UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
P.O. Box 21668
Juneau, Alaska 99802-1668

Endangered Species Act (ESA) Section 7(a)(2) Biological Opinion
National Petroleum Reserve-Alaska Integrated Activity Plan

NMFS Consultation Number: AKRO-2020-01519

Action Agencies: Bureau of Land Management

Affected Species and Determinations:

ESA-Listed Species and Distinct Population Segments (DPS) or Evolutionarily Significant Units (ESU)	Status	Is the Action Likely to Adversely Affect Species?	Is the Action Likely to Adversely Affect Critical Habitat?	Is the Action Likely To Jeopardize the Species?	Is the Action Likely To Destroy or Adversely Modify Critical Habitat?
Bowhead whale (*Balaena mysticetus*)	Endangered	Yes	n/a	No	n/a
Blue whale (*Balaenoptera musculus*)	Endangered	No	n/a	No	n/a
Fin whale (*Balaenoptera physalus*)	Endangered	Yes	n/a	No	n/a
Humpback whale, Western North Pacific DPS (*Megaptera novaeangliae*)	Endangered	Yes	n/a	No	n/a
Humpback whale, Mexico DPS (*Megaptera novaeangliae*)	Threatened	Yes	n/a	No	n/a
North Pacific right whale (*Eubalaena japonica*)	Endangered	No	No	No	No
Sperm whale (*Physeter macrocephalus*)	Endangered	Yes	n/a	No	n/a
Ringed seal, Arctic subspecies (*Phoca hispida hispida*)	Threatened	Yes	n/a	No	n/a
Bearded seal, Beringia DPS (*Erignathus barbatus nauticus*)	Threatened	Yes	n/a	No	n/a
Steller sea lion, Western DPS (*Eumetopias jubatus*)	Endangered	No	No	No	No

Consultation Conducted By: National Marine Fisheries Service, Alaska Region

Issued By:

for Robert D Mecum
James W. Balsiger, Ph.D.
Regional Administrator

Date: December 15, 2020

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TERMS AND ABBREVIATIONS

2D	Two-dimensional
3D	Three-dimensional
AAC	Alaska Administrative Code
ac	Acre
ADEC	Alaska Department of Environmental Conservation
ADFG	Alaska Department of Fish and Game
ADNR	Alaska Department of Natural Resources
AEWC	Alaska Eskimo Whaling Commission
Agl	Minimum height above ground
AIS	Automatic Identification System
AKR	(NMFS) Alaska Regional Office
AO	Authorized Officer
ASAMM	Aerial Surveys of Arctic Marine Mammals
ASLC	Alaska Sea Life Center
BA	Biological Assessment
bbl	Barrels
Bbbl	Billion barrels
BLM	Bureau of Land Management
BMPs	Best Management Practices
BOEM	Bureau of Ocean Energy Management
BSAI	Bering Sea/Aleutian Islands
BSEE	Bureau of Safety and Environmental Enforcement
CFR	Code of Federal Regulations
CI	Confidence Interval
CO_2	Carbon dioxide
CPF	Central Processing Facilities
CV	Coefficient of variation
CWA	Clean Water Act of 1972
dB re 1µPa	Decibel referenced 1 microPascal
dB	Decibel
DEIS	Draft Environmental Impact Statement
DPS	Distinct Population Segment
DQA	Data Quality Act
DMLW	Division of Mining, Land, and Water
DWH	Deepwater Horizon

EEZ	(U.S.) Exclusive Economic Zone
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ESA	Endangered Species Act
ESCA	Endangered Species Conservation Act
°F	Fahrenheit
FMP	Fishery Management Plan
FR	*Federal Register*
ft	Feet
GOA	Gulf of Alaska
GP	General permit (U.S. Army Corps of Engineers)
GPS	Global Positioning System
ha	Hectares
HF	High-frequency (cetacean hearing group)
hr	Hour(s)
Hz	Hertz
IAP	Integrated Activity Plan
ICS	Incident Command System
IHA	Incidental Harassment Authorization
IPCC	Intergovernmental Panel on Climate Change
ITS	Incidental Take Statement
IWC	International Whaling Commission
kHz	kiloHertz
km	kilometer
kn	Knots
L_E	Cumulative sound exposure at reference value of 1μPa^{2}s
L_{pk}	Peak sound pressure at 1 μPa
LF	Low frequency (cetacean hearing group)
LNG	Liquefied natural gas
LOA	Letter of Authorization
LOWC	loss of well control
μPa	Micro Pascal
m	meter
MF	Mid-frequency (cetacean hearing group)
mgd	Million gallons per day
MHHW	Mean higher high water
mi	mile

MLLW	Mean lower low water
MMHSRP	Marine Mammal Health and Stranding Response Program
MMPA	Marine Mammal Protection Act
mph	Miles per hour
MTI	Module Transfer Island
MTR	Marine Transit Route
nm	Nautical mile
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPR-A	National Petroleum Reserve-Alaska
NPRW	North Pacific right whale
NPDES	National Pollutant Discharge Elimination System
NSB	North Slope Borough
NSO	No Surface Occupancy
OCS	Outer Continental Shelf
OSRO	Oil Spill Removal Organization
OW	Otariid pinniped underwater (hearing group)
OWRO	Oiled Wildlife Response Organization
PBF	Physical or Biological Feature
PCB	polychlorinated biphenyls
PCE	Primary Constituent Element
PK	Peak sound level
PSO	Protected Species Observer
PTS	Permanent threshold shift
PW	Phocid pinniped underwater (hearing group)
rms	Root mean square
ROPs	Required Operating Procedures
RP	Responsible Party
RPA	Reasonable and prudent alternative
RSC	Regional Stranding Coordinator
s	seconds
SA	Stranding Agreement
SD	Standard deviation
SEL	Sound exposure level
SPL	Sound pressure level
SSV	Sound source verification

