Billing Code

DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

[Docket No. FWS–R7–ES–2021–0055; FXES111607MRG01–212–FF07CAMM00]

Marine Mammals; Incidental Take During Specified Activities; Proposed Incidental Harassment Authorization for Southern Beaufort Sea Stock of Polar Bears in the Prudhoe Bay Unit and Point Thomson Unit of the North Slope of Alaska

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Notice of receipt of application; proposed incidental harassment authorization; notice of availability of draft environmental assessment; request for comments.

SUMMARY: We, the U.S. Fish and Wildlife Service, received a request under the Marine Mammal Protection Act of 1972 from JADE Energy, LLC, for authorization to take by Level B harassment a small number of polar bears from the Southern Beaufort Sea (SBS) stock incidental to oil and gas exploratory activities scheduled to occur between December 1, 2021, through November 30, 2022. These activities include mobilization, constructing ice roads and ice pads,

drilling wells, and associated cleanup in the Prudhoe Bay Unit and Point Thomson Unit of the North Slope of Alaska. Mobilization would occur in December 2021, along a winter trail stretching east from Deadhorse, Alaska, to Point Thomson, Alaska. Prepacking of snow and construction of ice roads and pads would begin mid-December 2021, and drilling would begin at JADE #1 pad in late-January 2022. If conditions are favorable, drilling on JADE #2 pad would take place in mid-March 2022, preceding cleanup activities, which are proposed to be completed by July 15, 2022. We estimate these activities may result in the nonlethal incidental take of up to two SBS stock polar bears. This proposed authorization, if finalized, will be for take of two SBS stock polar bears by Level B harassment only. No lethal or Level A take of polar bears is likely or requested, and, therefore, such take is not included in this proposed authorization.

DATES: Comments on this proposed incidental harassment authorization and the accompanying draft environmental assessment must be received by [INSERT DATE 30 DAYS AFTER THE DATE OF PUBLICATION IN THE *FEDERAL REGISTER*].

ADDRESSES: *Document availability:* You may view this proposed authorization, the application package, supporting information, draft environmental assessment, and the list of references cited herein at *https://www.regulations.gov* under Docket No. FWS–R7–ES–2021–0055, or these documents may be requested as described under **FOR FURTHER INFORMATION CONTACT**. You may submit comments on the proposed authorization by one of the following methods:

- *U.S. mail:* Public Comments Processing, Attn: Docket No. FWS–R7–ES–2021–0055, U.S. Fish and Wildlife Service, MS: PRB (JAO/3W), 5275 Leesburg Pike, Falls Church, VA 22041–3803.
- *Electronic submission:* Federal eRulemaking Portal at: *https://www.regulations.gov*. Follow the instructions for submitting comments to Docket No. FWS-R7-ES-2021-0055.

We will post all comments at *https://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: Charles Hamilton, U.S. Fish and Wildlife Service, MS 341, 1011 East Tudor Road, Anchorage, Alaska 99503, by email at *R7mmmregulatory@fws.gov* or by telephone at 1–800–362–5148. 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:

Background

Section 101(a)(5)(D) of the Marine Mammal Protection Act of 1972 (MMPA; 16 U.S.C. 1361, et seq.) authorizes the Secretary of the Interior (Secretary) to allow, upon request, the incidental, but not intentional, taking by harassment of small numbers of marine mammals in response to requests by U.S. citizens (as defined in title 50 of the Code of Federal Regulations (CFR) in part 18, at 50 CFR 18.27(c)) engaged in a specified activity (other than commercial fishing) within a specific geographic region for periods of not more than 1 year. The Secretary has delegated authority for implementation of the MMPA to the U.S. Fish and Wildlife Service (Service or we). According to the MMPA, the Service shall authorize this harassment if we find that the total of such taking for the 1-year period:

(1) is of small numbers of marine mammals of a species or stock;

(2) will have a negligible impact on such species or stocks; and

(3) will not have an unmitigable adverse impact on the availability of these species or stocks for taking for subsistence uses by Alaska Natives.

If the requisite findings are made, we issue an authorization that sets forth the following, where applicable:

(a) permissible methods of taking;

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

(c) requirements for monitoring and reporting of such taking by harassment, including, in certain circumstances, requirements for the independent peer review of proposed monitoring plans or other research proposals.

The term "take" means to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal. "Harassment" 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").

The terms "negligible impact" and "unmitigable adverse impact" are defined in 50 CFR 18.27 (i.e., regulations governing small takes of marine mammals incidental to specified activities) as follows: "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 impact” as separate and distinct considerations when reviewing requests for incidental harassment authorizations (IHA) 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 IHA, we ensure the least practicable adverse impact by requiring mitigation measures that are effective in reducing the impact of project activities, but they are not so restrictive as to make project activities unduly burdensome or impossible to undertake and complete.

If the requisite findings are made, we will issue an IHA, which will set forth the following, where applicable: (i) permissible methods of taking; (ii) other means of effecting the least practicable impact on the species or stock and its habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance, and on the availability of the species or stock for taking for subsistence uses by coastal-dwelling Alaska Natives (if applicable); and (iii) requirements for monitoring and reporting such taking by harassment.

Summary of Request

On May 19, 2021, the Service received a request on behalf of JADE Energy, LLC (JADE), for nonlethal incidental harassment of small numbers of SBS stock polar bears during mobilization, well drilling, construction of ice roads and pads, and cleanup activities in the Prudhoe Bay Unit (PBU) and Point Thomson Unit (PTU) of the North Slope of Alaska for a period of 1 year (December 1, 2021, to November 30, 2022) (hereafter referred to as the "Request"). After discussions with the Service regarding project timelines and mitigation measures, we received project shapefiles on May 25, 2021, and a revised Request on June 9, 2021, which was deemed adequate and complete. JADE further amended their June 9, 2021, Request to include changes to the location of JADE #2 pad, JADE #2 ice road, and planned location of the winter trail. This final Request—which is also adequate and complete—was received August 2, 2021.

Description of Specified Activities and Specific Geographic Region

The specified activities (hereafter referred to as the "project") consists of mobilization activities, construction of ice roads and pads, drilling wells, and cleanup and supporting activities. All activities occur within Alaska's North Slope planning area. The North Slope planning area has 1,225 tracts that lie between the National Petroleum Reserve–Alaska (NPRA) and the boundary of the Arctic National Wildlife Refuge (Arctic Refuge). The southern boundary of the North Slope planning area is the Umiat baseline. Mobilization activities will stretch east from Deadhorse in the PBU to Point Thomson in the PTU and will not extend into the Arctic Refuge. JADE is the majority owner and operator of Alaska State oil and gas lease ADL 343112, which is located approximately 96.6 kilometers (km) (60 miles [mi]) east of Prudhoe Bay, Alaska, and 94 km (59 mi) west of Kaktovik, Alaska. ADL 343112 is located within the southeast portion of the PTU and consists of 266.06 hectares (ha) (657.45 acres [ac]) of land. Facilities used during the duration of the project activities are located in Point Thomson at PTU central pad. JADE #1 is approximately 9.09 km (5.65 mi) southeast, and JADE #2 is located approximately 6.37 km (3.96 mi) southwest, of PTU central pad (figure 1).

