roads and tundra travel routes), crews will constantly be on the lookout for signs of denning, use vehicle-based forward looking infrared cameras to scan for dens, and will largely avoid crossing topographic features suitable for denning given operational constraints. Thus, the risk of running over a den was deemed to have a probability so low that it was discountable.

Based on AOGA's description of their proposed activities, we only considered AIR surveys and pipeline inspection surveys as discrete exposures given that surveys occur quickly (*i.e.*, the time for an airplane to fly over) and infrequently.

For all other activities, we applied probabilities associated with repeated exposure (Table 7). For the pipeline surveys, we made one modification to the probabilities applied compared to those listed in Table 7. The case studies used to inform the post-emergence period include one where an individual fell into a den and caused the female to abandon her cubs. Given that pipeline surveys would either occur with a plane or a vehicle driving along an established path adjacent to a pipeline, there would be no chance of falling into a den. Therefore, we excluded this case study from the calculation of disturbance probabilities applied to our analysis, which led to a 0 percent probability of lethal take and a 100 percent probability of non-serious injury Level A harassment.

For dens exposed to human activity, we used a multinomial distribution with the probabilities of different levels of take for that period (Table 7). If a Level A harassment or lethal take was simulated to occur, a den was not allowed to be disturbed again during the subsequent denning periods because the outcome of that denning event was already determined. As noted above, Level A harassments and lethal takes only applied to cubs because proposed activities would not result in those levels of take for adult females. Adult females, however, could still receive Level B takes during the den establishment period or any time cubs

received Level B harassment, Level A harassment (*i.e.*, serious injury and non-serious injury), or lethal take.

We developed the code to run this model in program R (R Core Development Team 2021) and ran 10,000 iterations of the model (*i.e.*, Monte Carlo simulation) to derive the estimated number of animals disturbed and associated levels of take. We ran the model for each of the five winters covered by the ITR (*i.e.*, 2021/2022, 2022/2023, 2023/2024, 2024/2025, 2025/2026). For each winter's analysis, we analyzed the most impactful scenario that was possible. For example, seismic surveys may not occur every winter, but it is unclear which winters would have seismic surveys and which would not. Therefore, each of the scenarios were run with the inclusion of seismic surveys (and their additional AIR surveys) knowing that take rates will be less for a given winter if seismic surveys did not occur. Similarly, in some winters, winter travel between Deadhorse and Point Thomson will occur along an ice road running roughly parallel to the pipeline connecting the two locations. However, in other winters, the two locations will be connected via a tundra travel route farther south. Through preliminary analyses, we found that the tundra travel route led to higher annual take estimates. Therefore, for each of the scenarios, we only considered the tundra travel route knowing that take

rates will be less when the more northern ice road is used.

Model Results

On average, we estimated 52 (median = 51; 95% CI: 30–80) land-based dens in the area of proposed activity in AOGA's request within a 1.6-km (1-mi) buffer. Annual estimates for different levels of take are presented in Table 8. We also estimated that Level B harassment take from AIR surveys was never greater than a mean of 1.53 (median = 1; 95% CI: 0–5) during any winter. The distributions of both non-serious Level A and serious Level A/Lethal possible takes were non-normal and heavily skewed, as indicated by markedly different mean and median values. The heavily skewed nature of these distributions has led to a mean value that is not representative of the most common model result (*i.e.*, the median value), which for both non-serious Level A and serious Level A/Lethal takes is 0.0 takes. Due to the low (<0.29 for non-serious Level A and ≤0.426 for serious Level A/Lethal takes) probability of greater than or equal to 1 non-serious or serious injury Level A harassment/Lethal take each year of the proposed ITR period, combined with the median of 0.0 for each, we do not estimate the proposed activities will result in non-serious or serious injury Level A harassment or lethal take of polar bears.

TABLE 8—RESULTS OF THE DEN DISTURBANCE MODEL FOR EACH WINTER OF PROPOSED ACTIVITY. ESTIMATES ARE PROVIDED FOR THE PROBABILITY (PROB), MEAN, MEDIAN (MED), AND 95% CONFIDENCE INTERVALS (CI) FOR LEVEL B, NON-SERIOUS LEVEL A, AND SERIOUS LEVEL A LETHAL TAKE. THE PROBABILITIES REPRESENT THE PROBABILITY OF ≥1 TAKE OF A BEAR OCCURRING DURING A GIVEN WINTER.

Winter (20XX)	Level B harassment				Non serious Level A				Serious Level A lethal			
	Prob	Mean	Med	95 CI	Prob	Mean	Med	95 CI	Prob	Mean	Med	95 CI
21–22	0.89	3.1	3.0	0–9	0.28	0.7	0.0	0–4	0.45	1.2	0.0	0–5
22–23	0.90	3.2	3.0	0–9	0.29	0.7	0.0	0–4	0.46	1.2	0.0	0–6
23–24	0.90	3.1	3.0	0–9	0.28	0.6	0.0	0–4	0.46	1.2	0.0	0–5
24–25	0.90	3.1	3.0	0–9	0.28	0.6	0.0	0–4	0.46	1.2	0.0	0–6
25–26	0.90	3.2	3.0	0–9	0.28	0.7	0.0	0–4	0.46	1.2	0.0	0–5

Maritime Activities

Vessel Traffic

Maritime activities were divided into two categories of potential impact: Vessel traffic and in-water construction. Vessel traffic was further divided into two categories: Repeated, frequent trips by small boats and hovercraft for crew movement and less frequent trips to move fuel and equipment by tugs and barges. We estimated the potential Level B harassment take from the repeated, frequent trips by crew boats and hovercraft in *Polar Bear: Surface*

Interactions as marine roads using an occupancy rate of 0.2. This occupancy rate accounts for 20 percent of the impact area (*i.e.*, the length of the route buffered by 1.6 km (1 mi)) being impacted at any given point throughout the year, which is consistent with the daily trips described by AOGA.

For less frequent trips for fuel and equipment resupply by tugs and barges, AOGA has supplied the highest expected number of trips that may be taken each year. Because we have been supplied with a finite number of potential trips, we used the impact area

of the barge/tug combination as it moves in its route from one location to the next. We estimated a 16.5-km² (6.37-mi²) take area for the barge, tug, and associated tow line, which accounts for a barge, tow, and tug length of 200 m (656 ft), width of 100 m (328 ft), and a 1.6-km (1-mi) buffer surrounding the vessels. We calculated the total hours of impact using an average vessel speed of two knots (3.7 km/hr), and then calculated the proportion of the open-water season that would be impacted (Table 9).

TABLE 9—CALCULATION OF THE TOTAL NUMBER OF BARGE AND TUG VESSEL TRIP HOURS AND THE PROPORTION OF THE SEASON POLAR BEARS MAY BE IMPACTED IN A 16.5-km² IMPACT AREA BY BARGE/TUG PRESENCE

Origin	Destination	Frequency	Est. length (km)	Time/trip (hr)	Total time (hr)
West Dock	Milne Point	1	38	10	10
Milne Point	West Dock	1	38	10	10
West Dock	Endicott	30	22	6	178
Endicott	Badami	10	42	11	114
Badami	Pt. Thomson	10	32	9	86
Pt. Thomson	West Dock	10	96	26	259
Total Hours .....	.....	.....	.....	.....	658
Proportion of Season Impacted by Barge/Tug Use.	.....	.....	.....	.....	0.24

The number of estimated takes was then calculated using Equation 4, in which the impact area is multiplied by encounter rate, proportion of season, and harassment rate for the open-water season. The final number of estimated Level B harassment events from barge/tug trips was 1.12 bears per year.

In-Water Construction

Polar bears are neither known to vocalize underwater nor to rely substantially upon underwater sounds to locate prey. However, for any predator, loss of hearing is likely to be an impediment to successful foraging. The Service has applied a 190 dB re 1 μPa threshold for Level B harassment arising from exposure of polar bears to underwater sounds for previous authorizations in the Beaufort and Chukchi Seas; seas. However, given the projection of polar bear TTS at 188 dB by Southall *et al.* (2019) referenced in Figure 1, we used a threshold of Level

B harassment at 180 dB re 1 μPa in our analysis for these proposed regulations.

The proposal for the 2021–2026 ITR period includes several activities that will create underwater sound, including dredging, screeding, pile driving, gravel placement, and geohazard surveys. Underwater sounds and the spatial extent to which they propagate are variable and dependent upon the sound source (*e.g.*, size and composition of a pile for pile driving, equipment type for geophysical surveys, etc.), the installation method, substrate type, presence of sea ice, and water depth. Source levels range from less than 160 dB re 1 μPa to greater than 200 dB re 1 μPa (Rodkin and Pommerenck, 2014), meaning some sounds reach the level of TTS, however they do not reach the level of PTS (Table 1). Although these activities result in underwater areas that are above the 180 dB Level B harassment threshold for polar bears, the areas above the threshold will be

small and fall within the current impact area (1.6 km) used to estimate polar bear harassment due to surface interactions. Thus, additional harassment calculations based on in-water noise are not necessary. Similarly, any in-air sounds generated by underwater sources are not expected to propagate above the Level B harassment thresholds listed in Table 1 beyond the 1.6-km (1.0-mi) impact area established in *Polar Bear: Surface Interactions*.

Sum of Harassment From All Sources

A summary of total numbers of estimated take Level B harassments during the duration of the project by season and take category is provided in Table 10. The potential for lethal or Level A harassment was explored. The highest probability of greater than or equal to 1 lethal or serious Level A harassment take of polar bears over the 5-year ITR period was 0.462.

TABLE 10—TOTAL ESTIMATED LEVEL B HARASSMENT EVENTS OF POLAR BEARS PER YEAR AND SOURCE

Year	Level B harassment of polar bears on the surface or in water					Total
	Surface activity	Seismic exploration	Vessel activity	Aircraft overflights	Denning bears	
Open water 2021—Ice 2021/2022	56.54	1.94	1.12	0.82	3.1	65
Open water 2022—Ice 2022/2023	83.77	1.94	1.12	0.95	3.2	91
Open water 2023—Ice 2023/2024	84.28	1.94	1.12	0.95	3.1	92
Open water 2024—Ice 2024/2025	84.23	1.94	1.12	1.09	3.1	92
Open water 2025—Ice 2025/2026	84.48	1.94	1.12	1.09	3.2	92
Open water 2026	12	0.00	1.12	0.15	0	14

Critical Assumptions

To conduct this analysis and estimate the potential amount of Level B harassment, several critical assumptions were made.

Level B harassment is equated herein with behavioral responses that indicate harassment or disturbance. There is likely a portion of animals that respond in ways that indicate some level of disturbance but do not experience

significant biological consequences. Our estimates do not account for variable responses by polar bear age and sex; however, sensitivity of denning bears was incorporated into the analysis. The available information suggests that polar bears are generally resilient to low levels of disturbance. Females with dependent young and juvenile polar bears are physiologically the most sensitive (Andersen and Aars 2008) and most likely to experience harassment

from disturbance. There is not enough information on composition of the SBS polar bear stock in the proposed ITR area to incorporate individual variability based on age and sex or to predict its influence on harassment estimates. Our estimates are derived from a variety of sample populations with various age and sex structures, and we assume the exposed population will have a similar composition and

therefore, the response rates are applicable.

The estimates of behavioral response presented here do not account for the individual movements of animals away from the ITR area or habituation of animals to noise or human presence. Our assessment assumes animals remain stationary, (*i.e.*, density does not change). There is not enough information about the movement of polar bears in response to specific disturbances to refine this assumption. This situation could result in overestimation of harassment; however, we cannot account for harassment resulting from a polar bear moving into less preferred habitat due to disturbance.