STP	Seawater Treatment Plant
SUV	Sport Utility Vehicle
TOL	Take Off and Landing
TTS	Temporary threshold shift
UME	Unusual Mortality Event
U.S.C.	United States Code
USFWS	U.S. Fish and Wildlife Service
VLOS	Very large oil spill (>150,000 barrels)
VSM	Vertical Support Member
WNP	Western North Pacific (humpback whale)

1 INTRODUCTION

Section 7(a)(2) of the Endangered Species Act of 1973, as amended (ESA; 16 U.S.C. §1536(a)(2)) requires each Federal agency to ensure that any action it authorizes, funds, or carries out is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of critical habitat of such species. When a Federal agency's action "may affect" a protected species, that agency is required to consult with the National Marine Fisheries Service (NMFS) or the U.S. Fish and Wildlife Service (USFWS), depending upon the endangered species, threatened species, or designated critical habitat that may be affected by the action (50 CFR §402.14(a)). Federal agencies may fulfill this general requirement informally if they conclude that an action may affect, but "is not likely to adversely affect" endangered species, threatened species, or designated critical habitat, and NMFS or the USFWS concurs with that conclusion (50 CFR §402.14(b)).

In this document, the action agency is Department of Interior's Bureau of Land Management (BLM), which proposes to implement a new Integrated Activity Plan (IAP) in the National Petroleum Reserve-Alaska (NPR-A). The IAP will allow expanded leasing and development opportunities compared to the current IAP. The leasing, exploration, development, and decommissioning of multiple projects that occurs under this IAP is expected to extend over an 85-year period beginning within one year of the Record of Decision. The consulting agency for this proposal is NMFS's Alaska Region. This document represents NMFS's programmatic biological opinion (opinion) on the effects of this proposed action on endangered and threatened marine mammals and designated critical habitat.

Section 7(b)(3) of the ESA requires that at the conclusion of consultation, NMFS and/or USFWS provide an opinion stating how the Federal agency's action is likely to affect ESA-listed species and their critical habitat. If incidental take is reasonably certain to occur, section 7(b)(4) requires the consulting agency to provide an incidental take statement (ITS) that specifies the impact of any incidental taking, specifies those reasonable and prudent measures necessary or appropriate to minimize such impact, and sets forth terms and conditions to implement those measures. However, per NMFS's regulations, 50 CFR §402.14(i)(6) and §402.02, an ITS is not required at the programmatic level for framework programmatic actions where information on the specific number, location, timing, frequency, and intensity of actions is unknown; and any incidental take resulting from any actions subsequently authorized, funded, or carried out under the program will be addressed in subsequent ESA section 7 consultations. A framework programmatic action evaluates the effects of an agency policy or program and approves that policy or program as a framework for the development of future actions that will be authorized, funded, or carried out at a later time; any take of a ESA-listed species would not occur unless and until those future action(s) are authorized, funded, or carried out and subjected to further section 7 consultation (50 CFR 402.02).

Accordingly, this opinion considers effects from the entire IAP, but consultations also will be required for all future activities related to this program that may affect listed species, and for each subsequent consultation NMFS will determine whether a future activity under this program is or is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of the critical habitat of such species. At each phase, project-specific information will aid in the assessment of effects on listed species and the amount and extent of incidental take resulting from that project. Project-specific information also will aid in the development of sufficiently specific and meaningful reasonable and prudent measures and terms and conditions for each project and will ensure an accurate and reliable trigger for reinitiation of consultation (80 FR 26832, 26835-36; May 11, 2015). For these reasons, NMFS is not including an ITS with this opinion.

The agency action addressed in this framework programmatic opinion is all activities covered by the IAP, including leasing of lands within the NPR-A for oil and gas development and all the activities that follow a lease sale. While lease sales alone will not affect listed marine mammals, associated seismic exploration to determine lease viability, and the subsequent phases of exploration, development, production, and abandonment and reclamation of leased blocks may affect listed species and designated critical habitat and are expected to require subsequent consultation to be initiated by BLM. The IAP also addresses activities such as recreation and film permits, land-based travel and camping, community overland moves, excavation and collection of samples related to archaeological, paleontological, or geological studies, and solid and hazardous waste removal. These activities are much smaller in scale and scope and have much less potential to overlap with the presence of marine mammals than activities related to oil and gas development. If any of the activities permitted by BLM may affect listed marine mammals under NMFS jurisdiction, consultation would need to be initiated with NMFS.

The NPR-A has been managed under the existing IAP which went into effect in 2013. Consequently, lease sales, seismic exploration, and development have already occurred within the area. Ringed and bearded seals were listed after the prior IAP was written. The proposed action would open coastal areas previously closed to fluid mineral leasing and consequently may affect listed marine mammals. We consider potential impacts from initial seismic exploration through the endpoint of the action (i.e., abandonment and reclamation activities). We also consider effects along a Marine Transportation Route (MTR) associated with the proposed action.