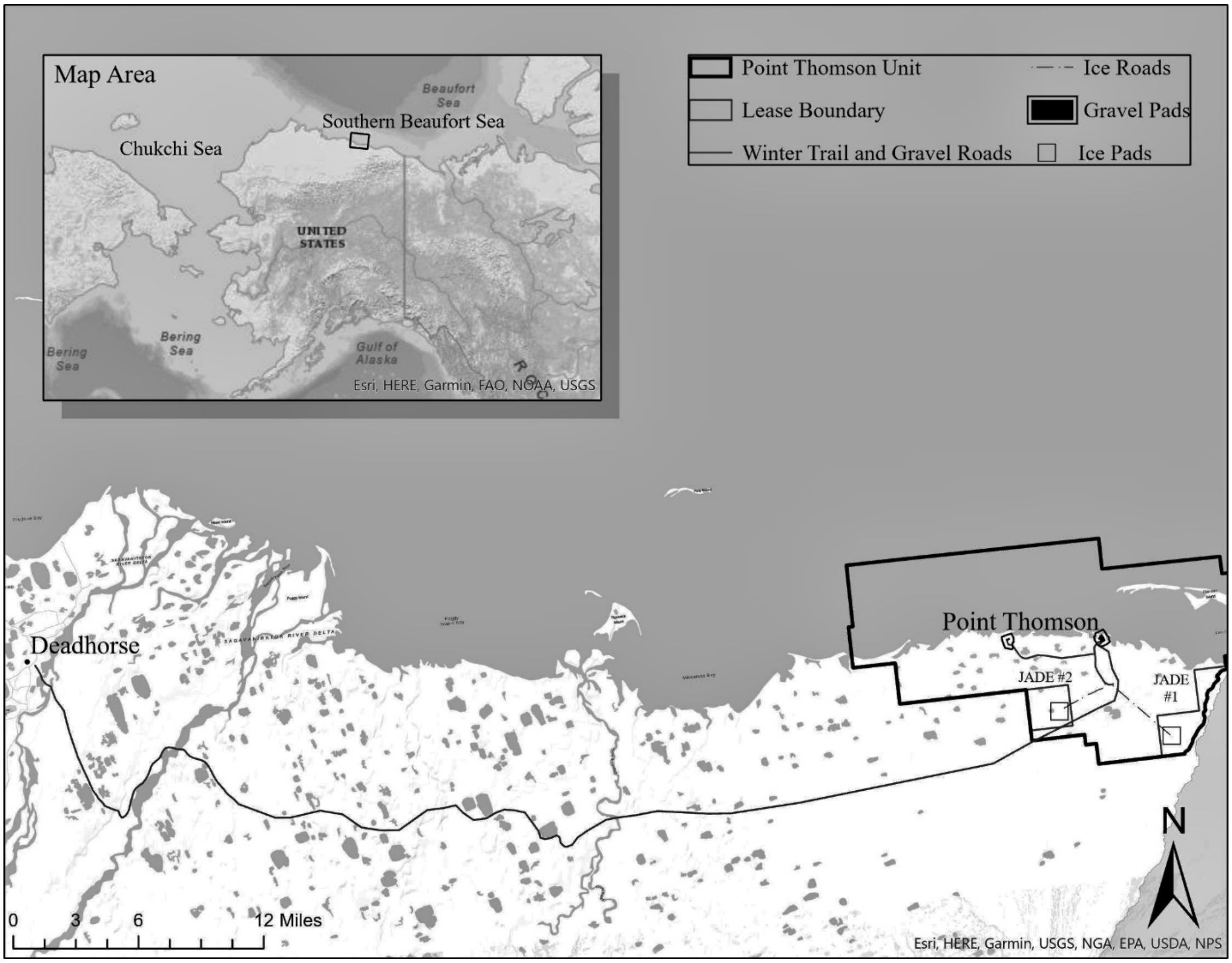

Figure 1—Specific geographic region and proposed ice roads and pads.

Staging and Mobilization

An overland winter trail stretching from Deadhorse to Point Thomson will be used for initial mobilization and resupply throughout the project. The winter trail is planned to be constructed by Exxon Mobil Alaska Production Inc. (EMAP); however, if EMAP is unable to construct the winter trail prior to JADE activities, JADE will construct the winter trail. Approximately 42 round trips of drilling supplies, fuel, and materials will be hauled by Pisten Bullys and Steiger tractor trailer units along the winter trail. During drilling and testing, supply hauls along the winter trail will be limited to every third day, generally consisting of two Pisten Bullys and two Steigers. Mobilization would begin January 16, 2022, and demobilization would be completed by April 29, 2022, with equipment being staged at PTU West Pad during the summer.

Ice Road and Pad Construction

One ice road, 5.95 km (3.7 mi) long, will be constructed south from the end of the PTU gravel road system to JADE #1—a 3.34-ha (8.26-ac) ice pad. A secondary ice road, 4.1 km (2.55 mi) long, will be constructed west from the PTU gravel road system to JADE #2, which will be similar in size to JADE #1. Preparation for the construction of ice roads and pads is set to occur from December 15, 2021, to January 2, 2022, and would involve two operators and approximately 7 days of work. Construction would proceed immediately after this activity, with eight operators working 12-hour day shifts for approximately 8 days to be completed by January 16, 2022. Maintenance of roads and pads would be required throughout the project and would be conducted by five operators working a day shift. Once drilling begins, ice roads will have daily traffic to shuttle crew to and from the pad(s) via busses from Point Thomson with approximately four trips per day.

Well Drilling and Cleanup

Drilling equipment will be mobilized from PTU West Pad to JADE #1 starting on January 16, 2022, and drilling will begin January 29, 2022. If drilling attempts are successful at JADE #1, the drill rig and associated drilling equipment will be moved to JADE #2 on March 7, 2022. If drilling is conducted at JADE #2, activities will begin approximately on March 13, 2022, and be completed on April 20, 2022.

Following drilling activities, JADE has proposed to contract one helicopter in early July to perform flyovers of the project area to identify any debris that may have been left behind during winter operations. The cleanup crew will inspect all camp locations and any area where field activities occurred. All cleanup work is to be completed by July 15, 2022. The area of cleanup will not extend beyond the project area, and during transit aircraft used are expected to maintain 1,500 feet (ft) altitude above ground level (AGL) to avoid disturbance.

Mitigation Measures

JADE will be working with EMAP to perform two aerial infrared (AIR) surveys. The first survey will be conducted between November 25 and December 15, and the second survey will be conducted between December 5 and December 31. In addition to AIR surveys, JADE will be using handheld and vehicle-mounted forward-looking infrared (FLIR) to locate maternal dens along any major drainages on the winter trail, snow drifts greater than 5 ft in height along the winter trail and ice roads, snow piles around each pad, and any other areas that may provide suitable snow buildup for denning polar bears. In the event a den is located, JADE will maintain a 1.6-km (1-mi) exclusion zone around the den, cease nearby activities or reduce essential activities, increase communication of personnel, and continuously monitor the den. Aircraft will be flown at a minimum of 1,500 ft AGL and will not land or take off if a bear is within 1.6 km (1 mi) of the landing/takeoff site. Additionally, work is targeted to be complete no later than July 18 prior to open-water season, which marks an increase in polar bear presence onshore.

Description of Marine Mammals in the Specified Geographic Region

Polar bears comprise 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 (SBS stock) and the Russia Federation (the Chukchi/Bering Seas [CBS] stock). The SBS stock is the only stock found in the specified geographic region. Therefore, the description below focuses on the SBS stock and general polar bear biology and behavior.

Polar Bear Biology

Polar bears are distributed throughout the ice-covered seas and adjacent coasts of the Arctic region. 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). Polar bears prefer to remain on the sea ice year-round throughout most of their range; however, an increasing proportion of stocks are spending prolonged periods of time onshore (Rode et al. 2015, Atwood et al. 2016). While time spent on land occurs primarily in late summer and autumn (Rode et al. 2015, Atwood et al. 2016), 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. 2016, Wilson et al. 2017) and its direct and indirect effects on foraging success and, in the case of pregnant females, also dependent on the availability of suitable denning habitat (Durner et al. 2006, Rode et al. 2015, Atwood et al. 2016).

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 providing measures that are necessary and advisable for the conservation of polar bears (78 FR 11766, February 20, 2013). The Service designated critical habitat for polar bear populations in the United States effective January 6, 2011 (75 FR 76086, December 7, 2010) identifying 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. 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 meters (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 Utqiaġvik. The total area designated under the ESA as critical habitat covers approximately 484,734 km^2 (~187,157 mi^2) and is entirely within the lands and waters of the United States. A digital copy of the final rule designating critical habitat is available at *https://www.regulations.gov* in Docket No. FWS-R7-ES-2009-0042 or at:

http://www.fws.gov/r7/fisheries/mmm/polarbear/pdf/federal_register_notice.pdf.

Polar Bear Stocks

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 Russia Federation (the Chukchi/Bering Seas [CBS] stock). 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). Management and conservation concerns for the SBS and CBS 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 (USFWS 2016, Regehr et al. 2017). Most notably, reductions in physical condition, growth, and survival of polar bears have been associated with declines in sea ice (Regehr et al. 2007, Rode et al. 2014, Bromaghin et al. 2015, 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 (Intergovernmental Panel on Climate Change (IPCC) 2014, Atwood et al. 2016) (see *Climate Change*, below, for further details). A detailed description of the SBS polar bear stock can be found in the Service's revised Polar Bear (*Ursus maritimus*) Stock Assessment Report announced in the *Federal Register* on June 24, 2021 (86 FR 28526). Digital copies of the revised Stock Assessment Report are available at: *https://www.fws.gov/alaska/sites/default/files/2021-06/Southern%20Beaufort%20Sea%20SAR%20Final_May%2019rev.pdfSouthern Beaufort Sea Stock*

The SBS polar bear stock is shared between Canada and Alaska. Radio-telemetry data, combined with eartag 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).

In 2020, the U.S. Geological Survey (USGS) produced the most recent population estimates for the Alaska portion of the SBS stock (Atwood et al. 2020), which 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) before stabilizing from 2006 through 2015. Despite the increase in size from 2009 to 2012, low survival in 2013 appears to have offset those gains. 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.

In Alaska during the late summer/fall period (July through November), polar bears from the SBS stock often occur along the coast and barrier islands, which serve as travel corridors, resting areas, and to some degree, foraging areas. Based on oil and gas industry (hereafter, “Industry”) observations and coastal survey data acquired by the Service (Wilson et al. 2017), encounter rates between humans and polar bears are higher during mid-July to mid-November than in any other season. 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 polar bears spend in these coastal habitats has been linked to sea-ice dynamics (Rode et al. 2015, Atwood et al. 2016). The remains of subsistence-harvested bowhead whales (*Balaena mysticetus*) 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 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 sea-ice conditions (Bentzen et al. 2007).

Polar bears have no natural predators (though cannibalism is known to occur; Stirling et al. 1993). 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 (Hunter et al. 2010, Regehr 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). SBS stock females typically give birth at 5 years old (Stirling et al. 1976, Lentfer and Hensel 1980). On average, SBS stock females produce litter sizes of 1.9 cubs (SD=0.5; Smith et al. 2007, 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 et al. 1992, Eberhardt 2002). The determining factor for polar bear stock growth 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. 2007). 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).

Female polar bears 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). 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 and that is part of the Arctic National Wildlife Refuge in northeastern Alaska; Amstrup 1993), 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).