Potential Effects of Oil Spills on Pacific Walrus and Polar Bears

Walrus and polar bear ranges overlap with many active and planned Industry activities—resulting in associated risks of oil spills from facilities, ships, and pipelines in both offshore and onshore habitat. To date, no major offshore oil spills have occurred in the Alaska Beaufort Sea. Although numerous small onshore spills have occurred on the North Slope. To date, there have been no documented effects to polar bears.

Oil spills are unintentional releases of oil or petroleum products. In accordance with the National Pollutant Discharge Elimination System Permit Program, all North Slope oil companies must submit an oil spill contingency plan. It is illegal to discharge oil into the environment, and a reporting system requires operators to report spills. Between 1977 and 1999, an average of 70 oil and 234 waste product spills occurred annually on the North Slope oilfields. Although most spills have been small by Industry standards (less than 50 bbl), larger spills (more than 500 bbl) accounted for much of the annual volume. In the North Slope, a total of seven large spills occurred between 1985 and 2009. The largest of these spills occurred in the spring of 2006 when approximately 6,190 bbl leaked from flow lines near an oil gathering center. More recently, several large spills have occurred. In 2012, 1,000 bbl of drilling mud and 100 bbl of crude were spilled in separate incidents; in 2013, approximately 166 bbl of crude oil was spilled; and in 2014, 177 bbl of drilling mud was spilled. In 2016, 160 bbl of mixed crude oil and produced water was spilled. These spills occurred primarily in the terrestrial environment in heavily industrialized areas not utilized by walrus or polar bears and therefore, posed little risk to the animals.

The two largest onshore oil spills were in the terrestrial environment and occurred because of pipeline failures. In the spring of 2006, approximately 6,190 bbl of crude oil spilled from a corroded pipeline operated by BP Exploration (Alaska). The spill impacted approximately 0.8 ha (~2 ac). In November 2009, a spill of approximately 1,150 bbl from a “common line” carrying oil, water, and natural gas operated by BP occurred as well, impacting approximately 780 m² (~8,400 ft²). None of these spills were known to impact polar bears, in part due to the locations and timing. Both sites were within or near Industry facilities not frequented by polar bears, and polar bears are not typically observed in the affected areas during the time of the spills and subsequent cleanup.

Nonetheless, walrus and polar bears could encounter spilled oil from exploratory operations, existing offshore facilities, pipelines, or from marine vessels. The shipping of crude oil, oil products, or other toxic substances, as well as the fuel for the shipping vessels, increases the risk of a spill.

As additional offshore Industry projects are planned, the potential for large spills in the marine environment increases. Oil spills in the sea-ice environment, at the ice edge, in leads, polynyas, and similar areas of importance to walrus and polar bears present an even greater challenge because of both the difficulties associated with cleaning oil in sea-ice along with the presence of wildlife in those areas.

Oiling of food sources, such as ringed seals, may result in indirect effects on polar bears, such as a local reduction in ringed seal numbers, or a change to the local distribution of seals and bears. More direct effects on polar bears could occur from: (1) Ingestion of oiled prey, potentially resulting in reduced survival of individual bears; (2) oiling of fur and subsequent ingestion of oil from grooming; (3) oiling and fouling of fur with subsequent loss of insulation, leading to hypothermia; and (4) disturbance, injury, or death from interactions with humans during oil spill response activities. Polar bears may be particularly vulnerable to disturbance when nutritionally stressed and during denning. Cleanup operations that disturb a den could result in death of cubs through abandonment, and perhaps, death of the female as well. In spring, females with cubs of the year that denned near or on land and migrate to contaminated offshore areas may encounter oil following a spill (Stirling in Geraci and St. Aubin 1990).

In the event of an oil spill, the Service follows oil spill response plans, coordinates with partners, and reduces the impact of a spill on wildlife. Several factors will be considered when responding to an oil spill—including spill location, magnitude, oil viscosity and thickness, accessibility to spill site, spill trajectory, time of year, weather conditions (*i.e.*, wind, temperature, precipitation), environmental conditions (*i.e.*, presence and thickness of ice), number, age, and sex of walrus and polar bears that are (or are likely to be) affected, degree of contact, importance of affected habitat, cleanup proposal, and likelihood of human-bear interactions. Response efforts will be conducted under a three-tier approach characterized as: (1) Primary response, involving containment, dispersion, burning, or cleanup of oil; (2) secondary response, involving hazing, herding, preventative capture/relocation, or additional methods to remove or deter wildlife from affected or potentially affected areas; and (3) tertiary response, involving capture, cleaning, treatment, and release of wildlife. If the decision is made to conduct response activities, primary and secondary response options will be vigorously applied. Tertiary response capability has been developed by the Service and partners, though such response efforts would most likely be able to handle only a few animals at a time. More information is available in the Service’s oil spill response plans for walrus and polar bears in Alaska, which is located at: https://www.fws.gov/r7/fisheries/contaminants/pdf/Polar%20Bear%20WRP%20final%20v8_Public%20website.pdf.

BOEM has acknowledged that there are difficulties in effective oil-spill response in broken-ice conditions, and the National Academy of Sciences has determined that “no current cleanup methods remove more than a small fraction of oil spilled in marine waters, especially in the presence of broken ice.” BOEM advocates the use of non-mechanical methods of spill response, such as in-situ burning during periods when broken ice would hamper an effective mechanical response (MMS 2008). An in-situ burn has the potential to rapidly remove large quantities of oil and can be employed when broken-ice conditions may preclude mechanical response. However, the resulting smoke plume may contain toxic chemicals and high levels of particulates that can pose health risks to marine mammals, birds, and other wildlife as well as to humans. As a result, smoke trajectories must be considered before making the decision

to burn spilled oil. Another potential non-mechanical response strategy is the use of chemical dispersants to speed dissipation of oil from the water surface and disperse it within the water column in small droplets. However, dispersant use presents environmental trade-offs. While walrus and polar bears would likely benefit from reduced surface or shoreline oiling, dispersant use could have negative impacts on the aquatic food chain. Oil spill cleanup in the broken-ice and open-water conditions that characterize Arctic waters is problematic.

Evaluation of Effects of Oil Spills on Pacific Walrus and Polar Bears

The MMPA does not authorize the incidental take of marine mammals as the result of illegal actions, such as oil spills. Any event that results in an injurious or lethal outcome to a marine mammal is not authorized under this proposed ITR. However, for the purpose of determining whether Industry activity would have a negligible effect on walrus and polar bears, the Service evaluated the potential impacts of oil spills within the Beaufort Sea proposed ITR region.

Pacific Walrus

As stated earlier, the Beaufort Sea is not within the primary range for walrus. Therefore, the probability of walrus encountering oil or waste products as a result of a spill from Industry activities is low. Onshore oil spills would not impact walrus unless they occurred on or near beaches or oil moved into the offshore environment. However, in the event of a spill that occurs during the open-water season, oil in the water column could drift offshore and possibly encounter a small number of walrus. Oil spills from offshore platforms could also contact walrus under certain conditions. For example, spilled oil during the ice-covered season that isn't cleaned up could become part of the ice substrate and could eventually be released back into the environment during the following open-water season. Additionally, during spring melt, oil would be collected by spill response activities, but it could eventually contact a limited number of walrus.

Little is known about the effects of oil, specifically on walrus, as no studies have been conducted to date. Hypothetically, walrus may react to oil much like other pinnipeds. Walrus are not likely to ingest oil while grooming since walrus have very little hair and exhibit no grooming behavior. Adult walrus may not be severely affected by the oil spill through direct contact, but they will be extremely

sensitive to any habitat disturbance by human noise and response activities. In addition, due to the gregarious nature of walrus, an oil spill would most likely affect multiple individuals in the area. Walrus may also expose themselves more often to the oil that has accumulated at the edge of a contaminated shore or ice lead if they repeatedly enter and exit the water.

Walrus calves are most likely to suffer the ill-effects of oil contamination. Female walrus with calves are very attentive, and the calf will always stay close to its mother—including when the female is foraging for food. Walrus calves can swim almost immediately after birth and will often join their mother in the water. It is possible that an oiled calf will be unrecognizable to its mother either by sight or by smell and be abandoned. However, the greater threat may come from an oiled calf that is unable to swim away from the contamination and a devoted mother that would not leave without the calf, resulting in the potential mortality of both animals. Further, a nursing calf might ingest oil if the mother was oiled, also increasing the risk of injury or mortality.

Walrus have thick skin and blubber layers for insulation. Heat loss is regulated by control of peripheral blood flow through the animal's skin and blubber. The peripheral blood flow is decreased in cold water and increased at warmer temperatures. Direct exposure of walrus to oil is not believed to have any effect on the insulating capacity of their skin and blubber, although it is unknown if oil could affect their peripheral blood flow.

Damage to the skin of pinnipeds can occur from contact with oil because some of the oil penetrates the skin, causing inflammation and death of some tissue. The dead tissue is discarded, leaving behind an ulcer. While these skin lesions have only rarely been found on oiled seals, the effects on walrus may be greater because of a lack of hair to protect the skin. Direct exposure to oil can also result in conjunctivitis. Like other pinnipeds, walrus are susceptible to oil contamination in their eyes. Continuous exposure to oil will quickly cause permanent eye damage.

Inhalation of hydrocarbon fumes presents another threat to marine mammals. In studies conducted on pinnipeds, pulmonary hemorrhage, inflammation, congestion, and nerve damage resulted after exposure to concentrated hydrocarbon fumes for a period of 24 hours. If the walrus were also under stress from molting, pregnancy, etc., the increased heart rate associated with the stress would

circulate the hydrocarbons more quickly, lowering the tolerance threshold for ingestion or inhalation.

Walrus are benthic feeders, and much of the benthic prey contaminated by an oil spill would be killed immediately. Others that survived would become contaminated from oil in bottom sediments, possibly resulting in slower growth and a decrease in reproduction. Bivalve mollusks, a favorite prey species of the walrus, are not effective at processing hydrocarbon compounds, resulting in highly concentrated accumulations and long-term retention of the contamination within the organism. Specifically, bivalve mollusks bioconcentrate polycyclic aromatic hydrocarbons (PAHs). These compounds are a particularly toxic fraction of oil that may cause a variety of chronic toxic effects in exposed organisms, including enzyme induction, immune impairment, or cancer, among others. In addition, 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. Furthermore, complete recovery of a bivalve mollusk population may take 10 years or more, forcing walrus to find other food resources or move to nontraditional areas.

The relatively few walrus in the Beaufort Sea and the low potential for a large oil spill (1,000 bbl or more), which is discussed in the following Risk Assessment Analysis, limit potential impacts to walrus to only certain events (*i.e.*, a large oil spill), which is further limited to only a handful of individuals. Fueling crews have personnel that are trained to handle operational spills and contain them. If a small offshore spill occurs, spill response vessels are stationed in close proximity and respond immediately.

Polar Bear

To date, large oil spills from Industry activities in the Beaufort Sea and coastal regions that would impact polar bears have not occurred, although the interest in and the development of offshore hydrocarbon reservoirs has increased the potential for large offshore oil spills. With limited background information available regarding oil spills in the Arctic environment, the outcome of such a spill is uncertain. For example, in the event of a large spill equal to a rupture in the Northstar pipeline and a complete drain of the subsea portion of the pipeline (approximately 5,900 bbl), oil would be influenced by seasonal weather and sea conditions including temperature, winds, wave action, and currents. Weather and sea conditions

also affect the type of equipment needed for spill response and the effectiveness of spill cleanup. Based on the experiences of cleanup efforts following the *Exxon Valdez* oil spill, where logistical support was readily available, spill response may be largely unsuccessful in open-water conditions. Indeed, spill response drills have been unsuccessful in the cleanup of oil in broken-ice conditions.

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

During the ice-covered season, mobile, non-denning bears would have a higher probability of encountering oil or other production wastes than non-mobile, denning females. Current management practices by Industry, such as requiring the proper use, storage, and disposal of hazardous materials, minimize the potential occurrence of such incidents. In the event of an oil spill, it is also likely that polar bears would be intentionally hazed to keep them away from the area, further reducing the likelihood of impacting the population.