The opinion was prepared by NMFS in accordance with section 7(b) of the ESA (16 U.S.C. §1536(b)) and implementing regulations at 50 CFR part 402. The opinion is in compliance with the Data Quality Act (44 U.S.C. 3504(d)(1) *et seq*.) and underwent pre-dissemination review.

1.1 Background

The BLM completed an IAP for the NPR-A in 2013. To align with Secretarial Order 3352 issued in 2017, to "effectuate the lawful review and development of a revised IAP for the NPR-A that strikes an appropriate balance of promoting development while protecting surface resources," the BLM initiated a new planning process and completed a final Environmental Impact Statement (EIS) in June 2020. This opinion considers the effects of the proposed action presented by BLM, which aligns with their preferred alternative (Alternative E) in the EIS (BLM 2020a). The preferred alternative makes 18.6 million acres (82% of subsurface estate in the NPR-A) available for leasing (Figure 1), an increase of 6.9 million acres compared to the existing IAP (Table 1). (BLM 2020c). The number of acres available for new infrastructure is the greatest under Alternative E.

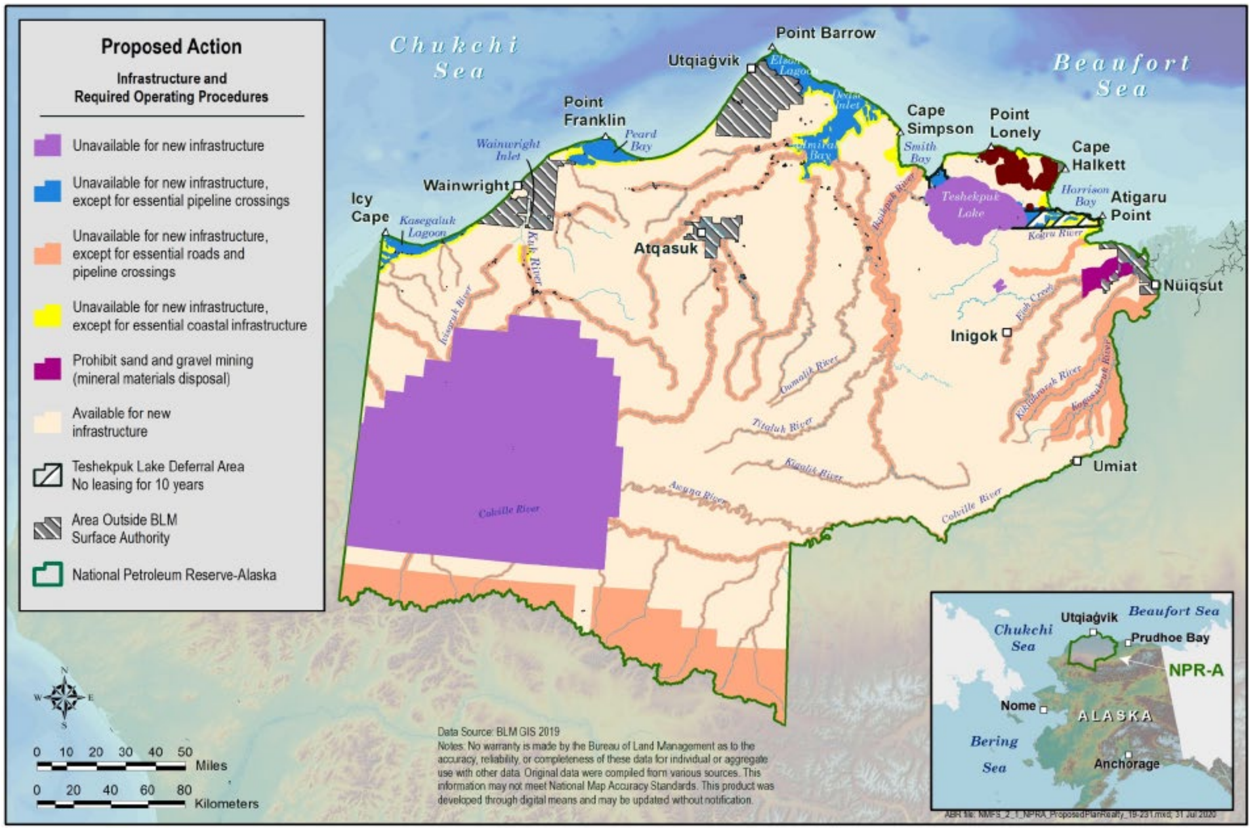

Figure 1. NPR-A showing various land designations under new IAP.

Approximately 4.1 million acres of the NPR-A planning area have been classified as having high petroleum development potential (BLM 2020a) and although the BLM assumes that only high-potential areas are reasonable targets for development, exploration is not limited to those locations (Figure 1).

Table 1. Acres allocated to leasing for oil and gas exploration in the National Petroleum Reserve-Alaska under the existing and proposed IAPs (BLM 2020c).