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 1978, Kenny and Bickel 2005). If a female leaves a den during early denning (day of cub birth to 60 days after cub birth), cub mortality is likely to occur due to a variety of factors, including susceptibility to cold temperatures (Blix and Lentfer 1978, Hansson and Thomassen 1983, Van de Velde 2003), predation (Derocher and Wiig 1999, Amstrup et al. 2006), 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 Impacts of Specified Activities* *on Marine Mammals: 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 increased 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 longer 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).

Climate Change

Global climate change will impact the future of 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 (Harwood et al. 2001, Bellard et al. 2012, Scheffers et al. 2016, 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 breakup earlier in the year, re-formation 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, 73 FR 28212, May 15, 2008, Amstrup et al. 2008, Hunter et al. 2010, Overland and Wang 2013, 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 of polar bears.

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. 2016, 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 due 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 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, 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 move off the sea ice onto land for the duration of 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 CBS 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. 2016). 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. 2016).

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 (Towns et al. 2009, Schliebe et al. 2008, Atwood et al. 2016). 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. 2016, 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 (Wilson et al. 2017, Penk et al. 2021).

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, Kutchera et al. 2016). The circumpolar polar bear population has been divided into six genetic clusters: the Western Polar Basin (which includes the SBS and CBS 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 (Stirling and Derocher 2012, Rode et al. 2018, Molnár et al. 2020). 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. 2016). 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 more female polar bears denning on shore as a result of 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, throughout the Circumpolar Region, 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 (RCP 8.5 [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 19 stocks, including in the SBS stock, 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 (McKinney et al. 2017). 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 SBS 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 (Stirling and Derocher 2012, Rode et al. 2018, 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, subsistence harvest, 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 coastal area will continue to increase during the open-water season.

Potential Impacts of the Specified Activities on Marine Mammals

Human–Polar Bear Encounters

Industry activities may affect polar bears in numerous ways. SBS polar bears are typically distributed in offshore areas associated with multiyear pack ice from mid-November to mid-July and can be found in large numbers and high densities on barrier islands, along the coastline, and in the nearshore waters of the Beaufort Sea from mid-July to mid-November. This distribution leads to a significantly higher number of human–polar bear encounters on land and at offshore structures during the open-water period (mid-July to mid-November) than at other times of the year. Because the project is located entirely on land, the remainder of this discussion will focus on human-polar bear encounters on land.

A majority of Industry's on-land bear observations occur within 2 km (1.2 mi) of the coastline; however, the location for these specified activities are primarily located outside of the coastal area. Encounters are more likely to occur during the fall at facilities on or near the coast. These facilities and associated infrastructure may act as physical barriers to polar bear movements; however, polar bears have frequently been observed crossing existing roads. Polar bear interaction plans, training, and monitoring have the potential to reduce human–polar bear encounters and the risks to bears and humans when encounters occur. Polar bear interaction plans detail the policies and procedures that the associated 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.

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 cleanup activities, and drilling operations. Mobile sources include aircraft traffic, ice road construction, vehicle traffic, tracked vehicles, and snowmobiles.

The potential behavioral reaction of polar bears to the specified activities can vary by activity type. Camp odors may attract polar bears, potentially resulting in human–bear encounters, intentional hazing, or possible lethal take in defense of human life. 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 (Dyck and Baydack 2004, Anderson and Aars 2008).

Effects of Aircraft Overflights on Polar Bears

Bears near aircraft flight paths experience increased noise and visual stimuli, both have the potential to elicit a biologically significant behavioral response. 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 polar bears (Southall et al. 2019). Through a series of systematic modeling procedures and extrapolations, Southall et al. (2019) have generated modified noise exposure thresholds for in-air 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 POLAR BEARS. (Values are weighted for other marine carnivores' hearing thresholds and given in cumulative sound exposure level (SEL_{CUM} dB re $(20\mu Pa)^2 s$ in air) for impulsive and non-impulsive sounds and unweighted peak sound pressure level in air (dB re 20μPa) (impulsive sounds only).)

	TTS			PTS		
	non-impulsive	impulsive		non-impulsive	impulsive	
	SEL_{CUM}	SEL_{CUM}	Peak SPL	SEL_{CUM}	SEL_{CUM}	Peak SPL
Air	157	146	161	177	161	167

During a Federal Aviation Administration test, test aircraft produced sound at all frequencies measured AGL (50 Hz to 10 kHz) (Healy 1974). At frequencies centered at 5 kHz, jets flying at 300 m (984 ft) produced 1/3 octave band noise levels of 84 to 124 dB AGL, propeller-driven aircraft produced 75 to 90 dB AGL, and helicopters produced 60 to 70 dB AGL (Richardson et al. 1995). Thus, the frequency and level of airborne sounds typically produced by the activities associated with JADE's Request is unlikely to cause temporary or permanent hearing damage. 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.

Although temporary or permanent hearing damage is not anticipated, impacts to bears near aircraft flight paths 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 flights, indicate that the reactions of non-denning polar bears are typically varied but limited to short-term changes in behavior ranging from no reaction to running away. Polar bears associated with dens have been shown to increase vigilance, initiate rapid movement, and even abandon dens when exposed to low-flying aircraft. Aircraft activities can impact polar 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 polar bears spend the majority of their time resting and limiting their movements on land. Exposure to auditory and visual stimuli associated with aircraft flight paths is likely 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 avoidance of frequently used habitat areas as well as flight restrictions around known polar bear aggregations, will be required when safe, to achieve least practicable adverse impact of the likelihood that polar bears are disturbed by aircraft.

Effects to Denning Polar Bears

The Service monitors known polar bear dens around the oilfield discovered either opportunistically or during planned surveys for tracking marked polar bears and detecting polar bear dens. However, these sites are only a small percentage of the total active polar bear dens for the SBS stock in any given year. To identify any active polar bear dens in the area, JADE has included in the Request plans to conduct AIR surveys in addition to using handheld and vehicle-mounted FLIR. If a polar bear den is located, activities are required to avoid known polar bear dens by 1.6 km (1 mi). When a previously unknown den is discovered in proximity to ongoing activities, JADE will implement 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 polar bears to disturbance and the consequences of these responses can vary throughout the denning process. We divide the denning period into four stages when considering impacts of disturbance: den establishment, early denning, late denning, and post-emergence; definitions and descriptions are located in the 2021–2026 Beaufort Sea ITR (86 FR 42982, August 5, 2021).

Effects of Industry Activities on Polar Bear Prey

While some oil and gas activity on the North Slope of Alaska may impact polar bears indirectly by altering polar bears' access to their prey, primarily ringed seals and bearded seals, impacts from the specified activities will not occur offshore. Therefore, the specified activities are not anticipated to have effects on polar bear prey or their availability to access prey.

Estimated Take

Definitions of Incidental Take under the Marine Mammal Protection Act

Below we provide definitions of potential types of take of polar bears. The Service does not anticipate and is not authorizing lethal take or Level A harassment as a part of this proposed incidental harassment authorization, nor was it included in the Request; 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. In the most serious interactions (e.g., vehicle collision or running over an unknown den causing its collapse), human actions can result in polar bear mortality. 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). Unintentional disturbance of a female polar bear 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.

Level A Harassment

Human activity may result in the injury of polar bears. 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. Numerous actions can cause take by Level A harassment, such as creating an annoyance that separates mothers from dependent cubs (Amstrup 2003), results in polar bear mothers leaving the den early (Amstrup and Gardner 1994, Rode et al. 2018), or interrupts the nursing or resting of cubs.

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. Human-caused changes in behavior that disrupt biologically significant behaviors or activities for the affected animal indicate take by Level B harassment under the MMPA. Such reactions 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 also be indicative of 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 indicative of Level B harassment. It is also important to note that reactions of greater duration, frequency, or severity than contemplated in the list above could reflect take by Level A harassment.

Surface Interactions

Encounter Rate

Human-caused disturbances cannot cause take if no polar bears are present in the area of exposure. To quantify the anticipated take associated with a given activity, it is necessary to evaluate the number of polar bears anticipated to be present within the area of exposure. The best available scientific evidence for estimating polar bear prevalence near areas of industrial activities on the North Slope includes data concerning human–polar bear encounters. 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 incidental take regulations. This database is referred to as the “LOA database” because it aggregates data reported by the Industry to the Service pursuant to the terms and conditions of Letters of Authorization (LOA) issued under current and previous incidental take regulations (50 CFR part 18, subpart J). We have used records in the LOA database from the period 2014–2018, in conjunction with polar bear density projections for the entire coastline, to generate quantitative encounter rates in the project area. This 5-year period was used to provide metrics that reflected the most recent patterns of polar bear habitat use within the Beaufort Sea 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 the Service's take determination. 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 (Geosphere Version 1.5–10, *https://cran.r-project.org/web/packages/geosphere/index.html*, accessed May 26, 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).