In 1980, Oritsland *et al.* (1981) performed experiments in Canada that studied the effects of oil exposure on polar bears. Effects on experimentally oiled bears (where bears were forced to remain in oil for prolonged periods of time) included acute inflammation of the nasal passages, marked epidermal responses, anemia, anorexia, and biochemical changes indicative of stress, renal impairment, and death. Many effects did not become evident until several weeks after the experiment.

Oiling of the pelt causes significant thermoregulatory problems by reducing insulation value. Irritation or damage to the skin by oil may further contribute to

impaired thermoregulation. Experiments on live polar bears and pelts showed that the thermal value of the fur decreased significantly after oiling, and oiled bears showed increased metabolic rates and elevated skin temperature. Oiled bears are also likely to ingest oil as they groom to restore the insulation value of the oiled fur.

Oil ingestion by polar bears through consumption of contaminated prey, and by grooming or nursing, could have pathological effects depending on the amount of oil ingested and the individual's physiological state. Death could occur if a large amount of oil was ingested or if volatile components of oil were aspirated into the lungs. In the Canadian experiment (Oritsland *et al.* 1981), two of three bears died. A suspected contributing factor to their deaths was ingestion of oil. Experimentally oiled bears ingested large amounts of oil through grooming. Much of the oil was eliminated by vomiting and defecating; some was absorbed and later found in body fluids and tissues.

Ingestion of sublethal amounts of oil can have various physiological effects on polar bears, depending on whether the animal is able to excrete or detoxify the hydrocarbons. Petroleum hydrocarbons irritate or destroy epithelial cells lining the stomach and intestine, thereby affecting motility, digestion, and absorption.

Polar bears swimming in or walking adjacent to an oil spill could inhale toxic, volatile organic compounds from petroleum vapors. Vapor inhalation by polar bears could result in damage to the respiratory and central nervous systems depending on the amount of exposure.

Oil may also affect food sources of polar bears. Seals that die as a result of an oil spill could be scavenged by polar bears. This food source would increase exposure of the bears to hydrocarbons and could result in lethal impacts or reduced survival to individual bears. A local reduction in ringed seal numbers as a result of direct or indirect effects of oil could temporarily affect the local distribution of polar bears. A reduction in density of seals as a direct result of mortality from contact with spilled oil could result in polar bears not using a particular area for hunting. Further, possible impacts from the loss of a food source could reduce recruitment and/or survival.

Spilled oil can concentrate and accumulate in leads and openings that occur during spring break-up and autumn freeze-up periods. Such a concentration of spilled oil would

increase the likelihood that polar bears and their principal prey would be oiled. To access ringed and bearded seals, polar bears in the SBS concentrate in shallow waters less than 300 m (984 ft) deep over the continental shelf and in areas with greater than 50 percent ice cover (Durner *et al.* 2004).

Due to their seasonal use of nearshore habitat, the times of greatest impact from an oil spill to polar bears are likely the open-water and broken-ice periods (summer and fall), extending into the ice-covered season (Wilson *et al.* 2018). This scenario is important because distributions of polar bears are not uniform through time. Nearshore and offshore polar bear densities are greatest in fall, and polar bear use of coastal areas during the fall open-water period has increased in recent years in the Beaufort Sea. An analysis of data collected from the period 2001–2005 during the fall open-water period concluded: (1) On average approximately 4 percent of the estimated polar bears in the Southern Beaufort Sea stock were observed onshore in the fall; (2) 80 percent of bears onshore occurred within 15 km (9 mi) of subsistence-harvested bowhead whale carcasses, where large congregations of polar bears have been observed feeding; and (3) sea-ice conditions affected the number of bears on land and the duration of time they spent there (Schliebe *et al.* 2006). Hence, bears concentrated in areas where beach-cast marine mammal carcasses occur during the fall would likely be more susceptible to oiling.

Wilson *et al.* (2018) analyzed the potential effects of a "worst case discharge" (WCD) on polar bears in the Chukchi Sea. Their WCD scenario was based on an Industry oil spill response plan for offshore development in the region and represented underwater blowouts releasing 25,000 bbls of crude oil per day for 30 days beginning in October. The results of this analysis suggested that between 5 and 40 percent of a stock of 2,000 polar bears in the Chukchi Sea could be exposed to oil if a WCD occurred. A similar analysis has not been conducted for the Beaufort Sea; however, given the extremely low probability (*i.e.*, 0.0001) that an unmitigated WCD event would occur (BOEM 2016, Wilson *et al.* 2017), the likelihood of such effects on polar bears in the Beaufort Sea is extremely low.

The persistence of toxic subsurface oil and chronic exposures, even at sublethal levels, can have long-term effects on wildlife (Peterson *et al.* 2003). Exposure to PAHs can have chronic effects because some effects are sublethal (*e.g.*, enzyme induction or

immune impairment) or delayed (*e.g.*, cancer). Although it is true that some bears may be directly affected by spilled oil initially, the long-term impact could be much greater. Long-term effects could be substantial through complex environmental interactions—compromising the health of exposed animals. For example, PAHs can impact the food web by concentrating in filter-feeding organisms, thus affecting fish that feed on those organisms, and the predators of those fish, such as the ringed seals that polar bears prey upon. How these complex interactions would affect polar bears is not well understood, but sublethal, chronic effects of an oil spill may affect the polar bear population due to reduced fitness of surviving animals.

Polar bears are biological sinks for some pollutants, such as polychlorinated biphenyls or organochlorine pesticides, because polar bears are an apex predator of the Arctic ecosystem and are also opportunistic scavengers of other marine mammals. Additionally, their diet is composed mostly of high-fat sealskin and blubber (Norstrom *et al.* 1988). The highest concentrations of persistent organic pollutants in Arctic marine mammals have been found in seal-eating walruses and polar bears near Svalbard (Norstrom *et al.* 1988, Andersen *et al.* 2001, Muir *et al.* 1999). As such, polar bears would be susceptible to the effects of bioaccumulation of contaminants, which could affect their reproduction, survival, and immune systems.

In addition, subadult polar bears are more vulnerable than adults to environmental effects (Taylor *et al.* 1987). Therefore, subadults would be most prone to the lethal and sublethal effects of an oil spill due to their proclivity for scavenging (thus increasing their exposure to oiled marine mammals) and their inexperience in hunting. Due to the greater maternal investment a weaned subadult represents, reduced survival rates of subadult polar bears have a greater impact on population growth rate and sustainable harvest than reduced litter production rates (Taylor *et al.* 1987).

Evaluation of the potential impacts of spilled Industry waste products and oil suggest that individual bears could be adversely impacted by exposure to these substances (Oritsland *et al.* 1981). The major concern regarding a large oil spill is the impact such a spill would have on the rates of recruitment and survival of the SBS polar bear stock. Polar bear deaths from an oil spill could be caused by direct exposure to the oil. However, indirect effects, such as a reduction of

prey or scavenging contaminated carcasses, could also cause health effects, death, or otherwise affect rates of recruitment and survival. Depending on the type and amount of oil or wastes involved and the timing and location of a spill, impacts could be acute, chronic, temporary, or lethal. For the rates of polar bear reproduction, recruitment, or survival to be impacted, a large-volume oil spill would have to take place. The following section analyzes the likelihood and potential effects of such a large-volume oil spill.

Risk Assessment of Potential Effects Upon Polar Bears From a Large Oil Spill in the Beaufort Sea

In this section, we qualitatively assess the likelihood that polar bear populations on the North Slope may be affected by large oil spills. We considered: (1) The probability of a large oil spill occurring in the Beaufort Sea; (2) the probability of that oil spill impacting coastal polar bear habitat; (3) the probability of polar bears being in the area and coming into contact with that large oil spill; and (4) the number of polar bears that could potentially be impacted by the spill. Although most of the information in this evaluation is qualitative, the probability of all factors occurring sequentially in a manner that impacts polar bears in the Beaufort Sea is low. Since walruses are not often found in the Beaufort Sea, and there is little information available regarding the potential effects of an oil spill upon walruses, this analysis emphasizes polar bears.

The analysis was based on polar bear distribution and habitat use using four sources of information that, when combined, allowed the Service to make conclusions on the risk of oil spills to polar bears. This information included: (1) The description of existing offshore oil and gas production facilities previously discussed in the Description of Activities section; (2) polar bear distribution information previously discussed in the Biological Information section; (3) BOEM Oil-Spill Risk Analysis (OSRA) for the OCS (Li and Smith 2020), including polar bear environmental resource areas (ERAs) and land segments (LSs); and (4) the most recent polar bear risk assessment from the previous ITRs.

Development of offshore production facilities with supporting pipelines increases the potential for large offshore spills. The probability of a large oil spill from offshore oil and gas facilities and the risk to polar bears is a scenario that has been considered in previous regulations (71 FR 43926, August 2, 2006; 76 FR 47010, August 3, 2011; 81

FR 52275, August 5, 2016). Although there is a slowly growing body of scientific literature (*e.g.*, Amstrup *et al.* 2006, Wilson *et al.* 2017), the background information available regarding the effects of large oil spills on polar bears in the marine arctic environment is still limited, and thus the impact of a large oil spill is uncertain. As far as is known, polar bears have not been affected by oil spilled as a result of North Slope Industry activities.

The oil-spill scenarios for this analysis include the potential impacts of a large oil spill (*i.e.*, 1,000 bbl or more) from one of the offshore Industry facilities: Northstar, Spy Island, Oooguruk, Endicott, or the future Liberty. Estimating a large oil-spill occurrence is accomplished by examining a variety of factors and associated uncertainty, including location, number, and size of a large oil spill and the wind, ice, and current conditions at the time of a spill.

BOEM Oil Spill Risk Analysis

Because the BOEM OSRA provides the most current and rigorous treatment of potential oil spills in the Beaufort Sea Planning Area, our analysis of potential oil spill impacts applied the results of BOEM's OSRA (Li and Smith 2020) to help analyze potential impacts of a large oil spill originating in the Beaufort Sea ITR region to polar bears. The OSRA quantitatively assesses how and where large offshore spills will likely move by modeling effects of the physical environment, including wind, sea-ice, and currents, on spilled oil. (Smith *et al.* 1982, Amstrup *et al.* 2006a).

The OSRA estimated that the mean number of large spills is less than one over the 20-year life of past, present, and reasonably foreseeable developments in the Beaufort Sea Planning Area. In addition, large spills are more likely to occur during development and production than during exploration in the Arctic (MMS 2008). Our oil spill assessment during a proposed 5-year regulatory period is predicated on the same assumptions.

Trajectory Estimates of Large Offshore Oil Spills

Although it is reasonable to conclude that the chance of one or more large spills occurring during the period of these proposed regulations on the Alaskan OCS from production activities is low, for analysis purposes, we assume that a large spill does occur in order to evaluate potential impacts to polar bears. The BOEM OSRA modeled the trajectories of 3,240 oil spills from 581 possible launch points in relation to the

shoreline and biological, physical, and sociocultural resource areas specific to the Beaufort Sea. The chance that a large oil spill will contact a specific ERA of concern within a given time of travel from a certain location (launch area or pipeline segment) is termed a “conditional probability.” Conditional probabilities assume that no cleanup activities take place and there are no efforts to contain the spill.

We used two BOEM launch areas (LAs), LA 2 and LA 3, and one pipeline segment (PL), PL 2, from Appendix A of the OSRA (Figure A2; Li and Smith 2020) to represent the oil spills moving from hypothetical offshore areas. These LAs and PLs were selected because of their proximity to current and proposed offshore facilities.