Allocation	Existing IAP (acres)	Proposed IAP (acres)[1]
Closed to leasing	10,991,000	4,173,000
Open, subject to no surface occupancy (NSO)	2,489,000	5,891,000
Open, subject to controlled surface use (CSU)	0	438,000
Open, subject to timing limitations (TLs)	0	3,187,000
Open, subject only to standard terms and conditions	9,274,000	9,089,000
Total Open	11,763,000	18,581,000

1. Values in this column were corrected from what was presented in the September 2020 BA (BLM 2020c). Changes did not affect analysis of the project.

Oil and gas exploration began in the NPR-A in an area called Umiat, which was first explored in 1944 by the U.S. Navy. From 1944 to 1981, 136 test holes were drilled within and adjacent to the

NPR-A. Some of these wells were on the coast and erosion has made them a high priority for clean-up and remediation (BLM 2013). BLM has overseen the remediation process since 1982, which has cost of millions of dollars (BLM 2013). Remediation of legacy sites is ongoing and the IAP covers all activities needed to address the remaining sites.

In 1982 and 1984, the BLM held its first oil and gas lease sales in the NPR-A. There were no more lease sales until 1999 when nearly 3.9 million acres in the Northeast Planning Unit were offered. Since 1999, there have been numerous lease sales, with a sale occurring annually since 2010. However, to date, no leases have been sold along the coastline of the NPR-A (Figure 2). Consequently, any coastline leases that are sold in the future must follow all the stipulations, mitigation measures, and Required Operating Procedures (ROPs) that are set forth in the new IAP and any seismic surveys or development along the coast would need additional consultation.

There have been oil and gas lease sales in state waters off the coast of the NPR-A. For example, in 2018 Caelus Energy Alaska LLC conducted a three-dimensional (3D) seismic survey and drilled two exploration wells on leases within State waters of Smith Bay off the northeastern coastline of the NPR-A. Offshore development would be outside the NPR-A planning area but would require pipelines to transport oil to market and gravel pads for barge landing and equipment staging and storage. Under the existing plan the portion of this area in the NPR-A is closed to fluid mineral leasing, but under the proposed action this area would be open to leasing with coastal areas subject to No Surface Occupancy (NSO) stipulations.

As shown in Figure 1, new infrastructure is prohibited in certain areas which can be leased. In general, there is a No Surface Occupancy (NSO) designation for coastal areas and areas near rivers. NSO is defined as an area that is open for mineral leasing but in which the construction of surface oil and gas facilities are prohibited so that other resource values are protected. However, NSO does not apply to infrastructure rights of ways, for instance essential pipelines and essential roads, which could be constructed in an NSO area. Exploratory and delineation wells that are drilled, plugged, and abandoned in a single winter season also may be permitted in lease areas with a NSO designation. NSO coastal areas allow for essential coastal infrastructure such as barge landings, saltwater treatment plants, or pipelines coming onshore from offshore (non-NPR-A) oil and gas developments (e.g. those that occur in State waters). Buffers along rivers would allow for essential road and pipeline crossings, but would not allow central processing facilities, airstrips or well pads within the river setback.