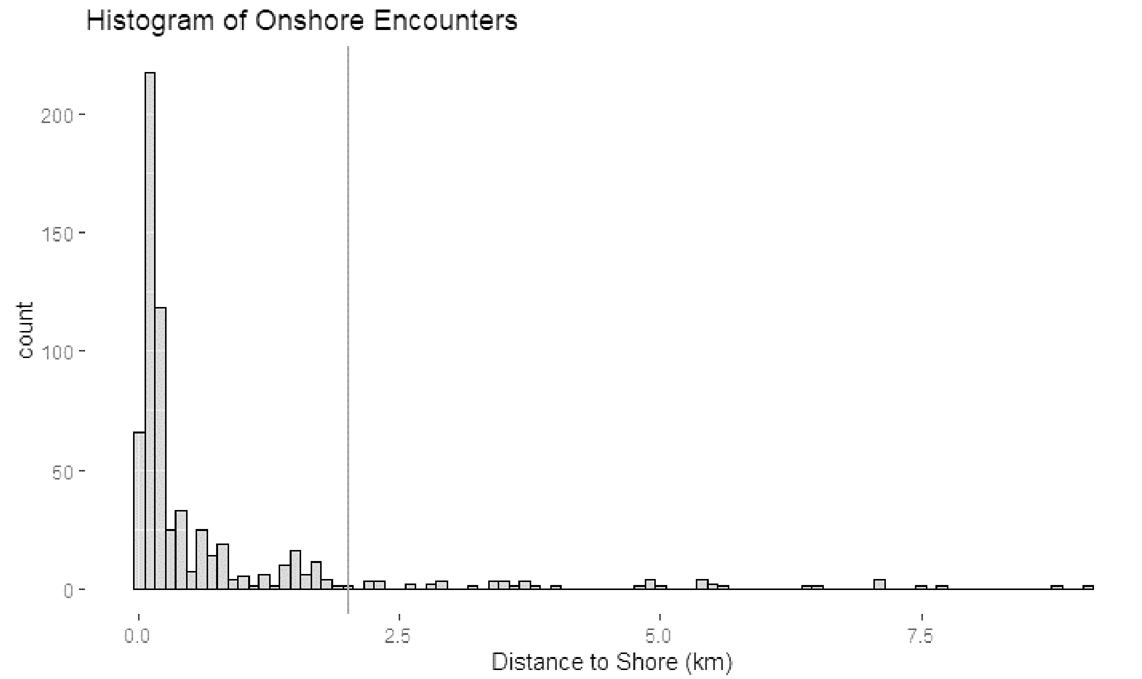

Figure 2—Distribution of onshore polar bear encounters on the North Slope of Alaska in the period 2014–2018 by distance to shore (km). The decrease in encounters was used to designate a "coastal" zone up to 2.0 km (1.2 mi) from shore and an "inland" zone greater than 2.0 km (1.2 mi) from shore.

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 *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 specified activities are also seasonal, and only occur either in the winter or summer months. To develop an accurate estimate of the number of polar bear encounters that may result from the specified 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).

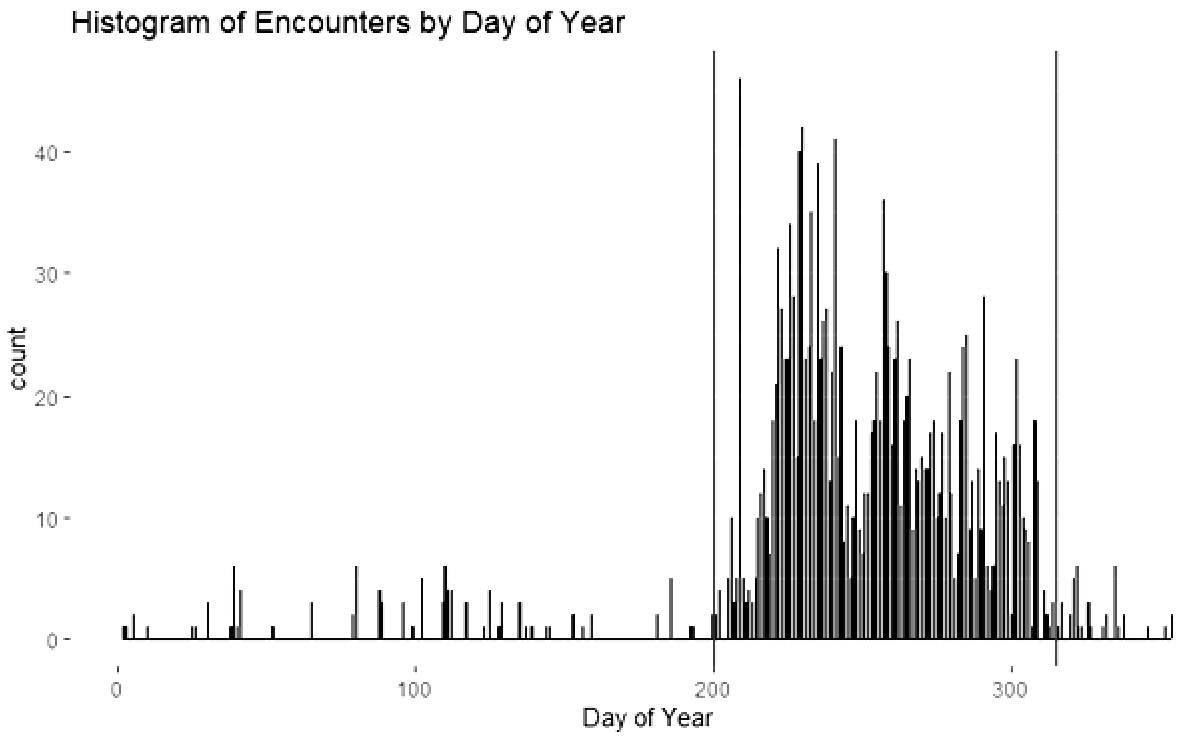

Figure 3—Distribution of polar bear encounters in the Southern Beaufort Sea and adjacent North Slope of Alaska in the period 2014–2018 by Julian day of year. Dotted lines delineate the "open" vs. "ice" seasons. Open season begins on the 200th day of the year (July 19th) and ends on the 315th day of the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

North Slope Encounter Rates

Encounter rates in bears/season/km^2 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):

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

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 several 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 Service 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).

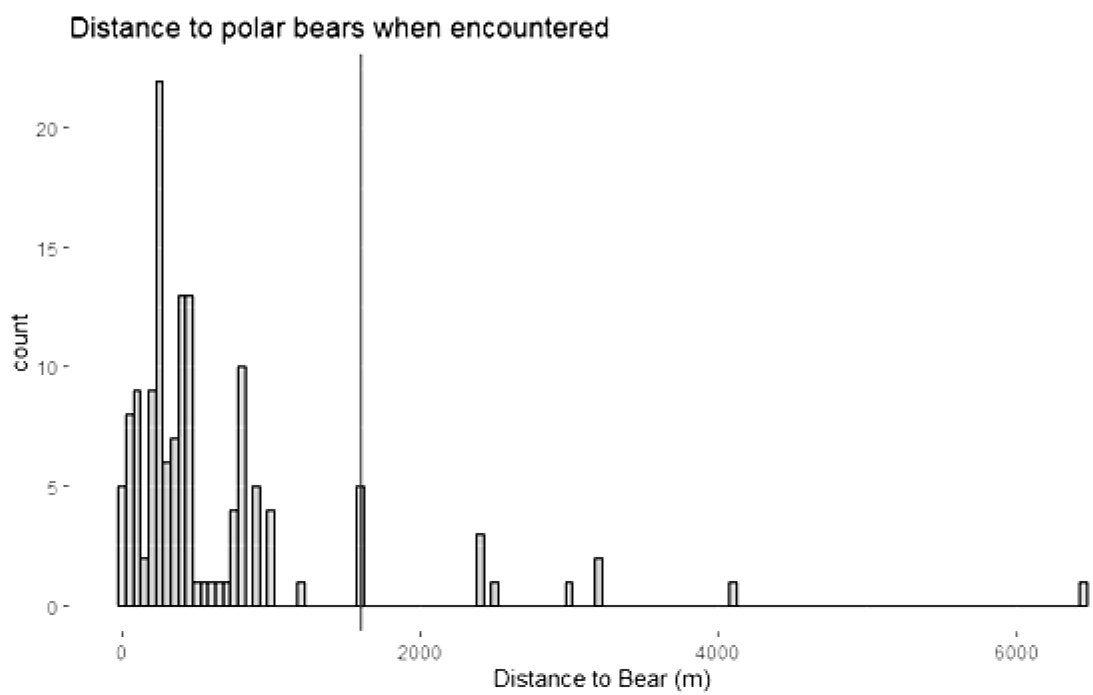

Figure 4—Distribution of polar bear encounters on the North Slope of Alaska in the period 2014–2018 by distance to bear (m).

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.

(A) Coastal Zone (Area = 133 km^2)

Year	Ice Season Encounters	Open-Water Season Encounters
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 km^2)

Year	Ice Season Encounters	Open-Water Season Encounters
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 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).