Oil-Spill-Trajectory Model Assumptions

For purposes of its oil spill trajectory simulation, BOEM made the following assumptions: All spills occur instantaneously; large oil spills occur in the hypothetical origin areas or along the hypothetical PLs noted above; large spills do not weather (*i.e.*, become degraded by weather conditions) for purposes of trajectory analysis; weathering is calculated separately; the model does not simulate cleanup scenarios; the oil spill trajectories move as though no oil spill response action is taken; and large oil spills stop when they contact the mainland coastline.

Analysis of the Conditional Probability Results

As noted above, the chance that a large oil spill will contact a specific ERA of concern within a given time of travel from a certain location (LA or PL), assuming a large spill occurs and that no cleanup takes place, is termed a “conditional probability.” From the OSRA, Appendix B, we chose ERAs and land segments (LSs) to represent areas of concern pertinent to polar bears (MMS 2008a). Those ERAs and LSs and the conditional probabilities that a large oil spill originating from the selected LAs or PLs could affect those ERAs and LSs are presented in a supplementary table titled “Conditional Oil Spill Probabilities” that can be found on <http://www.regulations.gov> under Docket No. FWS-R7-ES-2021-0037. From the information in this table, we note the highest chance of contact and the range of chances of contact that could occur should a large spill occur from LAs or PLs.

Polar bears are vulnerable to a large oil spill during the open-water period when bears form aggregations onshore. In the Beaufort Sea, these aggregations often form in the fall near subsistence-

harvested bowhead whale carcasses. Specific aggregation areas include Point Utqigvik, Cross Island, and Kaktovik. In recent years, more than 60 polar bears have been observed feeding on whale carcasses just outside of Kaktovik, and in the autumn of 2002, North Slope Borough and Service biologists documented more than 100 polar bears in and around Utqigvik. In order for significant impacts to polar bears to occur, (1) a large oil spill would have to occur, (2) oil would have to contact an area where polar bears aggregate, and (3) the aggregation of polar bears would have to occur at the same time as the spill. The risk of all three of these events occurring simultaneously is low.

We identified polar bear aggregations in environmental resource areas and non-grouped land segments (ERA 55, 93, 95, 96, 100; LS 85, 102, 107). The OSRA estimates the chance of contacting these aggregations is 18 percent or less (Table 11). The OSRA estimates for LA 2 and LA 3 have the highest chance of a large spill contacting ERA 96 in summer (Midway, Cross, and Bartlett islands). Some polar bears will aggregate at these islands during August–October (3-month period). If a large oil spill occurred and contacted those aggregation sites outside of the timeframe of use by polar bears, potential impacts to polar bears would be reduced.

Coastal areas provide important denning habitat for polar bears, such as the ANWR and nearshore barrier islands (containing tundra habitat) (Amstrup 1993, Amstrup and Gardner 1994, Durner *et al.* 2006, USFWS unpubl. data). Considering that 65 percent of confirmed terrestrial dens found in Alaska in the period 1981–2005 were on coastal or island bluffs (Durner *et al.* 2006), oiling of such habitats could have negative effects on polar bears, although the specific nature and ramifications of such effects are unknown.

Assuming a large oil spill occurs, tundra relief barrier islands (ERA 92, 93, and 94, LS 97 and 102) have up to an 18 percent chance of a large spill contacting them from PL 2 (Table 11). The OSRA estimates suggest that there is a 12 percent chance that oil would contact the coastline of the ANWR (GLS 166). The Kaktovik area (ERA 95 and 100, LS 107) has up to a one percent chance of a spill contacting the coastline. The chance of a spill contacting the coast near Utqigvik (ERA 55, LS 85) would be as high as 15 percent (Table 11).

All barrier islands are important resting and travel corridors for polar bears, and larger barrier islands that contain tundra relief are also important

denning habitat. Tundra-bearing barrier islands within the geographic region and near oilfield development are the Jones Island group of Pingok, Bertoncini, Bodfish, Cottle, Howe, Foggy, Tigvariak, and Flaxman Islands. In addition, Cross Island has gravel relief where polar bears have denned. The Jones Island group is located in ERA 92 and LS 97. If a spill were to originate from an LA 2 pipeline segment during the summer months, the probability that this spill would contact these land segments could be as great as 15 percent. The probability that a spill from LA 3 would contact the Jones Island group would range from 1 percent to as high as 12 percent. Likewise, for PL 2, the range would be from 3 percent to as high as 12 percent.

Risk Assessment From Prior ITRs

In previous ITRs, we used a risk assessment method that considered oil spill probability estimates for two sites (Northstar and Liberty), oil spill trajectory models, and a polar bear distribution model based on location of satellite-collared females during September and October (68 FR 66744, November 28, 2003; 71 FR 43926, August 2, 2006; 76 FR 47010, August 3, 2011; and 81 FR 52275, August 5, 2016). To support the analysis for this action, we reviewed the previous analysis and used the data to compare the potential effects of a large oil spill in a nearshore production facility (less than 5 mi), such as Liberty, and a facility located further offshore, such as Northstar. Even though the risk assessment of 2006 did not specifically model spills from the Ooguruk or Nikaitchuk sites, we believe it was reasonable to assume that the analysis for Liberty and indirectly, Northstar, adequately reflected the potential impacts likely to occur from an oil spill at either of these additional locations due to the similarity in the nearshore locations.

Methodology of Prior Risk Assessment

The first step of the risk assessment analysis was to examine oil spill probabilities at offshore production sites for the summer (July–October) and winter (November–June) seasons based on information developed for the original Northstar and Liberty EISs. We assumed that one large spill occurred during the 5-year period covered by the regulations. A detailed description of the methodology can be found at 71 FR 43926 (August 2, 2006). The second step in the risk assessment was to estimate the number of polar bears that could be impacted by a large spill. All modeled polar bear grid cell locations that were intersected by one or more cells of a

rasterized spill path (a modeled group of hundreds of oil particles forming a trajectory and pushed by winds and currents and impeded by ice) were considered “oiled” by a spill. For purposes of the analysis, if a bear contacted oil, the contact was assumed to be lethal. This analysis involved estimating the distribution of bears that could be in the area and overlapping polar bear distributions and seasonal aggregations with oil spill trajectories. The trajectories previously calculated for Northstar and Liberty sites were used. The trajectories for Northstar and Liberty were provided by the BOEM and were reported in Amstrup *et al.* (2006a). BOEM estimated probable sizes of oil spills from a pinhole leak to a rupture in the transportation pipeline. These spill sizes ranged from a minimum of 125 to a catastrophic release event of 5,912 bbl. Researchers set the size of the modeled spill at the scenario of 5,912 bbl caused by a pinhole or small leak for 60 days under ice without detection.

The second step of the risk assessment analysis incorporated polar bear densities overlapped with the oil spill trajectories. To accomplish this, in 2004, USGS completed an analysis investigating the potential effects of hypothetical oil spills on polar bears. Movement and distribution information were derived from radio and satellite locations of collared adult females. Density estimates were used to determine the distribution of polar bears in the Beaufort Sea. Researchers then created a grid system centered over the Northstar production island and the Liberty site to estimate the number of bears expected to occur within each 1-km² grid cell. Each of the simulated oil spills were overlaid with the polar bear distribution grid. Finally, the likelihood of occurrence of bears oiled during the duration of the proposed 5-year ITRs was estimated. This likelihood was calculated by multiplying the number of polar bears oiled by the spill by the percentage of time bears were at risk for each period of the year.

In summary, the maximum numbers of bears potentially oiled by a 5,912-bbl spill during the September open-water season from Northstar was 27, and the maximum from Liberty was 23, assuming a large oil spill occurred and no cleanup or mitigation measures took place. Potentially oiled polar bears ranged up to 74 bears with up to 55 bears during October in mixed-ice conditions for Northstar and Liberty, respectively. Median number of bears oiled by the 5,912-bbl spill from the Northstar simulation site in September and October were 3 and 11 bears, respectively. Median numbers of bears

oiled from the Liberty simulation site for September and October were 1 and 3 bears, respectively. Variation occurred among oil spill scenarios, resulting from differences in oil spill trajectories among those scenarios and not the result of variation in the estimated bear densities. For example, in October, 75 percent of trajectories from the 5,912-bbl spill affected 20 or fewer polar bears from spills originating at the Northstar simulation site and 9 or fewer bears from spills originating at the Liberty simulation site.

When calculating the probability that a 5,912-bbl spill would oil five or more bears during the annual fall period, we found that oil spills and trajectories were more likely to affect fewer than five bears versus more than five bears. Thus, for Northstar, the chance that a 5,912-bbl oil spill affected (resulting in mortality) 5 or more bears was 1.0–3.4 percent; 10 or more bears was 0.7–2.3 percent; and 20 or more bears was 0.2–0.8 percent. For Liberty, the probability of a spill that would affect 5 or more bears was 0.3–7.4 percent; 10 or more bears, 0.1–0.4 percent; and 20 or more bears, 0.1–0.2 percent.

Discussion of Prior Risk Assessment

Based on the simulations, a nearshore island production site (less than 5 mi from shore) would potentially involve less risk of polar bears being oiled than a facility located farther offshore (greater than 5 mi). For any spill event, seasonality of habitat use by bears will be an important variable in assessing risk to polar bears. During the fall season when a portion of the SBS bear stock aggregate on terrestrial sites and use barrier islands for travel corridors, spill events from nearshore industrial facilities may pose more chance of exposing bears to oil due to its persistence in the nearshore environment. Conversely, during the ice-covered and summer seasons, Industry facilities located farther offshore (greater than 5 mi) may increase the chance of bears being exposed to oil as bears will be associated with the ice habitat.

Conclusion of Risk Assessment

To date, documented oil spill-related impacts in the marine environment to polar bears in the Beaufort Sea by the oil and gas Industry are minimal. No large spills by Industry in the marine environment have occurred in Arctic Alaska. Nevertheless, the possibility of oil spills from Industry activities and the subsequent impacts on polar bears that contact oil remain a major concern.

There has been much discussion about effective techniques for

containing, recovering, and cleaning up oil spills in Arctic marine environments, particularly the concern that effective oil spill cleanup during poor weather and broken-ice conditions has not been proven. Given this uncertainty, limiting the likelihood of a large oil spill becomes an even more important consideration. Industry oil spill contingency plans describe methodologies put in place to prevent a spill from occurring. For example, all current offshore production facilities have spill containment systems in place at the well heads. In the event an oil discharge should occur, containment systems are designed to collect the oil before it makes contact with the environment.

With the limited background information available regarding oil spills in the Arctic environment, it is unknown what the outcome of such a spill event would be if one were to occur. For example, polar bears could encounter oil spills during the open-water and ice-covered seasons in offshore or onshore habitat. Although most polar bears in the SBS stock spend a large amount of their time offshore on the pack ice, it is likely that some bears would encounter oil from a large spill that persisted for 30 days or more.

An analysis of the potential effects of a “worst case discharge” (WCD) on polar bears in the Chukchi Sea suggested that between 5 and 40 percent of a stock of 2,000 polar bears could be exposed to oil if a WCD occurred (Wilson *et al.* 2017). A similar analysis has not been conducted for the Beaufort Sea; however, given the extremely low probability (*i.e.*, 0.0001) that an unmitigated WCD event would occur (BOEM 2015, Wilson *et al.* 2017), the likelihood of such effects on polar bears in the Beaufort Sea is extremely low.

Although the extent of impacts from a large oil spill would depend on the size, location, and timing of spills relative to polar bear distributions along with the effectiveness of spill response and cleanup efforts, under some scenarios, stock-level impacts could be expected. A large spill originating from a marine oil platform could have significant impacts on polar bears if an oil spill contacted an aggregation of polar bears. Likewise, a spill occurring during the broken-ice period could significantly impact the SBS polar bear stock in part because polar bears may be more active during this season.

If an offshore oil spill contaminated numerous bears, a potentially significant impact to the SBS stock could result. This effect would be magnified in and around areas of polar bear aggregations. Bears could also be

affected indirectly either by food contamination or by chronic lasting effects caused by exposure to oil. During the 5-year period of these proposed regulations, however, the chance of a large spill occurring is low.