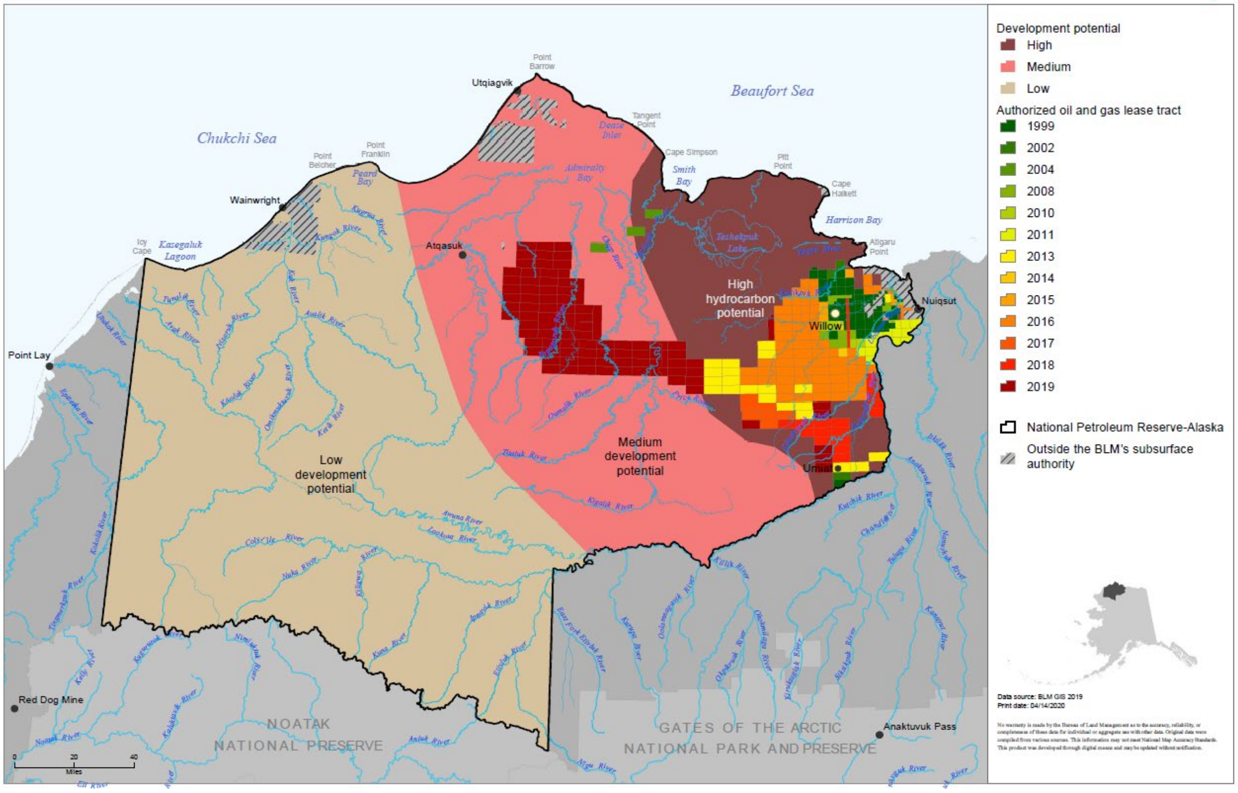

Figure 2. Lease sales that have occurred in the NPR-A and areas of high medium and low development potential.

BLM's proposed action analyzed the Reasonably Foreseeable Development under three scenarios that ranged in oil production from 120,000 barrels of oil per day to 500,000 barrels of oil per day (BLM 2020c). It is estimated that the Global Warming Potential from activities covered in this consultation will add 59,378,000 metric tons of CO_2 equivalents (includes methane, nitrous oxide) over 100 years from downstream use of the oil and gas and 3,488,000 metric tons of CO_2 from the production of oil and gas from the NPR (BLM 2020b). For our analysis, we assumed that the high level of production would occur. The proposed action represents the most likely scenario for oil exploration, development, production, and abandonment. The activities associated with these phases have the potential to affect the endangered bowhead whale (*Balaena mysticetus*), the endangered Western North Pacific distinct population segment (DPS) and threatened Mexico DPS of humpback whale (*Megaptera novaeangliae*), endangered fin whale (*Balaenoptera physalus*), endangered blue whale (*Balaenoptera musculus*), endangered North Pacific right whale (*Eubalaena japonica*), endangered sperm whale (*Physeter macrocephalus*), threatened Arctic subspecies of ringed seal (*Phoca hispida hispida*), threatened Beringia DPS of bearded seal (*Erignathus barbatus nauticus*), and endangered western DPS (WDPS) Steller sea lion (*Eumetopias jubatus)*. These actions may also affect critical habitat for Steller sea lions and North Pacific right whales.

This opinion is based on information provided in the Biological Assessment (BA) (BLM 2020c) for the National Petroleum Reserve-Alaska Integrated Activity Plan, the final EIS for the NPR-A IAP, clarifying emails and telephone conversations between NMFS and BLM, and other sources of information.

1.2 Consultation History

On June 8, 2020, BLM submitted a request for ESA consultation to NMFS regarding its determination of the impacts of the IAP on ESA listed species and their critical habitat. NMFS submitted comments and questions regarding the BA on July 8, 2020. On July 16, 2020, we received BLM's response to our questions and comments and on July 20, 2020, we had a teleconference discussing outstanding issues. We received a revised BA on August 3, 2020. NMFS submitted comments and questions regarding the revised BA on August 24, 2020. We had teleconferences with BLM on August 10 and August 26, 2020, and BLM delivered supplemental information via email during this time frame. On September 9, 2020, we received a revised BA. On September 16, 2020, NMFS deemed the initiation package complete and initiated consultation. Following initiation, communication continued between BLM and NMFS to clarify various aspects of the proposed action. A complete record of this consultation is on file at NMFS's Anchorage, Alaska office.

2 DESCRIPTION OF THE PROPOSED ACTION AND ACTION AREA

2.1 Proposed Action

"Action" means all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies in the United States or upon the high seas (50 CFR 402.02).

This opinion considers all effects of the revised IAP. However, we anticipate that it is the activities associated with oil and gas development that have the potential to affect listed marine mammals. Consequently, we focus our analysis on phases of an oil and gas program from exploration, development, production, and transportation of oil and gas in and from the NPR-A, to well closure and site restoration. In addition to an oil and gas program within the NPR-A, the IAP ensures the opportunity, subject to future analysis and decision, for onshore infrastructure such as pipelines and roads to accommodate the transfer of oil and gas resources from the Chukchi and Beaufort seas to the Trans-Alaska Pipeline System and/or a future gas pipeline on the North Slope.

The proposed action would make available specific areas of the NPR-A for lease sales and subsequent oil and gas exploration, development, and production activities. Issuance of an oil and gas lease would not authorize ground disturbing activities; however, a lease would grant the lessee certain rights to drill and extract oil and/or gas subject to applicable regulations and lease stipulations. Therefore, one or more lease sales are a prerequisite for subsequent permitting of on-lease activity, and it is the subsequent actions resulting from the permit for on-lease activity, which require separate action by BLM, that have the potential for impacts to listed species and designated critical habitat. In addition to on-lease oil and gas activities, impacts to listed species could occur from construction of off-lease infrastructure and seismic exploration. The BLM would not issue a permit for any activities until: 1) the permittee applies for appropriate BLM authorizations (e.g., application for permit to drill), 2) the permittee files a plan with site-specific details, and demonstrates compliance with the BLM stipulations and ROPs, 3) the BLM completes subsequent federal environmental analysis, such as under National Environmental Policy Act and the ESA and 4) the permittee demonstrates compliance with the MMPA, Clean Water Act, and/or other applicable requirements.