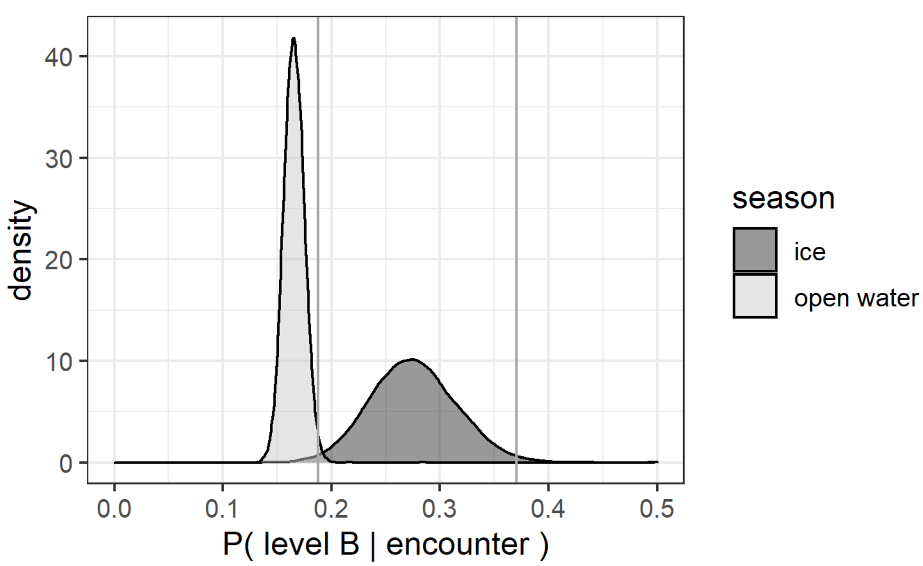

Figure 5—Estimated marginal posterior predictive probabilities from the Bayesian probit regression of Level B harassment of polar bears on the North Slope of Alaska in the period 2014–2018. Vertical gray lines correspond to the upper 99 percent quantiles for each distribution, which were used as the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

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 Service-conducted aerial surveys 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 area, including the PBU and PTU in which the specified activities are proposed to occur. 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 7 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 central pad in grid 7. These locations were determined in earlier analyses to have constant 24-hour 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/km^2 and multiplied this number by the total coastal Service aerial survey area. The results are summarized in 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 *reported* at point location	0.246	0.354	2.215
Average weekly number of bears projected in grid	7	26	7
Average weekly number of bears *projected* 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 JADE 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
r_o	occupancy rate
e_{ci}	coastal ice season bear-encounter rate in bears/season
e_{ii}	inland ice season bear-encounter rate in bears/season
t_i	ice season harassment rate
B_t	number of estimated Level B harassment events

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 Request, JADE provided the Service with digital geospatial files and crew shift information that was used to determine the maximum expected human occupancy (i.e., rate of occupancy (r_o)) for each phase of the project (e.g., construction of ice roads, construction of ice pads, ice road maintenance, drilling, etc.). Using the buffer tool in ArcGIS, we created a spatial file of a 1.6-km (1-mi) buffer around all proposed structures. 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.

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 2) 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 2

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 3).

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

Equation 3

Aircraft Activities

Aircraft activities are proposed to take place only during cleanup activities lasting early- to mid-July. The proposed aircraft activity would be spatially limited, occur prior to the start of the open-water season (July 19), and be subject to mitigation measures proposed by JADE. Analyses of previous projects of a similar nature and location, but larger extents, estimated polar bear takes by harassment to be less than 0.0003 polar bears. Given this information, the Service has determined that impacts would be negligible and further analysis is not warranted.

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 JADE's Request, we characterized, evaluated, and prioritized a series of rules and definitions towards a predictive model based on knowledge of published and unpublished information on polar bear 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 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 polar 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 polar 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 5).

TABLE 5—PROBABILITY FOR EACH POSSIBLE LEVEL OF TAKE BASED ON THE 57 CASE STUDIES FROM A DISCRETE OR REPEATED EXPOSURE DURING EACH 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 Impacts of Specified Activities on Marine Mammals: Effects to Denning Polar 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. 2018). 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 December 15 the estimated average date of cub birth; Messier et al. 1994, Van de Velde et al. 2003).

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 February14 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 if a behavioral response was observed. However, multiple exposures do not result in multiple Level B harassments 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 (Durner et al. 2006, 2013; Blank 2013) contained within the National Petroleum Reserve–Alaska (NPRA) in the west to the Canadian border in the east. While JADE's Request does not include activity inside the Arctic Refuge, 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 NPRA, the area between the Colville and Canning Rivers (CC), and Arctic Refuge. The mean estimated number of dens in each region during a given winter were as follows: 12 dens (95 percent CI: 3–26) in the NPRA, 26 dens (95 percent CI: 11–48) in the CC region, and 14 dens (95 percent CI: 5–30) in the Arctic Refuge (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: NPRA (122/5.82,12/5.82), CC (262/9.52,26/9.52), and Arctic Refuge (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 catalog (Durner et al. 2020) that should occur on barrier islands in the CC region during that given model iteration; $n_{barrier}$=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 greater than 45 km 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

$$f(\boldsymbol{s}) \propto \frac{\theta}{n}\sum_{i}^{n} k\left(\frac{\boldsymbol{s}-\boldsymbol{s}_i}{h(\boldsymbol{s})}\right)$$, where the adaptive bandwidth

$$h(\boldsymbol{s}) = \left(\beta_0 + \beta_1 I(\boldsymbol{s}_i \in \mathcal{M}) I(\boldsymbol{s} \in \mathcal{M})\right)^{\beta_2}$$

for the location of the *i*th den and each location

$$\boldsymbol{s}$$

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

$$\theta,\ \beta_0,\ \beta_1,\ \beta_2$$

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. 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.

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 (Durner et al. 2006, 2013; Blank 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.

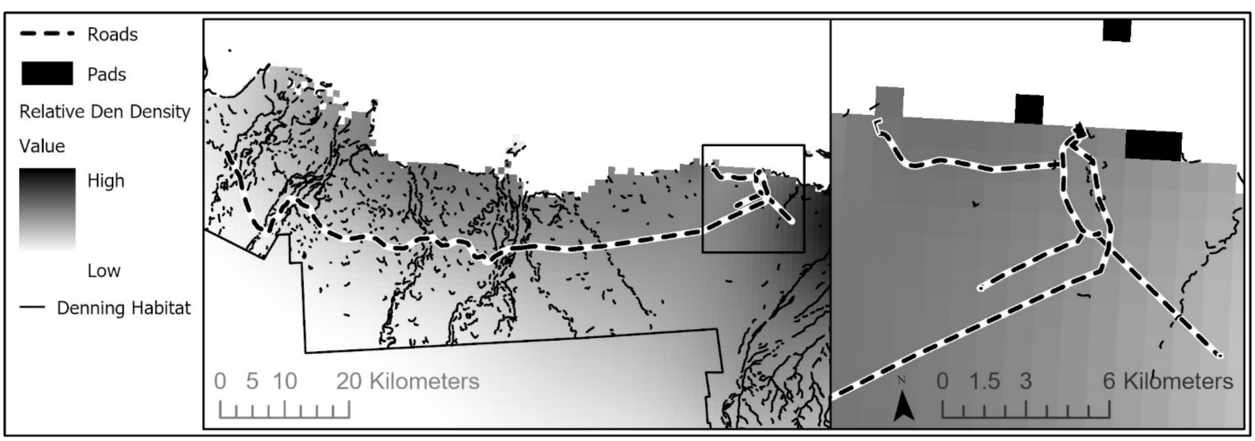

Figure 6—Depiction of the proposed project area on the North Slope of Alaska with the underlying relative density of polar bear dens and potential polar bear denning habitat as identified by Durner et al. (2006, 2013) and Blank (2013).

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 SBS 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 date 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., September 12 to December 22) 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., December 15) 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 μ=81.0, σ=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 SBS 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 three behavioral studies, Smith et al. (2007, 2013) and Robinson (2014), which monitored dens 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 8.02/5.52 and a rate parameter equal to 8.0/5.52; 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, 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, 2013) and Robinson (2014).

Because there is some probability that a female naturally emerges with zero cubs, we also wanted to ensure this scenario was captured. It is difficult to parameterize the probability of litter size equal to zero 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 zero. There were only three bears in the USGS (2018) data that met this criteria, leading to an assumed probability of a litter size of zero 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 specified 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 specified 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 IHA Request. However, given that activity on the border of this region could still affect dens falling outside of the area defined in the IHA 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 road and pad infrastructure associated with industrial activities from JADE. Each attribute in the shapefiles included a monthly occupancy rate that ranged from zero to one. For this analysis, we assumed that any road or pad with occupancy greater than zero 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 roads, tundra travel routes, and ice pads from JADE. We also received information on the proposed start and end dates for ice roads and tundra routes each winter from JADE with activity anticipated to occur at least daily along each.

Aerial Infrared Surveys

Based on JADE's Request, we assumed that all permanent infrastructure (i.e., roads and pads) and ice roads would receive two AIR surveys of polar bear den habitat within 1.6 km (1 mi) of those features in the winter of 2021. The first survey would occur between November 25 and December 15, and the second survey would occur between December 5 and December 31. During each iteration of the model, the AIR surveys were randomly assigned a probability of detecting dens. Two 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 $\left(\frac{0.41^2-0.41^3-0.41\times0.1539^2}{0.1539^2},\frac{0.41-2\times0.41^2+0.41^3-0.1539^2+0.41\times0.1539^2}{0.1539^2}\right)$ *Beta0.412−0.413−0.41×0.153920.15392,0.41−2×0.412+0.413−0.15392+0.41×0.153920.15392)* 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 5).

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 specified activities had a discountable risk of running over dens and thus killing a female or impacting her future reproductive potential. The majority of the specified activities occur on established, permanent infrastructure or in areas that would not be suitable for denning and, therefore, pose no risk of being run over (i.e., an existing road or pad). 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 JADE's description of their specified activities, we only considered AIR surveys as discrete exposures given that surveys occur quickly (i.e., the time for an airplane to fly over) and infrequently. 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. 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.

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 applied only to cubs because specified 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.