While there is uncertainty in the analysis, certain factors must align for polar bears to be impacted by a large oil spill occurring in the marine environment. First, a large spill must occur. Second, the large spill must contaminate areas where bears may be located. Third, polar bears must be seasonally distributed within the affected region when the oil is present. Assuming a large spill occurs, BOEM's OSRA estimated that there is up to a 6 percent chance that a large spill from the analyzed sites would contact Cross Island (ERA 96) within 360 days, as much as a 12 percent chance that it would contact Barter Island and/or the coast of the ANWR (ERA 95 and 100, LS 107, and GLS 166), and up to a 15 percent chance that an oil spill would contact the coast near Utqiagvik (ERA 55, LS 85) during the summer time period. Data from polar bear coastal surveys indicate that polar bears are unevenly and seasonally distributed along the coastal areas of the Beaufort Sea ITR region. Seasonally, only a portion of the SBS stock utilizes the coastline between the Alaska-Canada border and Utqiagvik and only a portion of those bears could be in the oil-spill-affected region.

As a result of the information considered here, the Service concludes that the likelihood of an offshore spill from an offshore production facility in the next 5 years is low. Moreover, in the unlikely event of a large spill, the likelihood that spills would contaminate areas occupied by large numbers of bears is low. While individual bears could be negatively affected by a spill, the potential for a stock-level effect is low unless the spill contacted an area where large numbers of polar bears were gathered. Known polar bear aggregations tend to be seasonal during the fall, further minimizing the potential of a spill to impact the stock. Therefore, we conclude that the likelihood of a large spill occurring is low, but if a large spill does occur, the likelihood that it would contaminate areas occupied by large numbers of polar bears is also low. If a large spill does occur, we conclude that only small numbers of polar bears are likely to be affected, though some bears may be killed, and there would be only a negligible impact to the SBS stock.

Take Estimates for Pacific Walruses and Polar Bears

Small Numbers Determinations and Findings

The following analysis concludes that only small numbers of walruses and polar bears are likely to be subjected to take incidental to the described Industry activities relative to their respective stocks. For our small numbers determination, we consider whether the estimated number of marine mammals to be subjected to incidental take is small relative to the population size of the species or stock.

1. The estimated number of walruses and polar bears that will be harassed by Industry activity is small relative to the number of animals in their stocks.

As stated previously, walruses are extralimital in the Beaufort Sea with nearly the entire walrus population found in the Chukchi and Bering Seas. Industry monitoring reports have observed no more than 38 walruses between 1995 and 2015, with only a few observed instances of disturbance to those walruses (AES Alaska 2015, USFWS unpublished data). Between those years, Industry walrus observations in the Beaufort Sea ITR region averaged approximately two walruses per year, although the actual observations were of a single or two animals, often separated by several years. At most, only a tiny fraction of the Pacific walrus population—which is comprised of hundreds of thousands of animals—may be found in areas potentially affected by AOGA's specified activities. We do not anticipate that seasonal movements of a few walruses into the Beaufort Sea will significantly increase over the 5-year period of this proposed ITR. The estimated take of 15 Pacific walruses per year from a population numbering approximately 283,213 animals represents 0.005 percent of that population. We therefore find that the Industry activities specified in AOGA's Request would result in only a small number of incidental harassments of walruses.

The Beaufort Sea ITR region is completely within the range of the SBS stock of polar bears, and during some portions of the year polar bears can be frequently encountered by Industry. From 2014 through 2018, Industry made 1,166 reports of polar bears comprising 1,698 bears. However, when we evaluated the effects upon the 1,698 bears observed, we found that 84 percent (1,434) did not result in take. Over those 5 years, Level B harassments of polar bears totaled 264, approximately 15.5 percent of the

observed bears. No other forms of take or harassment were observed. Annually an average of 340 polar bears were observed during Industry activities. The number of Level B harassment events has averaged 53 per year from 2014 to 2018. We conclude that over the 5-year period of this proposed ITR, Industry activities will result in a similarly small number of incidental harassments of polar bears, and that those events will be similarly limited to Level B harassment.

Based on this information, we estimate that there will be no more than 443 Level B harassment takes of polar bears during the 5-year period of this proposed ITR, with no more than 92 occurring within a single year. Take of 92 animals is 10.14 percent of the best available estimate of the current stock size of 907 animals in the Southern Beaufort Sea stock (Bromaghin *et al.* 2015, Atwood *et al.* 2020) $((92 \div 907) \times 100 \approx 10.14)$, and represents a "small number" of polar bears of that stock. The incidental Level B harassment of no more than 92 polar bears each year is unlikely to lead to significant consequences for the health, reproduction, or survival of affected animals. All takes are anticipated to be incidental Level B harassment involving short-term and temporary changes in bear behavior. The required mitigation and monitoring measures described in the proposed regulations are expected to prevent any lethal or injurious takes.

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

Walruses and polar bears range well beyond the boundaries of the proposed Beaufort Sea ITR region. As such, the ITR region itself represents only a subset of the potential area in which these species may occur. Further, only seven percent of the ITR area (518,800 ha of 7.9 million ha) is estimated to be impacted by the proposed Industry activities, even accounting for a disturbance zone surrounding industrial facility and transit routes. Thus, the Service concludes that the area of Industry activity will be relatively small compared to the range of walruses and polar bears.

Conclusion

We expect that only small numbers of Pacific walruses and SBS polar bears stocks would be taken by the Industry activities specified in AOGA's Request because: (1) Only a small proportion of the walrus or polar bear stocks will occur in the areas where Industry activities will occur; and (2) only small numbers will be impacted because

walrus are extralimital in the Beaufort Sea and SBS polar bears are widely distributed throughout their expansive range, which encompasses areas beyond the Beaufort Sea ITR region.

Negligible Impacts Determination and Finding

Based on the best scientific information available, the results of Industry monitoring data from the previous ITRs, the review of the information generated by the listing of the polar bear as a threatened species and the designation of polar bear critical habitat, the results of our modeling assessments, and the status of the stocks, we find that any incidental take reasonably likely to result from the effects of Industry activities during the period of the proposed ITRs, in the specified geographic region will have no more than a negligible impact on walrus and polar bears. We do not expect that the total of these disturbances will affect rates of recruitment or survival for walrus or polar bears. Factors considered in our negligible impacts determination include:

1. The behavior and distribution of walrus and polar bears in areas that overlap with Industry activities are expected to limit interactions of walrus and polar bears with those activities.

The distribution and habitat use patterns of walrus and polar bears indicate that relatively few animals will occur in the proposed areas of Industry activity at any particular time, and therefore, few animals are likely to be affected. As discussed previously, only small numbers of walrus are likely to be found in the Beaufort Sea where and when offshore Industry activities are proposed. Likewise, SBS polar bears are widely distributed across a range that much greater than the geographic scope of the proposed ITRs, are most often closely associated with pack ice, and are unlikely to interact with the open water industrial activities specified in AOGA's Request, much less the majority of activities that would occur onshore.

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

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

Beaufort Sea ITR region, undisturbed by the Industry activity.

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

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

4. The type of harassment that is estimated is not expected to have effects on annual rates of recruitment of survival.

The Service does not anticipate any lethal or injurious take that would remove individual polar bears or Pacific walrus from the population or prevent their successful reproduction. Harassment events are anticipated to be limited to human interactions that lead to short-term behavioral disturbances. These disturbances would not affect the rates of recruitment or survival for the walrus and polar bear stocks. These proposed regulations do not authorize lethal take, and we do not anticipate any lethal take will occur.

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

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

In making this finding, we considered the following: The distribution of the species; the biological characteristics of the species; the nature of Industry activities; the potential effects of Industry activities and potential oil spills on the species; the probability of oil spills occurring; the documented impacts of Industry activities on the species, taking into consideration cumulative effects; the potential impacts of climate change, where both walrus and polar bears can potentially be displaced from preferred habitat; mitigation measures designed to minimize Industry impacts through adaptive management; and other data provided by Industry monitoring programs in the Beaufort and Chukchi Seas.

We also considered the specific Congressional direction in balancing the

potential for a significant impact with the likelihood of that event occurring. The specific Congressional direction that justifies balancing probabilities with impacts follows:

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

We reviewed the effects of the oil and gas Industry activities on walrus and polar bears, including impacts from surface interactions, aircraft overflights, maritime activities, and oil spills. Based on our review of these potential impacts, past LOA monitoring reports, and the biology and natural history of walrus and polar bear, we conclude that any incidental take reasonably likely to occur as a result of projected activities will be limited to short term behavioral disturbances that would not affect the rates of recruitment or survival for the walrus and polar bear stocks. These proposed regulations do not authorize lethal take, and we do not anticipate any lethal take will occur.

The probability of an oil spill that will cause significant impacts to walrus and polar bears appears extremely low. We have included information from both offshore and onshore projects in our oil spill analysis. We have analyzed the likelihood of a marine oil spill of the magnitude necessary to lethally take a significant number of polar bears for offshore projects and, through a risk assessment analysis, found that it is unlikely that there will be any lethal take associated with a release of oil. In the unlikely event of a catastrophic spill, we will take immediate action to minimize the impacts to these species and reconsider the appropriateness of authorizations for incidental taking through section 101(a)(5)(A) of the MMPA.

We have evaluated climate change regarding walrus and polar bears. Climate change is a global phenomenon and was considered as the overall driver of effects that could alter walrus and polar bear habitat and behavior. Although climate change is a pressing conservation issue for walrus and polar bears, we have concluded that the authorized taking of walrus and polar

bears during the activities proposed by Industry during this proposed 5-year rule will not adversely impact the survival of these species and will have no more than negligible effects.

Conclusion

We conclude that any incidental take reasonably likely to occur in association with the proposed Industry activities addressed under these proposed regulations will have no more than a negligible impact on the Pacific walrus population and the SBS stock of polar bears. We do not expect any resulting disturbance to negatively impact the rates of recruitment or survival for the walrus and polar bear stocks. These proposed regulations do not authorize lethal take, and we do not anticipate that any lethal take will occur.

Least Practicable Adverse Impacts

We evaluated the practicality and effectiveness of mitigation measures based on the nature, scope, and timing of Industry activities; the best available scientific information; and monitoring data during Industry activities in the specified geographic region. We have determined that the mitigation measures included within AOGA's request will ensure least practicable adverse impacts on polar bears and Pacific walruses (AOGA 2021).

The Service collaborated extensively with AOGA prior to the submission of their final Request to identify effective and practicable mitigation measures for the proposed activities. Polar bear den surveys before activities begin during the denning season, and the resulting 1.6-km (1-mi) operational exclusion zone around all known polar bear dens and restrictions on the timing and types of activities in the vicinity of dens will ensure that impacts to denning female polar bears and their cubs are minimized during this critical time. Minimum flight elevations over polar bear areas and flight restrictions around known polar bear dens would reduce the potential for bears to be disturbed by aircraft. Additionally, AOGA will implement mitigation measures to prevent the presence and impact of attractants such as the use of wildlife-resistant waste receptacles and enclosing access doors and stairs. These measures will be outlined in polar bear and walrus interaction plans that are developed in coordination with the Service prior to starting activities. Based on the information we currently have regarding den and aircraft disturbance and polar bear attractants, we concluded that the mitigation measures outlined in AOGA's request (AOGA 2021) will practically and effectively minimize

disturbance from the specified oil and gas activities.

Impacts on Subsistence Uses

Based on community consultations, locations of hunting areas, the potential overlap of hunting areas and Industry projects, the best scientific information available, and the results of monitoring data, we proposed a finding that take caused by oil and gas exploration, development, and production activities in the specified geographic region will not have an unmitigable adverse impact on the availability of walruses and polar bears for taking for subsistence uses during the proposed timeframe. In making this proposed finding, we considered the following: Records on subsistence harvest from the Service's Marking, Tagging, and Reporting Program; community consultations; effectiveness of the Plan of Cooperation (POC) process between Industry and affected Native communities; and anticipated 5-year effects of Industry activities on subsistence hunting.