For oil and gas development, a sequence of activities could take place, each dependent on the success of the previous phase. These phases would include: 1) purchase of a lease, 2) exploration for oil and gas resources (exploration), 3) construction of infrastructure (development), 4) extraction, processing, and transportation of resources (production), and 5) end of field life with decommissioning of wells, production facilities, and other infrastructure (abandonment). These phases are discussed in further detail below. Based on experience from prior projects, hypothetical timeframes for development are presented in Table 2.

Table 2. Estimated hypothetical development time frames for NPR-A Development (BLM 2020c).

Project Phase	Project Description	Estimated Time Frames of Activities	Activities
First	Three-dimensional (3D) seismic exploration	Within 2 years of lease sale	Area-wide 3D seismic exploration.
First	Exploration	Within 2 years of lease sale (winter)	• First application for permit to drill submitted for exploration well. • First exploration well drilled Assumes discovery with first exploration well.
First	Additional seismic exploration	Within 3 years after lease sale (winter)	• Seismic exploration on lease block with discovery to locate future delineation exploration wells. • Process seismic data and determine location of delineation wells to be drilled the following winter.
First	Additional exploration wells	4 years after lease sale (winter)	• Drill 3 to 5 additional wells to define the prospect and identify satellite pad locations.
First	Master development plan and EIS	5 to 6 years after lease sale	• Continue drilling 2 to 3 exploration wells to identify CPF and satellite pad locations.
Future			• Conduct NEPA analysis on master development plan for anchor field.
Future	Development	7 years after lease sale	• Begin laying gravel for anchor pad, begin CPF construction. • Continue drilling 2 to 3 exploration wells to identify satellite pad locations. • Begin drilling production wells on anchor pad.
Future	Development	7-9 years after lease sale	• Begin construction on Seawater Treatment Plant • Begin construction on Module Transfer Island
Future	Production begins	8 years after lease sale	• First production from anchor pad. • Winter gravel and construction on satellite pads.
Future	Production increases	9 to 40 years after first lease sale	• All wells completed on anchor pad. • All wells completed on satellite pads.
Future	Development of additional fields	11 to 85 years after lease sale	• Construct facilities and drill wells in additional fields. • Production continues for approximately 35 years after reaching peak production in each field.
Future	Abandonment and reclamation	19 to 85 or more years after lease sale 2-5 years after end of production	• Plug wells that are no longer economically productive. • Remove retired equipment, dig up vacant gravel pads and roads and reclaim the area.

2.1.1 Proposed Activities

The IAP covers a wide range of activities. In this biological opinion we only consider those aspects of the IAP which may affect listed marine mammals. Those activities include:

- 3D seismic surveys,
- exploratory (and delineation) well drilling including in bays and lagoons,
- construction and operation of up to three central processing facilities and 20 satellite wells
- staging of equipment in staging areas
- construction and use of ice roads,
- construction and use of pipelines
- construction and operation of up to two seawater treatment plants (STPs),
- construction of up to two module transfer islands (MTIs),
- marine transportation,
- screeding and dredging,
- air transportation,
- other activities not related to oil and gas development.

Abandonment and reclamation activities within the NPR-A are governed by 43 CFR Part 3160, subpart 3162, which requires permittees to reclaim the land in accordance with plans approved by the BLM. We expect that reclamation activities will be necessary for exploratory well drilling, central processing facilities (and satellite wells), pipelines, STPs, and MTIs. Further details on reclamation for each of the identified activities can be found in the sections below.

2.1.1.1 Seismic Surveys

Two types of seismic surveys could be used in the action area: 2D seismic and 3D seismic. However, 2D seismic surveys have already been conducted over the majority of the NPR-A and they are unlikely to be repeated during the life of the IAP because they provide less detailed information and the information from the prior surveys is available. 3D seismic requires a dense grid of seismic lines (approximately 200 ft apart) to provide a more detailed image of the subsurface under the survey area. Each survey would cover 400–900 square miles. It is foreseeable that up to twelve 3D surveys would be conducted through the life of the IAP. Surveys would occur approximately every other year after the signing of the ROD. It is assumed that none of the surveys would be in areas unavailable for leasing because no drilling would be allowed there. It is also assumed that exploration-focused seismic surveys would not be repeated where good data gathered with modern technology are already available.

It is anticipated that all seismic surveys will be conducted by vibroseis seismic vehicles in the winter on land and over frozen bays and lagoons. The surveys require vibroseis seismic vehicles and smaller support vehicles. Vibroseis trucks are mounted on rubber tracks to minimize ground pressure. No air-guns or dynamite are expected to be used. Multiple vehicles could be used simultaneously miles apart to conduct vibroseis exploration, or convoys of four to five trucks could travel in a line, which is less common. Approximately 65 vehicles (vibe trucks, tractors, tuckers, snow machines etc.) would be required for a survey.