Model Results

On average, we estimated 52 (median=51; *95% CI*: 30–79) land-based dens along the North Slope of Alaska, within which JADE's proposal is located. Estimates for different levels of harassment takes are presented in table 6. We also estimated that Level B harassment from only AIR surveys was a mean of 0.49 (median=0; 95% CI: 0–2). The distributions of both non-serious Level A harassment and serious Level A harassment/lethal 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 harassment/lethal takes is 0.0. Due to the low (0.23 for non-serious Level A and 0.26 for serious Level A harassment takes) probability of greater than or equal to 1 non-serious or serious injury Level A harassment/lethal take each year of the proposed IHA period, combined with the median of 0.0 for each, we do not estimate the specified activities will result in non-serious-injury or serious-injury Level A harassment or lethal take of polar bears.

TABLE 6—RESULTS OF THE DEN DISTURBANCE MODEL FOR ALL PROPOSED ACTIVITIES DURING THE 1-YEAR IHA PERIOD. ESTIMATES ARE PROVIDED FOR THE PROBABILITY, MEAN, MEDIAN, AND 95% CONFIDENCE INTERVALS FOR LEVEL B, NON-SERIOUS LEVEL A, AND SERIOUS LEVEL A

HARASSMENT/LETHAL TAKE. THE PROBABILITIES REPRESENT THE PROBABILITY OF ≥1 TAKE OF A BEAR OCCURRING DURING A GIVEN WINTER.

Level B Harassment	Probability	0.58
	Mean	1.40
	Median	1.0
	95% Confidence Interval	0–6
Non-Serious Level A	Probability	0.23
	Mean	0.51
	Median	0.0
	95% Confidence Interval	0–3
Serious Level A/Lethal	Probability	0.26
	Mean	0.58
	Median	0.0
	95% Confidence Interval	0–4

Evaluation of Impacts of Oil Spills on Polar Bears

To date, large oil spills from Industry activities in the Beaufort Sea and coastal regions that would impact polar bears have not occurred. Even small spills of oil or waste products 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 ingestion of a mixture that included ethylene glycol and Rhodamine B dye (Amstrup et al. 1989). Again, in 2012, two dead polar bears that had ingested 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 are not attributed to Industry activity. Thus, we recognize potential impacts of even small spills of such materials. However, because specified activities are primarily occurring inland and during the ice season, thereby reducing the number of polar bears that may come in contact with any small spills that could occur and not be cleaned up at time of occurrence, impacts due to oil spills will be very unlikely.

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 barrels 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.

Sum of Take from All Sources

The applicant proposes to conduct mobilization activities, well drilling, ice road and ice pad construction, and cleanup activities within the PBU and PTU of the North Slope of Alaska from December 1, 2021, to November 30, 2022. A summary of total estimated take via Level B harassment during the project by source is provided in table 7. The potential for lethal or Level A harassment was explored. Lethal take or Level A harassment would not occur outside of denning bears because the level of sound and visual stimuli on a bear on the surface would not be significant enough to result in injury or death. Denning bears, however, may be subject to repeated exposures, significant energy expenditure from den abandonment or departure, or potential impacts to a cub if the den is abandoned or departed prematurely. The probability of greater than or equal to 1 lethal or serious Level A take of denning polar bears was 0.25.

TABLE 7—TOTAL ESTIMATED LEVEL B HARASSMENT EVENTS OF POLAR BEARS AND SOURCE.

Source	Estimated Level B Harassment
Surface Interactions	0.21
Denning Impacts	1.40
Total	1.61

Critical Assumptions

In order to conduct this analysis and estimate the potential amount of Level B harassment, we made several critical assumptions.

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 project 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 project 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.

Determinations and Findings

Small Numbers

For our small numbers determination, we consider whether the estimated number of polar bears to be subjected to incidental take is small relative to the population size of the species or stock.

1. We estimate JADE's proposed specified activities in the specified geographic region will take no more than 2 SBS polar bears by two Level B harassment during the 1-year period of this proposed IHA (see *Estimated Take: Sum of Take from All Sources*). Take of 2 animals is 0.2 percent of the best available estimate of the current SBS stock size of 907 animals SBS (Bromaghin et al. 2015, Atwood et al. 2020) ((2÷907)×100≈0.2, and represents a "small number" of polar bears of that stock.

2. Within the specified geographical region, the area of proposed activity is expected to be small relative to the range of the SBS stock of polar bears. SBS polar bears range well beyond the boundaries of the proposed IHA region. As such, the IHA region itself represents only a subset of the potential area in which this species may occur. Further, only 17 percent of the IHA area (39,254 ha of 221,179 ha) is estimated to be impacted by the specified activities, even accounting for a disturbance zone surrounding industrial facility and transit routes. Thus, the Service concludes that the area of proposed activity will be relatively small compared to the range of the SBS stock of polar bears.

Conclusion

Therefore, we propose a finding that JADE's proposed specified activities will take by level B harassment only small numbers of the SBS polar bear stock because: (1) only a small proportion of the polar bear stock will overlap with the areas where the specified activities will occur; and (2) only small numbers will be taken by harassment because the specified activities are limited in spatial and temporal extent reducing the number of SBS polar bears that could be encountered in the duration of the proposed IHA.

Negligible Impacts

For our negligible impacts determination, we considered the following:

1. The distribution and habitat use patterns of polar bears indicate that relatively few animals will occur in the specified areas of activity at any particular time and, therefore, few animals are likely to be affected.

2. The documented impacts of previous Industry activities on polar bears, taking into consideration cumulative effects, suggests that the types of activities analyzed for this proposed IHA 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 proposed IHA region, undisturbed by the Industry activity.

3. The relatively small area of the specified activities compared to the ranges of the SBS stock of polar bears will reduce the potential of their exposure to and disturbance from the specified activities.

4. The Service does not anticipate any lethal or injurious harassment take that would remove individual polar bears from the population or prevent their successful reproduction. Incidental 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 polar bear stocks. This proposed IHA does not authorize injurious or lethal take, and we do not anticipate any such take will occur.

5. If this IHA is finalized, the applicant will be required to adopt monitoring requirements and mitigation measures designed to reduce the potential impacts of their operations on polar bears. Den detection surveys for polar bears and adaptive mitigation and management responses based on real-time monitoring information (described in this proposed authorization) will be used to avoid or minimize interactions with polar bears and, therefore, limit potential disturbance of these animals.

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 exploration activities on polar bears, including impacts from surface interactions, aircraft overflights, and oil spills. Based on our review of these potential impacts, past Industry monitoring reports, and the biology and natural history of 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 polar bear stock.

The probability of an oil spill that will cause significant impacts to polar bears appears extremely low due to the timing and location of specified activities. In the unlikely event of a catastrophic spill, we will take immediate action to minimize the impacts to this 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 polar bears. Climate change is a global phenomenon and was considered as the overall driver of effects that could alter polar bear habitat and behavior. Though climate change is a pressing conservation issue for polar bears, we have concluded that the authorized incidental taking of polar bears during the activities proposed by JADE during this proposed 1-year authorization will not adversely impact the survival of the species, or stock, and will have no more than negligible effects. The Service is currently involved in research to understand how climate change may affect polar bears. As we gain a better understanding of climate change effects, we will incorporate the information in future authorizations.

Therefore, we propose a finding that two Level B harassments in association with the specified activities addressed under this proposed IHA will have no more than a negligible impact on the SBS stock of polar bears. We do not expect any resulting disturbance to negatively impact the rates of recruitment or survival for the polar bear stock. This proposed IHA does not authorize lethal take, and we do not anticipate that any lethal take will occur.

Least Practicable Adverse Impact

We evaluated the practicability and effectiveness of mitigation measures based on the nature, scope, and timing of the specified activities; the best available scientific information; and monitoring data during Industry activities in the specified geographic region. We propose a finding that the mitigation measures included within JADE's Request will ensure least practicable adverse impacts on polar bears (JADE 2021).

Polar bear den surveys before activities begin during the denning season, 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 will reduce the potential for bears to be disturbed by aircraft. Finally, JADE 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 are outlined in a polar bear interaction plan that was developed in coordination with the Service and is part of JADE's application for this IHA. Based on the information we currently have regarding den and aircraft disturbance and polar bear attractants, we concluded that the mitigation measures outlined in JADE's Request (JADE 2021) and incorporated into this authorization will minimize impacts from the specified oil and gas activities to the extent practicable.

A number of mitigation measures were considered but determined to be not practicable. These measures are listed below:

- *Required use of helicopters for AIR surveys*—Use of helicopters to survey active dens might lead to greater levels of disturbance and take compared to fixed-wing aircraft. Additionally, there is no published data to indicate increased den detection efficacy of helicopter AIR.
- *Grounding all flights if they must fly below 1,500 feet*—Requiring all aircraft to maintain an altitude of 1,500 ft at all times is not practicable as some operations may require flying below 1,500 ft to perform necessary inspections or maintain safety of flight crew. Aircraft are required, however, to fly above 1,500 ft at all times, except for emergencies, within 805 m (0.5 mi) of an observed polar bear.
- *Spatial and temporal restrictions on surface* activity—Some spatial and temporal restrictions of operations were included in JADE's Request; however, additional restrictions would not be practicable for the specified activities based on other regulatory and safety requirements.
- *One-mile buffer around all known polar bear denning habitat*—One-mile buffer around all known polar bear denning habitat is not practicable as most of the existing infrastructure used by JADE occurs within 1 mile of denning habitat, and they would not be able to shut down all operations based on other regulatory and safety requirements.
- *Prohibition of driving over high relief areas, embankments, or stream and river crossings*—While the denning habitat must be considered in tundra travel activities, complete prohibition is not practicable for safety reasons.
- *Use of a broader definition of "denning habitat" for operational offsets*—There is no available data to support broadening the defining features of denning habitat beyond that established by USGS. Such a redefinition would cause an increase in the area surveyed

for maternal dens, and the associated increase in potential harassment of bears on the surface would outweigh the mitigative benefits.