While walruses and polar bears represent a small portion, in terms of the number of animals, of the total subsistence harvest for the communities of Utqiagvik, Nuiqsut, and Kaktovik, the harvest of these species is important to Alaska Natives. Prior to receipt of an LOA, Industry must provide evidence to us that community consultations have occurred or that an adequate POC has been presented to the subsistence communities. Industry will be required to contact subsistence communities that may be affected by its activities to discuss potential conflicts caused by location, timing, and methods of proposed operations. Industry must make reasonable efforts to ensure that activities do not interfere with subsistence hunting and that adverse effects on the availability of walruses and polar bear are minimized. Although multiple meetings for multiple projects from numerous operators have already taken place, no official concerns have been voiced by the Alaska Native communities regarding Industry activities limiting availability of walruses or polar bears for subsistence uses. However, should such a concern be voiced as Industry continues to reach out to the Alaska Native communities, development of POCs, which must identify measures to minimize any adverse effects, will be required. The POC will ensure that oil and gas activities will not have an unmitigable adverse impact on the availability of the species or stock for subsistence uses. This POC must provide the procedures addressing how Industry will work with the affected Alaska Native communities

and what actions will be taken to avoid interference with subsistence hunting of walruses and polar bears, as warranted.

The Service has not received any reports and is aware of no information that indicates that walruses or polar bears are being or will be deflected from hunting areas or impacted in any way that diminishes their availability for subsistence use by the expected level of oil and gas activity. If there is evidence during the 5-year period of the proposed regulations that oil and gas activities are affecting the availability of walruses or polar bears for take for subsistence uses, we will reevaluate our findings regarding permissible limits of take and the measures required to ensure continued subsistence hunting opportunities.

Monitoring and Reporting

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

Monitoring activities will be summarized and reported in a formal report each year. The applicant must

submit an annual monitoring and reporting plan at least 90 days prior to the initiation of a proposed activity, and the applicant must submit a final monitoring report to us no later than 90 days after the expiration of the LOA. We base each year's monitoring objective on the previous year's monitoring results.

We require an approved plan for monitoring and reporting the effects of oil and gas Industry exploration, development, and production activities on polar bears and walrus prior to issuance of an LOA. Since production activities are continuous and long term, upon approval, LOAs and their required monitoring and reporting plans will be issued for the life of the activity or until the expiration of the regulations, whichever occurs first. Each year, prior to January 15, we will require that the operator submit development and production activity monitoring results of the previous year's activity. We require approval of the monitoring results for continued operation under the LOA.

Request for Public Comments

If you wish to comment on this proposed regulation or the associated draft environmental assessment, you may submit your comments by any of the methods described in **ADDRESSES**. Please identify if you are commenting on the proposed regulation, the draft environmental assessment, or both, make your comments as specific as possible, confine them to issues pertinent to the proposed regulation, and explain the reason for any changes you recommend. Where possible, your comments should reference the specific section or paragraph that you are addressing. The Service will consider all comments that are received by the close of the comment period (see **DATES**).

Clarity of This Rule

We are required by Executive Orders 12866 and 12988 and by the Presidential Memorandum of June 1, 1998, to write all rules in plain language. This means that each rule we publish must:

- (a) Be logically organized;
- (b) Use the active voice to address readers directly;
- (c) Use common, everyday words and clear language rather than jargon;
- (d) Be divided into short sections and sentences; and
- (e) Use lists and tables wherever possible.

If you feel that we have not met these requirements, send us comments by one of the methods listed in **ADDRESSES**. To better help us revise the rule, your

comments should be as specific as possible. For example, you should tell us the numbers of the sections or paragraphs that you find unclear, which sections or sentences are too long, the sections where you feel lists or tables would be useful, etc.

Required Determinations

Treaty Obligations

The proposed ITR is consistent with the 1973 Agreement on the Conservation of Polar Bears, a multilateral treaty executed in Oslo, Norway, among the Governments of Canada, Denmark, Norway, the Soviet Union, and the United States. Article II of this Polar Bear Agreement lists three obligations of the Parties in protecting polar bear habitat. Parties are obliged to: (1) Take appropriate action to protect the ecosystem of which polar bears are a part; (2) give special attention to habitat components such as denning and feeding sites and migration patterns; and (3) manage polar bear subpopulations in accordance with sound conservation practices based on the best available scientific data.

This rule, if finalized, will further consistency with the Service's treaty obligations through incorporation of mitigation measures that ensure the protection of polar bear habitat. Any LOAs issued pursuant to this rule would adhere to the requirements of the rule and would be conditioned upon including area or seasonal timing limitations or prohibitions, such as placing 1.6-km (1-mi) avoidance buffers around known or observed dens (which halts or limits activity until the bear naturally leaves the den) and monitoring the effects of the activities on polar bears. Available denning habitat maps are provided by the USGS.

National Environmental Policy Act (NEPA)

Per the National Environmental Policy Act (NEPA; 42 U.S.C. 4321, *et seq.*), the Service must evaluate the effects of the proposed action on the human environment. We have prepared a draft environmental assessment (EA) in conjunction with this proposed rulemaking. Subsequent to the closure of the comment period for this proposed rule, we will finalize the EA and decide whether this rulemaking is a major Federal action significantly affecting the quality of the human environment within the meaning of Section 102(2)(C) of the NEPA. See Request for Public Comments, above, if you wish to provide comment on our draft EA.

Endangered Species Act

Under the ESA, all Federal agencies are required to ensure the actions they authorize are not likely to jeopardize the continued existence of any threatened or endangered species or result in destruction or adverse modification of critical habitat. In 2008, the Service listed the polar bear as a threatened species under the ESA (73 FR 28212, May 15, 2008) and later designated critical habitat for polar bear subpopulations in the United States, effective January 6, 2011 (75 FR 76086, December 7, 2010). Consistent with these statutory requirements, the Service's Marine Mammal Management Office has initiated intra-Service section 7 consultation regarding the effects of these regulations on polar bears with the Service's Fairbanks' Ecological Services Field Office. The Service has found the issuance of the proposed ITR will not affect other listed species or designated critical habitat. We will complete the consultation prior to finalizing these proposed regulations.

Regulatory Planning and Review

Executive Order 12866 provides that the Office of Information and Regulatory Affairs (OIRA) in the Office of Management and Budget (OMB) will review all significant rules for a determination of significance. OMB has designated this rule as not significant.

Executive Order 13563 reaffirms the principles of Executive Order 12866 while calling for improvements in the nation's regulatory system to promote predictability, reduce uncertainty, and use the best, most innovative, and least burdensome tools for achieving regulatory ends. The Executive order directs agencies to consider regulatory approaches that reduce burdens and maintain flexibility and freedom of choice for the public where these approaches are relevant, feasible, and consistent with regulatory objectives. Executive Order 13563 emphasizes further that regulations must be based on the best available science and that the rulemaking process must allow for public participation and an open exchange of ideas. We have developed this proposed rule in a manner consistent with these requirements.

OIRA bases its determination upon the following four criteria: (a) Whether the rule will have an annual effect of \$100 million or more on the economy or adversely affect an economic sector, productivity, jobs, the environment, or other units of the government; (b) whether the rule will create inconsistencies with other Federal agencies' actions; (c) whether the rule

will materially affect entitlements, grants, user fees, loan programs, or the rights and obligations of their recipients; (d) whether the rule raises novel legal or policy issues.

Expenses will be related to, but not necessarily limited to: The development of applications for LOAs; monitoring, recordkeeping, and reporting activities conducted during Industry oil and gas operations; development of polar bear interaction plans; and coordination with Alaska Natives to minimize effects of operations on subsistence hunting. Compliance with the proposed rule is not expected to result in additional costs to Industry that it has not already borne under all previous ITRs. Realistically, these costs are minimal in comparison to those related to actual oil and gas exploration, development, and production operations. The actual costs to Industry to develop the request for promulgation of regulations and LOA requests probably do not exceed \$500,000 per year, short of the “major rule” threshold that would require preparation of a regulatory impact analysis. As is presently the case, profits will accrue to Industry; royalties and taxes will accrue to the Government; and the proposed rule will have little or no impact on decisions by Industry to relinquish tracts and write off bonus payments.

Small Business Regulatory Enforcement Fairness Act

We have determined that this proposed rule is not a major rule under 5 U.S.C. 804(2), the Small Business Regulatory Enforcement Fairness Act. The rule is also not likely to result in a major increase in costs or prices for consumers, individual industries, or government agencies or have significant adverse effects on competition, employment, productivity, innovation, or on the ability of United States-based enterprises to compete with foreign-based enterprises in domestic or export markets.

Regulatory Flexibility Act

We have also determined that this proposed rule will not have a significant economic effect on a substantial number of small entities under the Regulatory Flexibility Act (5 U.S.C. 601 *et seq.*). Oil companies and their contractors conducting exploration, development, and production activities in Alaska have been identified as the only likely applicants under the regulations, and these potential applicants have not been identified as small businesses. Therefore, neither a regulatory flexibility analysis nor a small entity compliance guide is required.

Takings Implications

This proposed rule does not have takings implications under Executive Order 12630 because it authorizes the nonlethal, incidental, but not intentional, take of walruses and polar bears by Industry and thereby, exempts these companies from civil and criminal liability as long as they operate in compliance with the terms of their LOAs. Therefore, a takings implications assessment is not required.

Federalism Effects

This rule does not contain policies with Federalism implications sufficient to warrant preparation of a federalism assessment under Executive Order 13132. The MMPA gives the Service the authority and responsibility to protect walruses and polar bears.

Unfunded Mandates Reform Act

In accordance with the Unfunded Mandates Reform Act (2 U.S.C. 1501 *et seq.*), this proposed rule will not “significantly or uniquely” affect small governments. A Small Government Agency Plan is not required. The Service has determined and certifies pursuant to the Unfunded Mandates Reform Act that this rulemaking will not impose a cost of \$100 million or more in any given year on local or State governments or private entities. This rule will not produce a Federal mandate of \$100 million or greater in any year, *i.e.*, it is not a “significant regulatory action” under the Unfunded Mandates Reform Act.

Government-to-Government Coordination

It is our responsibility to communicate and work directly on a Government-to-Government basis with federally recognized Tribes in developing programs for healthy ecosystems. We are also required to consult with Alaska Native Corporations. We seek their full and meaningful participation in evaluating and addressing conservation concerns for protected species. It is our goal to remain sensitive to Alaska Native culture and to make information available to Alaska Natives. Our efforts are guided by the following policies and directives:

- (1) The Native American Policy of the Service (January 20, 2016);
- (2) the Alaska Native Relations Policy (currently in draft form);
- (3) Executive Order 13175 (January 9, 2000);
- (4) Department of the Interior Secretarial Orders 3206 (June 5, 1997), 3225 (January 19, 2001), 3317

(December 1, 2011), and 3342 (October 21, 2016);

(5) the Department of the Interior’s policies on consultation with Tribes and with Alaska Native Corporations; and

(6) Presidential Memorandum on Tribal Consultation and Strengthening Nation-to-Nation Relationships (January 21, 2021).

We have evaluated possible effects of the proposed ITR on federally recognized Alaska Native Tribes and corporations and have concluded the issuance of the ITR does not require formal consultation with Alaska Native Tribes and corporations. Through the proposed ITR process identified in the MMPA, the AOGA has presented a communication process, culminating in a POC if needed, with the Native organizations and communities most likely to be affected by their work. The applicant has engaged these groups in informational communications. We invited continued discussion about the proposed ITR.