Mobile camps to accommodate the workforce are established in the center of the surveys. On change days, crews will be transported to camp location by plane. Based on a proposed vibroseis survey in the Arctic National Wildlife Refuge (Marsh Creek East), we expect that a camp would accommodate approximately 200 people. Equipment at camp stations would include long haul fuel tractors, remote fuelers, water maker, incinerator, resupply and survival sleigh, tractors, loaders, and tuckers. Sanitary conditions in the kitchen and diner and washrooms would be maintained in full compliance with governmental regulations. Gray water would be filtered to meet the discharge requirements of the Alaska Department of Environmental Conservation Alaska Pollutant Discharge Elimination System permit prior to discharge.

The camp might stay in one location up to seven days. Typically, the camp moves 1-2 miles every 5-7 days, which could be 4-6 camp moves per month. Length of the operation would depend on the size of the area being surveyed. Moves are determined by the efficiency of the crew or the conditions of the tundra. A maximum footprint for a large camp is approximately 300 ft x 400 ft.

BLM will make its approval of any seismic survey activity with the potential to take a marine mammal (whether conducted pre- or post-lease sale) contingent upon the applicant having a valid MMPA incidental take authorization from NMFS. MMPA incidental take authorization is a federal action subject to section 7 consultation, and thus we expect any seismic surveys that may affect ESA-listed marine mammals will undergo additional ESA Section 7 consultation.

2.1.1.2 Exploratory Drilling

Exploration wells would be drilled onshore or in bays and lagoons in the winter using ice roads to allow transportation of a drilling rig. A typical 6-acre ice pad for exploration drilling requires 1.5 million gallons of water to construct. Although permanent well pads are not allowed within one mile of the coastline, exploratory drilling may occur in this area during the winter as long as the well head is capped and the exploratory drill pad is removed before ice break up. Following a promising discovery in an exploration well, delineation wells will be drilled to further characterize the discovery. These wells require similar resource commitments and require about the same time for drilling as an initial exploration well. Delineation wells may also occur within one mile of the coast, and would be drilled during the winter, the well head capped, and the drill pad removed before ice break up. Typically, 3 to 5 additional wells are drilled to define the prospect and identify satellite pad locations. After drilling and other downhole evaluation activities are complete, exploration and delineation wells may either be completed and suspended for future use (if beyond the 1 mile from coast NSO stipulation) or plugged and abandoned according to regulatory requirements, with all wastes removed from the site (BLM 2005). Exploratory and delineation wells pose an oil spill risk.

2.1.1.3 Construction and Processing of Central Processing Facility and Wells

Under the high-level production scenario up to three central processing facilities (CPFs) and a total of 2–20 oil satellite well production pads might be built. These facilities would have to be at least one mile from the coast (Required Operating Procedure K-5, see Section 2.2.3). A CPF would require 40 acres plus an additional 11 acres for a gravel airstrip. A satellite well typically requires 15 acres and a 10–15 miles of gravel road to connect to a CPF.

Components of the CPF may be constructed as transportable modules in offsite locations, barged to the North Slope, then moved over gravel roads or winter ice roads to the project location and assembled. All buildings would be supported above the ground on pilings to accommodate ground settling or frost heaving. Approximately 23 million cubic yards of gravel would be needed for CPF, well pads, air strips, gravel roads and staging areas.

Peak production on NPR-A is anticipated to be 500,000 billion gallons of oil per day when multiple wells are producing. This level of production would require approximately 21 million gallons of water per day to maintain reservoir pressure; however, natural gas could also be used to maintain reservoir pressure. After reaching peak production, well production typically declines at a rate of 8% per year. The total lifetime production anticipated under the high scenario is approximately 2.64 billion barrels of oil (BLM 2020a). BLM has stated that they anticipate the material used to construct these facilities will be repurposed on the North Slope after the conclusion of production.[1]

Because production facilities will be a mile or more from the coast, risk of oil spills occurring and reaching the marine environment during construction and operation will be the only stressor that we will examine for potential affects to listed marine mammals for this activity.

2.1.1.4 Staging Areas

Up to three 20 ha (50 ac) staging areas might be constructed inland of the coast to support oil and gas activities. Other existing gravel pads could also be used for staging, such as those at Point Lonely, Cape Simpson, Ikpikpuk Well site, Inigok, or Umiat. It is not foreseen that any new staging areas would be built along the coast, as existing gravel pads are already present at Point Lonely, Cape Simpson, Utqiaġvik, and Wainwright.

Staging areas are used to store equipment and materials from the time they are brought to the NPR-A until further transportation is feasible. Staging areas can be established for year-round use, and typically comprise fuel storage tanks, warehouses, and housing units. Some include permanent gravel airstrips capable of handling large capacity aircraft. In winter months, staged materials are moved by temporary roads (ice or packed snow) or by aircraft to their final destination. Because no coastal construction of staging areas is expected, we do not consider this activity further.

2.1.1.5 Construction and Use of Ice Roads and Trails

It is anticipated under the high development scenario that 50 mi of ice roads or snow packed trails would be constructed in the NPR-A annually, for a total of 3,500 miles over the life of the leases sold under this IAP. Many of these ice roads would likely be over terrestrial habitat. However, because Dease Inlet, Admiralty Bay, and Elson Lagoon will be available for leasing, ice roads may be constructed upon these bodies of water. The construction of one or two MTIs and STPs would require construction and use of ice roads offshore or right along the coastline. Equipment and modules unloaded at a MTI during the open water season would be transported inland over ice roads the following winter. Sea ice may also be used to transport materials and equipment from Prudhoe Bay or Utqiaġvik to work sites. On a yearly basis, 4–60 trains of 4–15 vehicles and attached sleds could travel on the ice roads, depending on the level of development.