- *Establishment of corridors for sow and cub transit to the sea ice*—As there is no data to support the existence of natural transit corridors to the sea ice, establishment of corridors in the IHA area would be highly speculative. Therefore, there would be no mitigative benefit realized by their establishment.
- *Requirement of third-party neutral marine mammal observers*—It is often not practicable to hire third-party marine mammal observers due to operational constraints. Additional crew may require additional transit vehicles, which could increase disturbance.
- *Require all activities to cease if a polar bear is injured or killed until an investigation is completed*—The Service has incorporated into this proposed authorization reporting requirements for all polar bear interactions. While it may aid in any subsequent investigation, ceasing all activities may not be practicable or safe in certain circumstances and, thus, will not be mandated.
- *Require use of den detection* dogs—It is not practicable or safe to require scent-trained dogs to detect dens due to the large spatial extent that would need to be surveyed along the winter trail route and project area.
- *Require the use of handheld or vehicle-mounted Forward Looking Infrared (FLIR)*—The efficacy rates for AIR have been found to be four times more likely to detect dens versus ground-based FLIR (handheld or vehicle-mounted FLIR) due to impacts of blowing snow on detection. There would likely be no additional benefit to requiring ground-based FLIR methods.

Impact on Subsistence Use

Based on past community consultations, locations of hunting areas, no anticipated overlap of hunting areas and Industry projects, and the best scientific information available, including monitoring data from similar activities, we propose a finding that take caused by the proposed oil and gas exploration activities in the project area will not have an unmitigable adverse impact on the availability of polar bears for taking for subsistence uses during the proposed timeframe.

While polar bears represent a small portion, in terms of the number of animals, of the total subsistence harvest for the Kaktovik community, the harvest of these species is important to Alaska Natives. JADE 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. JADE must make reasonable efforts to ensure that activities do not interfere with subsistence hunting and that adverse effects on the availability of polar bears are minimized. Although past meetings for the proposed project, prior to being postponed due to the coronavirus pandemic, have already taken place, no official concerns have been voiced by the Alaska Native communities regarding project activities limiting availability of polar bears for subsistence uses. However, should such a concern be voiced, development of Plans of Cooperation (POCs), which must identify measures to minimize any adverse effects, will be required. The POC will ensure that project 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 JADE will work with the affected Alaska Native communities and what actions will be taken to avoid interference with subsistence hunting of polar bears, as warranted.

The Service has not received any reports and is not aware of information that indicates that polar bears are being or will be deterred 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 that these oil and gas activities are affecting the availability of 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 project activities on 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 stock. Monitoring plans document when and how bears are encountered, the number of bears, and their behavior during the encounter. This information allows the Service to measure encounter rates and trends of 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, JADE is required to report all sightings of polar bears. To the extent possible, monitors will record group size, age, sex, reaction, duration of interaction, and closest approach to facilities 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.

The Service will provide JADE with the most recent and up-to-date Polar Bear Observation Form in which to record sightings of bears. Sightings must be reported to the Service Office of Marine Mammal Management (MMM) within 48 hours of the sighting and submitted to fw7_mmm_reports@fws.gov. Details on monitoring guidelines and reporting requirements can be read below in Proposed Authorization, (C) Monitoring and (E) Reporting Requirements.

Required Determinations

National Environmental Policy Act (NEPA)

We have prepared a draft environmental assessment in accordance with the NEPA (42 U.S.C. 4321 *et seq.).* We have preliminarily concluded that authorizing the nonlethal, incidental take by Level B harassment of up to two polar bears from the SBS stock in the specified geographic region during the specified activities during the regulatory period would not significantly affect the quality of the human environment and, thus, preparation of an environmental impact statement for this incidental harassment authorization is not required by section 102(2) of NEPA or its implementing regulations. We are accepting comments on the draft environmental assessment as specified above in **DATES** and **ADDRESSES**.

Endangered Species Act

Under the ESA (16 U.S.C. 1536(a)(2)), 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. Prior to issuance of this proposed IHA, the Service will complete intra-Service consultation under section 7 of the ESA on our proposed issuance of an IHA. These evaluations and findings will be made available on the Service's website at *https://ecos.fws.gov/ecp/report/biological-opinion.* The authorization of incidental take of polar bears and the measures included in the proposed IHA will not affect other listed species or designated critical habitat.

Government-to-Government Coordination

It is our responsibility to communicate and work directly on a Government-to-Government basis with federally recognized Alaska Native Tribes and Alaska Native Claims Settlement Act (ANCSA) corporations in developing programs for healthy ecosystems. 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 Alaska Government-to-Government Policy* (a departmental memorandum issued January 18, 2001); and (6) the Department of the Interior's policies on consultation with Alaska Native Tribes and organizations.

We have evaluated possible effects of the specified activities on federally recognized Alaska Native Tribes and organizations. Through the IHA process identified in the MMPA, the applicant 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 Service does not anticipate impacts to Alaska Native Tribes or ANCSA corporations and does not anticipate requesting consultation; however, we invite continued discussion, either about the project and its impacts or about our coordination and information exchange throughout the IHA/POC process.

Proposed Authorization

We propose to authorize the nonlethal, incidental take by Level B harassment of two SBS stock polar bears. Authorized take will be limited to disruption of behavioral patterns that may be caused by oil and gas exploration and support activities conducted by JADE Energy Inc. (JADE) in the Prudhoe Bay Unit (PBU) and the Point Thomson Unit (PTU) of the North Slope of Alaska, from December 1, 2021, through November 30, 2022. We do not anticipate or authorize any take by Level A harassment, injury, or death to polar bears resulting from these activities.

A. *General Conditions for this IHA*

(1) Activities must be conducted in the manner described in the request dated August 2, 2021, for an IHA and in accordance with all applicable conditions and mitigation measures. The taking of polar bears whenever the required conditions, mitigation, monitoring, and reporting measures are not fully implemented as required by the IHA is prohibited. Failure to follow the

measures specified both in the revised request and within this proposed authorization may result in the modification, suspension, or revocation of the IHA.

(2) If project activities cause unauthorized take (i.e., take of more than two polar bears, a form of take other than Level B harassment, or take of one or more polar bears through methods not described in the IHA), JADE must take the following actions: (i) Cease its activities immediately (or reduce activities to the minimum level necessary to maintain safety); (ii) report the details of the incident to the Service within 48 hours; and (iii) suspend further activities until the Service has reviewed the circumstances and determined whether additional mitigation measures are necessary to avoid further unauthorized taking.

(3) All operations managers, vehicle operators, and aircraft pilots must receive a copy of this IHA and maintain access to it for reference at all times during project work. These personnel must understand, be fully aware of, and be capable of implementing the conditions of the IHA at all times during project work.

(4) This IHA will apply to activities associated with the proposed project as described in this document and in JADE's revised request. Changes to the proposed project without prior authorization may invalidate the IHA.

(5) JADE's request is approved and fully incorporated into this IHA, unless exceptions are specifically noted herein. The request includes:

- JADE's original request for an IHA, dated May 19, 2021 (JADE 2021);
- The letters requesting additional information, dated May 25, 2021;
- JADE's responses to requests for additional information from the Service, dated May 25, 2021;
- JADE's revised request for an IHA, dated June 9, 2021;

- JADE’s revised request for an IHA, dated August 2, 2021; and

- The *JADE Exploration and Appraisal Program Wildlife Avoidance and Interaction Plan* (Appendix A in JADE 2021).

(6) Operators will allow Service personnel or the Service’s designated representative to visit project work sites to monitor for impacts to polar bears and subsistence uses of polar bears at any time throughout project activities so long as it is safe to do so. “Operators” are all personnel operating under JADE’s authority, including all contractors and subcontractors.

B. *Avoidance and Minimization*

JADE must implement the following policies and procedures to avoid interactions with and minimize to the greatest extent practicable any adverse impacts on polar bears, their habitat, and the availability of these marine mammals for subsistence uses.

(a) *General avoidance measures.*

(1) JADE must cooperate with the Service and other designated Federal, State, and local agencies to monitor and mitigate the impacts of activities on polar bears.

(2) Trained and qualified personnel must be designated to monitor at all times for the presence of polar bears, initiate mitigation measures, and monitor, record, and report the effects of the activities on polar bears. JADE must provide all operators with polar bear awareness training prior to their participation in project activities. Delivery of this polar bear awareness training must include Service participation.

(3) A Service-approved polar bear safety, awareness, and interaction plan must be on file with the Service Marine Mammal Management office and available onsite. The interaction plan must include:

(i) A description of the proposed activity (i.e., a summary of the plan of operations during the proposed activity);

(ii) A food, waste, and other attractants management plan;

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

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

(v) Polar bear avoidance and encounter procedures; and

(vi) Polar bear observation and reporting procedures.