In addition, to facilitate co-management activities, the Service maintains cooperative agreements with the Eskimo Walrus Commission (EWC) and the Qayassiq Walrus Commission (QWC) and is working towards developing such an agreement with the newly formed Alaska Nannut Co-Management Council (ANCC). The cooperative agreements fund a wide variety of management issues, including: Commission co-management operations; biological sampling programs; harvest monitoring; collection of Native knowledge in management; international coordination on management issues; cooperative enforcement of the MMPA; and development of local conservation plans. To help realize mutual management goals, the Service, EWC, ANCC, and QWC regularly hold meetings to discuss future expectations and outline a shared vision of co-management.

The Service also has ongoing cooperative relationships with the North Slope Borough and the Inupiat-Inuvialuit Game Commission where we work cooperatively to ensure that data collected from harvest and research are used to ensure that polar bears are available for harvest in the future; provide information to co-management partners that allows them to evaluate harvest relative to their management agreements and objectives; and provide information that allows evaluation of the status, trends, and health of polar bear subpopulations.

Civil Justice Reform

The Department's Office of the Solicitor has determined that these proposed regulations do not unduly burden the judicial system and meet the applicable standards provided in sections 3(a) and 3(b)(2) of Executive Order 12988.

Paperwork Reduction Act

This proposed rule does not contain any new collections of information that require approval by the Office of Management and Budget (OMB) under the Paperwork Reduction Act of 1995 (44 U.S.C. 3501 *et seq.*). OMB has previously approved the information collection requirements associated with incidental take of marine mammals and assigned OMB control number 1018-0070 (expires January 31, 2022). An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number.

Energy Effects

Executive Order 13211 requires agencies to prepare statements of energy effects when undertaking certain actions. This proposed rule provides exceptions from the MMPA's taking prohibitions for Industry engaged in specified oil and gas activities in the specified geographic region. By providing certainty regarding compliance with the MMPA, this proposed rule will have a positive effect on Industry and its activities. Although the proposed rule requires Industry to take a number of actions, these actions have been undertaken by Industry for many years as part of similar past regulations. Therefore, this proposed rule is not expected to significantly affect energy supplies, distribution, or use and does not constitute a significant energy action. No statement of energy effects is required.

References

For a list of the references cited in this rule, see Docket No. FWS-R7-ES-2021-0037, available at <http://www.regulations.gov>.

List of Subjects in 50 CFR Part 18

Administrative practice and procedure, Alaska, Imports, Indians, Marine mammals, Oil and gas exploration, Reporting and recordkeeping requirements, Transportation.

Proposed Regulation Promulgation

For the reasons set forth in the preamble, the Service proposes to amend part 18, subchapter B of chapter I, title 50 of the Code of Federal Regulations as set forth below.

PART 18—MARINE MAMMALS

- 1. The authority citation of part 18 continues to read as follows:

Authority: 16 U.S.C. 1361 *et seq.*

- 2. Revise subpart J to read as follows:

Subpart J—Nonlethal Taking of Marine Mammals Incidental to Oil and Gas Exploration, Development, Production, and Other Substantially Similar Activities in the Beaufort Sea and Adjacent Northern Coast of Alaska

Sec.

- 18.119 Specified activities covered by this subpart.
- 18.120 Specified geographic region where this subpart applies.
- 18.121 Dates this subpart is in effect.
- 18.122 Procedure to obtain a Letter of Authorization (LOA).
- 18.123 How the Service will evaluate a request for a Letter of Authorization (LOA).
- 18.124 Authorized take allowed under a Letter of Authorization (LOA).
- 18.125 Prohibited take under a Letter of Authorization (LOA).
- 18.126 Mitigation.
- 18.127 Monitoring.
- 18.128 Reporting requirements.

- 18.129 Information collection requirements.

Subpart J—Nonlethal Taking of Marine Mammals Incidental to Oil and Gas Exploration, Development, Production, and Other Substantially Similar Activities in the Beaufort Sea and Adjacent Northern Coast of Alaska

§ 18.119 Specified activities covered by this subpart.

Regulations in this subpart apply to the nonlethal incidental, but not intentional, take of small numbers of polar bear and Pacific walrus by certain U.S. citizens while engaged in oil and gas exploration, development, production, and/or other substantially similar activities in the Beaufort Sea and adjacent northern coast of Alaska.

§ 18.120 Specified geographic region where this subpart applies.

This subpart applies to the specified geographic region that encompasses all Beaufort Sea waters east of a north-south line through Point Barrow, Alaska (N71.39139, W156.475, BGN 1944), and approximately 322 kilometers (km) (~200 miles (mi)) north of Point Barrow, including all Alaska State waters and Outer Continental Shelf waters, and east of that line to the Canadian border.

(a) The offshore boundary of the Beaufort Sea incidental take regulations (ITR) region match the boundary of the Bureau of Ocean Energy Management Beaufort Sea Planning area, approximately 322 km (~200 mi) offshore. The onshore region is the same north/south line at Utqiagvik, 40.2 km (25 mi) inland and east to the Canning River.

(b) The Arctic National Wildlife Refuge and the associated offshore waters within the refuge boundaries is not included in the Beaufort Sea ITR region. Figure 1 shows the area where this subpart applies.

Figure 1 to § 18.120.

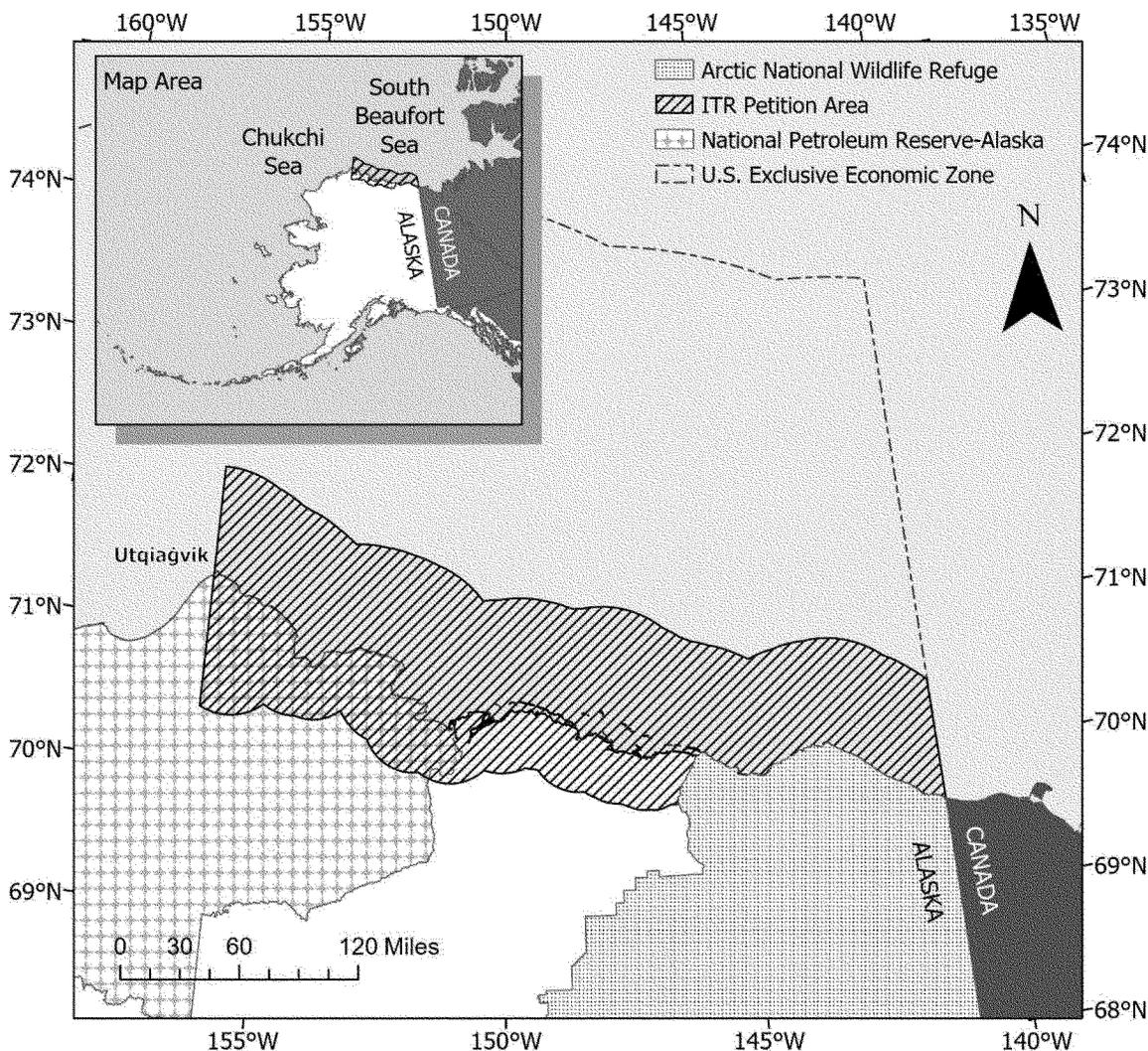


Figure 1—Map of the Beaufort Sea ITR region.

§ 18.121 Dates this subpart is in effect.

Regulations in this subpart are effective from [EFFECTIVE DATE OF FINAL RULE] through [DATE 5 YEARS AFTER EFFECTIVE DATE OF FINAL RULE], for year-round oil and gas exploration, development, production, and other substantially similar activities.

§ 18.122 Procedure to obtain a Letter of Authorization (LOA).

(a) An applicant must be a U.S. citizen as defined in § 18.27(c) and among those entities specified in the Request for this rule or a subsidiary, subcontractor, or successor-in-interest to such an entity. The entities specified in the Request are the Alaska Oil and Gas Association, which includes Alyeska Pipeline Service Company, BlueCrest Energy, Inc., Chevron Corporation,

ConocoPhillips Alaska, Inc., Eni U.S. Operating Co. Inc., ExxonMobil Alaska Production Inc., Furie Operating Alaska, LLC, Glacier Oil and Gas Corporation, Hilcorp Alaska, LLC, Marathon Petroleum, Petro Star Inc., Repsol, and Shell Exploration and Production Company, Alaska Gasline Development Corporation, Arctic Slope Regional Corporation Energy Services, Oil Search (Alaska), LLC, and Qilak LNG, Inc.

(b) If an applicant proposes to conduct oil and gas industry exploration, development, production, and/or other substantially similar activity in the Beaufort Sea ITR region described in § 18.120 that may cause the taking of Pacific walrus and/or polar bears and wants nonlethal incidental take authorization under the regulations in this subpart J, the applicant must

apply for an LOA. The applicant must submit the request for authorization to the Service's Alaska Region Marine Mammals Management Office (see § 2.2 for address) at least 90 days prior to the start of the activity.

(c) The request for an LOA must include the following information and must comply with the requirements set forth in §§ 18.126 through 18.128:

(1) A plan of operations that describes in detail the activity (e.g., type of project, methods, and types and numbers of equipment and personnel, etc.), the dates and duration of the activity, and the specific locations of and areas affected by the activity.

(2) A site-specific marine mammal monitoring and mitigation plan to monitor and mitigate the effects of the

activity on Pacific walruses and polar bears.

(3) A site-specific Pacific walrus and polar bear safety, awareness, and interaction plan. The plan for each activity and location will detail the policies and procedures that will provide for the safety and awareness of personnel, avoid interactions with Pacific walruses and polar bears, and minimize impacts to these animals.