(4) JADE must contact potentially affected subsistence communities and hunter organizations to discuss potential conflicts caused by the activities and provide the Service documentation of communications as described in (D) *Measures To Reduce Impacts to Subsistence Users*.

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

(1) *Attempt to locate bear dens.* JADE must conduct two surveys for occupied polar bear dens in all denning habitat within 1.6 km (1 mi) of specified activities using AIR imagery. The first survey must occur prior to construction activities between the dates of November 25 and December 15, and a second survey must be performed between the dates of December 5 and December 31. All observed or suspected polar bear dens must be reported to the Service prior to the initiation of activities.

(i) AIR surveys will be conducted during darkness or civil twilight and not during daylight hours. Ideal environmental conditions during surveys would be clear, calm, and cold. If there is blowing snow, any form of precipitation, or other sources of airborne moisture, use of AIR detection is not advised. Flight crews will record and report environmental parameters including air temperature, dew point, wind speed and direction, cloud ceiling, and percent humidity, and a flight log will be provided to the Service within 48 hours of the flight.

(ii) A scientist experienced in interpreting AIR imagery will be on board the survey aircraft to analyze the AIR data in real-time. The data (infrared video) will be available for viewing by the Service immediately upon return of the survey aircraft to the base of operations in Deadhorse, Alaska. Data will be transmitted electronically to the Service in Anchorage for review.

(iii) If a suspected den site is located, JADE will immediately consult with the Service to analyze the data and determine if additional surveys or mitigation measures are required. All located dens will be subject to the 1.6-km (1.0-mi) exclusion zone as described in paragraph (b)(1) of this section. The Service will determine whether the suspected den is to be treated as a putative den for the purposes of this IHA.

(2) *Observe 1-mile operational 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*. In determining the denning habitat that requires surveys, use the den habitat map developed by the USGS. A map of potential coastal polar bear denning habitat can be found at: *https://www.usgs.gov/centers/asc/science/polar-bear-maternal-denning?qt-science_center_objects=4#qt-science_center_objects*.

(4) *Temporal restriction after July 18.* Proposed cleanup activities must conclude prior to July 19 to reduce the likelihood of disturbance to polar bears and potential for human–polar bear interactions.

(c) *Mitigation measures for aircraft.*

(1) *Aircraft elevation and flight path restrictions to avoid disturbance.* Operators of support aircraft should, at all times, conduct their activities at the maximum distance practicable from concentrations of polar bears. Under no circumstances, other than an emergency, will aircraft operate at an altitude lower than 457 m (1,500 ft) within 805 m (0.5 mi) of polar bears observed on ice or land measured in a straight line between the bear and the ground directly underneath the plane. Aircraft may be operated below 457 m (1,500 ft) only when necessary to avoid adverse weather conditions. However, when weather conditions necessitate operation of aircraft at altitudes below 457 m (1,500 ft), the operator must avoid areas of known polar bear concentrations and should take precautions to avoid flying directly over or within 805 m (0.5 mile) of these areas.

(2) *Aircraft landing and take-off spatial restrictions.* Aircraft will not land within 805 m (0.5 mi) of a polar bear. If a polar bear is observed while the aircraft is grounded, personnel will board the aircraft and leave the area. The pilot will also avoid flying over the polar bear if possible. Pilots should avoid making any sudden maneuvers, especially when traveling at lower altitudes, even if such maneuvers are intended to avoid polar bears. The Service recommends that if a polar bear is spotted within the landing zone or work area, aircraft operators travel away from the site, and slowly increase altitude to 1,500 ft or a level that is safest and viable given current traveling conditions. Aircraft may not be operated in such a way as to separate individual polar bears from a group of polar bears.

C. *Monitoring*

(1) Operators must provide onsite observers and implement the Service-approved polar bear avoidance and interaction plan to apply mitigation measures, monitor the project's effects on polar bears and subsistence uses, and to evaluate the effectiveness of mitigation measures.

(2) All onsite observers shall complete a Service-provided training course designed to familiarize individuals with monitoring and mitigation activities identified in the polar bear avoidance and interaction plan.

(3) Onsite observers must be present during all operations and must record all polar bear observations, identify and document potential harassment, and work with personnel to implement appropriate mitigation measures.

(4) Operators shall cooperate with the Service and other designated Federal, State, and local agencies to monitor the impacts of project activities on polar bears. Where information is insufficient to evaluate the potential effects of activities on polar bears and the subsistence use of this species, JADE may be required to participate in joint monitoring efforts to address these information needs and ensure the least practicable impact to this resource.

(5) Operators must allow Service personnel or the Service's designated representative to visit project work sites to monitor impacts to polar bear and subsistence use at any time throughout project activities so long as it is safe to do so.

D. *Measures To Reduce Impacts to Subsistence Users*

JADE must conduct its activities in a manner that, to the greatest extent practicable, minimizes adverse impacts on the availability of polar bears for subsistence uses.

(1) JADE will be required to develop a Service-approved Plan of Cooperation (POC) if, through community consultation, concerns are raised regarding impacts to subsistence harvest or Alaska Native Tribes and organizations.

(2) If required, JADE will implement the Service-approved POC.

(3) Prior to conducting the work, JADE will take the following steps to reduce potential effects on subsistence harvest of polar bears: (i) Avoid work in areas of known polar bear subsistence harvest; (ii) discuss the planned activities with subsistence stakeholders including the North Slope Borough, the Native Village of Kaktovik, the State of Alaska, the Service, the Bureau of Land Management, and other interested parties on a Federal, State, and local regulatory level; (iii) identify and work to resolve concerns of stakeholders regarding the project's effects on subsistence hunting of polar bears; (iv) if any unresolved or ongoing concerns remain, modify the POC in consultation with the Service and subsistence stakeholders to address these concerns; and (v) develop mitigation measures that will reduce impacts to subsistence users and their resources.

E. *Reporting Requirements*

JADE must report the results of monitoring to the Service MMM via email at: *fw7_mmm_reports@fws.gov*.

(1) *In-season monitoring reports.*

(i) *Activity progress reports.* JADE must:

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

(B) Provide the Service weekly progress reports summarizing activities. Reports must include GPS/GIS tracks of all vehicles including scout vehicles in *.kml* or *.shp* format with time/date stamps and metadata.

(C) Notify the Service within 48 hours of project completion or end of the work season.

(ii) *Polar bear observation reports.* JADE must report, within 48 hours, all observations of polar bears and potential polar bear dens during any project activities including AIR surveys. 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 need not be limited to:

(A) Date and time of each observation;

(B) Locations of the observer and bears (GPS coordinates if possible);

(C) Number of polar bears;

(D) Sex and age class—adult, subadult, cub (if known);

(E) Observer name and contact information;

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

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

(H) Type of work being conducted at time of sighting;

(I) Possible attractants present;

(J) Polar bear behavior—initial behavior when first observed (e.g., walking, swimming, resting, etc.);

(K) Potential reaction—behavior of bear potentially in response to presence or activity of personnel and equipment;

(L) Description of the encounter;

(M) Duration of the encounter; and

(N) Mitigation actions taken.

(2) *Notification of human–bear interaction incident report.* JADE must report all human–bear interaction incidents immediately, and not later than 48 hours after the incident. A human–bear interaction incident is any situation in which there is a possibility for unauthorized

take. For instance, when project activities exceed those included in an IHA, when a mitigation measure was required but not enacted, or when injury or death of a polar bear occurs. Reports must include:

(i) All information specified for an observation report in paragraphs (1)(ii)(A)–(N) of this section E;

(ii) A complete detailed description of the incident; and

(iii) Any other actions taken.

Injured, dead, or distressed polar bears that are clearly not associated with project activities (e.g., animals found outside the project area, previously wounded animals, or carcasses with moderate to advanced decomposition or scavenger damage) must also be reported to the Service immediately, and not later than 48 hours after discovery. Photographs, video, location information, or any other available documentation must be included.

(3) *Final report.* The results of monitoring and mitigation efforts identified in the polar bear avoidance and interaction plan must be submitted to the Service for review within 90 days of the expiration of this IHA. Upon request, final report data must be provided in a common electronic format (to be specified by the Service). Information in the final report must include, but need not be limited to:

(i) Copies of all observation reports submitted under the IHA;

(ii) A summary of the observation reports;

(iii) A summary of monitoring and mitigation efforts including areas, total hours, total distances, and distribution;

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

(v) Analysis of the effectiveness of mitigation measures;

(vi) A summary and analysis of the distribution, abundance, and behavior of all polar bears observed; and

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

Request for Public Comments

If you wish to comment on this proposed authorization, the associated draft environmental assessment, or both documents, you may submit your comments by either of the methods described in **ADDRESSES**. Please identify if you are commenting on the proposed authorization, draft environmental assessment, or both, make your comments as specific as possible, confine them to issues pertinent to the proposed authorization, 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 before the close of the comment period (see **DATES**). The Service does not anticipate extending the public comment period beyond the 30 days required under section 101(a)(5)(D)(iii) of the MMPA.

Comments, including names and street addresses of respondents, will become part of the administrative record for this proposal. Before including your address, telephone number, email address, or other personal identifying information in your comment, be advised that your entire comment, including your personal identifying information, may be made publicly available at any time. While you can ask us in your comments to withhold from public review your personal identifying information, we cannot guarantee that we will be able to do so.

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Karen Cogswell,

Acting Regional Director, Alaska Region.

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