(4) A Plan of Cooperation to mitigate potential conflicts between the activity and subsistence hunting, where relevant. Applicants must provide documentation of communication with potentially affected subsistence communities along the Beaufort Sea coast (*i.e.*, Kaktovik, Nuiqsut, and Utqigvik) and appropriate subsistence user organizations (*i.e.*, the Alaska Nannut Co-Management Council, the Eskimo Walrus Commission, or North Slope Borough) to discuss the location, timing, and methods of activities and identify and mitigate any potential conflicts with subsistence walrus and polar bear hunting activities. Applicants must specifically inquire of relevant communities and organizations if the activity will interfere with the availability of Pacific walruses and/or polar bears for the subsistence use of those groups. Applications for an LOA must include documentation of all consultations with potentially affected user groups. Documentation must include a summary of any concerns identified by community members and hunter organizations and the applicant's responses to identified concerns.

§ 18.123 How the Service will evaluate a request for a Letter of Authorization (LOA).

(a) We will evaluate each request for an LOA based on the specific activity and the specific geographic location. We will determine whether the level of activity identified in the request exceeds that analyzed by us in considering the number of animals estimated to be taken and evaluating whether there will be a negligible impact on the species or stock and an unmitigable adverse impact on the availability of the species or stock for subsistence uses. If the level of activity is greater, we will reevaluate our findings to determine if those findings continue to be appropriate based on the combined estimated take of the greater level of activity that the applicant has requested and all other activities proposed during the time of the activities in the LOA application. Depending on the results of the evaluation, we may grant the authorization, add further conditions, or deny the authorization.

(b) In accordance with § 18.27(f)(5), we will make decisions concerning withdrawals of an LOA, either on an individual or class basis, only after notice and opportunity for public comment.

(c) The requirement for notice and public comment in paragraph (b) of this section will not apply should we determine that an emergency exists that poses a significant risk to the well-being of the species or stocks of polar bears or Pacific walruses.

§ 18.124 Authorized take allowed under a Letter of Authorization (LOA).

(a) An LOA allows for the nonlethal, non-injurious, incidental, but not intentional take by Level B harassment, as defined in § 18.3 and under section 3 of the Marine Mammal Protection Act (16 U.S.C. 1371 *et seq.*), of Pacific walruses and/or polar bears while conducting oil and gas industry exploration, development, production, and/or other substantially similar activities within the Beaufort Sea ITR region described in § 18.120.

(b) Each LOA will identify terms and conditions for each activity and location.

§ 18.125 Prohibited take under a Letter of Authorization (LOA).

Except as otherwise provided in this subpart, prohibited taking is described in § 18.11 as well as:

(a) Intentional take, Level A harassment, as defined in section 3 of the Marine Mammal Protection Act (16 U.S.C. 1362 *et seq.*), and lethal incidental take of polar bears or Pacific walruses; and

(b) Any take that fails to comply with this subpart or with the terms and conditions of an LOA.

§ 18.126 Mitigation.

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

(1) All holders of an LOA must:

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

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

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

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

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

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

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

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

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

(2) All applicants for an LOA must contact affected subsistence communities and hunter organizations to discuss potential conflicts caused by the activities and provide the Service documentation of communications as described in § 18.122.

(b) *Mitigation measures for onshore activities.* Holders of an LOA must undertake the following activities to limit disturbance around known polar bear dens:

(1) *Attempt to locate polar bear dens.* Holders of an LOA seeking to carry out onshore activities during the denning season (November–April) must conduct two separate surveys for occupied polar bear dens in all denning habitat within 1.6 km (1 mi) of proposed activities using aerial infrared imagery. Further, all denning habitat within 1.6 km (1 mi) of areas of proposed seismic surveys must be surveyed three separate times with aerial infrared technology. The first survey must occur between the dates of November 25 and December 15, the second between the dates of December 5 and December 31, and the third (if required) between the dates of December 15 and January 15. All observed or suspected polar bear dens must be reported to the Service prior to the initiation of activities.

(2) *Observe the exclusion zone around known polar bear dens.* Operators must observe a 1.6-km (1-mi) operational exclusion zone around all putative polar bear dens during the denning season (November–April, or until the female and cubs leave the areas). Should previously unknown occupied dens be discovered within 1 mile of activities, work must cease and the Service contacted for guidance. The Service will evaluate these instances on a case-by-case basis to determine the appropriate action. Potential actions may range from cessation or modification of work to conducting additional monitoring, and the holder of the authorization must comply with any additional measures specified.

(3) *Use the den habitat map developed by the USGS.* A map of potential coastal polar bear denning habitat can be found at: http://alaska.usgs.gov/science/biology/polar_bears/denning.html. This measure ensures that the location of potential polar bear dens is considered when conducting activities in the coastal areas of the Beaufort Sea.

(4) *Polar bear den restrictions.* Restrict the timing of the activity to limit disturbance around dens.

(c) *Mitigation measures for operational and support vessels.* (1) Operational and support vessels must be staffed with dedicated marine mammal observers to alert crew of the presence of walrus and polar bears and initiate adaptive mitigation responses.

(2) At all times, vessels must maintain the maximum distance possible from concentrations of walrus or polar bears. Under no circumstances, other than an emergency, should any vessel approach within an 805-m (0.5-mi) radius of walrus or polar bears observed on land or ice.

(3) Vessel operators must take every precaution to avoid harassment of concentrations of feeding walrus when a vessel is operating near these animals. Vessels should reduce speed and maintain a minimum 805-m (0.5-mi) operational exclusion zone around feeding walrus groups. Vessels may not be operated in such a way as to separate members of a group of walrus 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 walrus.

(4) Vessels bound for the Beaufort Sea ITR Region may not transit through the Chukchi Sea prior to July 1. This operating condition is intended to allow walrus the opportunity to move through the Bering Strait and disperse from the confines of the spring lead

system into the Chukchi Sea with minimal disturbance. It is also intended to minimize vessel impacts upon the availability of walrus for Alaska Native subsistence hunters. Exemption waivers to this operating condition may be issued by the Service on a case-by-case basis, based upon a review of seasonal ice conditions and available information on walrus and polar bear distributions in the area of interest.

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

(6) In association with marine activities, we may require trained marine mammal monitors on the site of the activity or onboard ships, aircraft, icebreakers, or other support vessels or vehicles to monitor the impacts of Industry's activity on polar bear and Pacific walrus.

(d) *Mitigation measures for aircraft.* (1) Operators of support aircraft should, at all times, conduct their activities at the maximum distance possible from concentrations of walrus or polar bears.

(2) Aircraft operations within the ITR area should maintain an altitude of 1,500 ft above ground level when operationally possible.

(3) 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 walrus 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 this altitude. However, when weather conditions necessitate operation of aircraft at altitudes below 457 m (1,500 ft), 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 mile) of these areas.

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

(e) *Mitigation measures for the subsistence use of walrus and polar bears.* Holders of an LOA must conduct their activities in a manner that, to the greatest extent practicable, minimizes adverse impacts on the availability of Pacific walrus and polar bears for subsistence uses.

(1) *Community consultation.* Prior to receipt of an LOA, applicants must consult with potentially affected communities and appropriate subsistence user organizations to discuss potential conflicts with subsistence walrus and polar bear hunting caused by the location, timing, and methods of operations and support activities (see § 18.122 for details). If community concerns suggest that the 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 in paragraph (e)(2) of this section.

(2) *Plan of cooperation (POC).* When appropriate, a holder of an LOA will be required to develop and implement a Service-approved POC.

(i) The POC must include a description of the procedures by which the holder of the LOA 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 walrus and polar bears and to ensure continued availability of the species for subsistence use.

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

§ 18.127 Monitoring.

Holders of an LOA must develop and implement a site-specific, Service-approved marine mammal monitoring and mitigation plan to monitor and evaluate the effectiveness of mitigation measures and the effects of activities on walrus, polar bears, and the subsistence use of these species and provide trained, qualified, and Service-approved onsite observers to carry out monitoring and mitigation activities identified in the marine mammal monitoring and mitigation plan.

§ 18.128 Reporting requirements.

Holders of a Letter of Authorization (LOA) must report the results of monitoring and mitigation activities to the Service's Marine Mammals Management Office via email at: fw7_mmm_reports@fws.gov.

(a) *In-season monitoring reports*—(1) *Activity progress reports.* Holders of an LOA must:

(i) Notify the Service at least 48 hours prior to the onset of activities;

(ii) Provide the Service weekly progress reports of any significant changes in activities and/or locations; and

(iii) Notify the Service within 48 hours after ending of activities.

(2) *Walrus observation reports.* Holders of an LOA must report, on a weekly basis, all observations of walrus during any Industry activity. Upon request, monitoring report data must be provided in a common electronic format (to be specified by the Service). Information in the observation report must include, but is not limited to:

- (i) Date, time, and location of each walrus sighting;
- (ii) Number of walrus;
- (iii) Sex and age (if known);
- (iv) Observer name and contact information;
- (v) Weather, visibility, sea state, and sea-ice conditions at the time of observation;
- (vi) Estimated range at closest approach;
- (vii) Industry activity at time of sighting;
- (viii) Behavior of animals sighted;
- (ix) Description of the encounter;
- (x) Duration of the encounter; and
- (xi) Mitigation actions taken.

(3) *Polar bear observation reports.* Holders of an LOA must report, within 48 hours, all observations of polar bears and potential polar bear dens, during any Industry activity. Upon request, monitoring report data must be provided in a common electronic format (to be specified by the Service). Information in the observation report must include, but is not limited to:

- (i) Date, time, and location of observation;
- (ii) Number of bears;
- (iii) Sex and age (if known);
- (iv) Observer name and contact information;

(v) Weather, visibility, sea state, and sea-ice conditions at the time of observation;

(vi) Estimated closest distance of bears from personnel and facilities;

(vii) Industry activity at time of sighting;

(viii) Possible attractants present;

(ix) Bear behavior;

(x) Description of the encounter;

(xi) Duration of the encounter; and

(xii) Mitigation actions taken.

(b) *Notification of LOA incident report.* Holders of an LOA must report, as soon as possible, but within 48 hours, all LOA incidents during any Industry activity. An LOA incident is any situation when specified activities exceed the authority of an LOA, when a mitigation measure was required but not enacted, or when injury or death of a walrus or polar bear occurs. Reports must include:

- (1) All information specified for an observation report;
- (2) A complete detailed description of the incident; and
- (3) Any other actions taken.

(c) *Final report.* The results of monitoring and mitigation efforts identified in the marine mammal monitoring and mitigation plan must be submitted to the Service for review within 90 days of the expiration of an LOA, or for production LOAs, an annual report by January 15th of each calendar year. Upon request, final report data must be provided in a common electronic format (to be specified by the Service). Information in the final (or annual) report must include, but is not limited to:

- (1) Copies of all observation reports submitted under the LOA;
- (2) A summary of the observation reports;
- (3) A summary of monitoring and mitigation efforts including areas, total hours, total distances, and distribution;

(4) Analysis of factors affecting the visibility and detectability of walrus and polar bears during monitoring;

(5) Analysis of the effectiveness of mitigation measures;

(6) Analysis of the distribution, abundance, and behavior of walrus and/or polar bears observed; and

(7) Estimates of take in relation to the specified activities.

§ 18.129 Information collection requirements.

(a) We may not conduct or sponsor and a person is not required to respond to a collection of information unless it displays a currently valid Office of Management and Budget (OMB) control number. OMB has approved the collection of information contained in this subpart and assigned OMB control number 1018-0070. You must respond to this information collection request to obtain a benefit pursuant to section 101(a)(5) of the Marine Mammal Protection Act. We will use the information to:

- (1) Evaluate the application and determine whether or not to issue specific Letters of Authorization; and
- (2) Monitor impacts of activities and effectiveness of mitigation measures conducted under the Letters of Authorization.

(b) Comments regarding the burden estimate or any other aspect of this requirement must be submitted to the Information Collection Clearance Officer, U.S. Fish and Wildlife Service, at the address listed in 50 CFR 2.1.

Shannon A. Estenoz,

Principal Deputy Assistant Secretary for Fish and Wildlife and Parks, Exercising the Delegated Authority of the Assistant Secretary for Fish and Wildlife and Parks.

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