Ice roads are used during exploration and to support construction, maintenance, and monitoring of pipelines transporting oil and gas from the respective development complexes in the NPR-A to transmission pipelines east of the NPR-A border. Ice roads would be approximately 3.6 m (12

[1] S. Rice, BLM, pers. comm. via email to S. Pautzke, 11/25/2020.

ft) wide, constructed annually, and used for 4 to 5 months each winter (December to April). Ice roads are best constructed when weather is -20 to -30 degrees Fahrenheit (ºF), but temperatures below 0ºF are considered adequate. The following equipment could be used to construct ice roads: graders, water pump units equipped with ice augers, and construction vehicles.

In preparation for building the ice road, snow would be cleared away from the route and ice rubble smoothed into the ice surface or moved outside of the expected road surface. Then pumper units equipped with ice augers would drill holes in the sea ice and pump water from under the ice to flood the surface of the ice. The ice augers and pumping units continue to move along the ice road alignment to flood the entire alignment, returning to a previous area as soon as the flooded water has frozen. Flooding techniques are dependent on the conditions of the sea ice. Grounded ice typically requires limited flooding with fresh water to either cap or repair cracks. Floating ice requires flooding with seawater until a desired thickness is achieved. Thickness of floating ice is determined by the required strength and integrity of the ice. After the desired thickness is achieved, floating ice may then be flooded with fresh water to either cap or repair cracks. This technique minimizes the usage of fresh water while obtaining the desired thickness of the ice road. Routine maintenance (i.e., blowing, blading, and flooding) of damaged areas on an ice road is important in maintaining safe ice cover throughout the season.

The Alaska Department of Natural Resources (ADNR) regulates many aspects of winter travel on Alaska's North Slope. ADNR's Division of Mining, Land, and Water (DMLW) is responsible for permitting ice road construction and winter travel without ice roads while the Water Resources Office regulates temporary water withdrawal (used for onshore ice road construction) from rehabilitated and existing mine sites and tundra ponds. State permits are required for ice road and ice pad construction.

2.1.1.6 Pipelines

It is anticipated that all oil produced in the NPR-A would ultimately be moved east to Pump Station 1 of the Trans-Alaska Pipeline System. Typically, oil pipeline routes are laid out in straight-line segments and are installed aboveground on vertical support members (VSMs). Above-ground pipelines are preferred over buried pipelines because they take less time to construct, cause less disruption to the land during installation, are easier to monitor and repair, and provide more flexibility for later modification (e.g., adding new pipelines) than buried pipelines. The high-level development scenario estimates that 48–386 km (30–240 mi) of pipeline supported by VSMs would be required for oil production. All pipelines supporting development in the NPR-A would be constructed in terrestrial environments.

Pipeline construction is expected to occur during the winter concurrent with the construction of the development and production facilities. Pipelines would be installed above ground on VSMs spaced 10–21 m (35–70 ft) apart. Pipelines would be placed a minimum of 2.1 m (7 ft) above the tundra. Clearance is generally higher (up to 6 m (20 ft)) over topographic lows (stream valleys), because engineering requirements call for a nearly level pipeline route. Pipelines crossing large rivers, such as the Colville River, could be on bridges or buried using horizontal directional drilling techniques. Elevated pipelines would likely cross narrow streams on suspension spans to minimize impacts to stream banks and riparian vegetation and to avoid potential problems associated with corrosion, maintenance, and abandonment of buried pipelines. Power lines would be placed in cable trays on or suspended from VSMs. Routine pipeline maintenance would occur during the winter months when ice roads or hardened snow trails provide ready access; summer activities would occur on an emergency basis only. Pipelines would be monitored both electronically (remotely) and visually (e.g., with aircraft over flights) to determine pipeline integrity.

The State of Alaska regulates pipeline standards and safety. Under Alaska Statutes, a pipeline may not be permitted unless an oil discharge prevention and contingency plan for the pipeline has been approved. The Code of Federal Regulations (CFR) Title 49 CFR Parts 190-199 also regulates pipeline safety. We assume that all appropriate permitting and regulations regarding pipelines will be followed when projects reach the development stage (see also Section 2.2 in Mitigation Measures). However, our effects analysis includes an oil spill risk assessment and description of potential effects from anticipated oil and gas spills resulting from activities under the IAP, including pipelines.

2.1.1.7 Seawater Treatment Plant

Treated seawater (flood water) is used primarily to recover more oil from an oil reservoir. Seawater can also be treated to produce potable water if needed for remote work camps. Under the high development scenario, up to two STPs might be constructed if sufficient freshwater resources are not available from lakes and streams. Although design details would be speculative at this time, the STP at Prudhoe Bay can withdraw 75,000 gallons of seawater per minute and is designed to treat 3 million gallons of seawater per day. A similar sized plant would likely be constructed under the high development scenario. A STP could be delivered as a complete unit to an offshore site or could be constructed on shore from modules delivered by barges. Offshore construction does not fall within the jurisdiction of the BLM. If lessees chose to build offshore, they would need appropriate State permits to build in this area.

A pre-fabricated STP, transported by sealift on a submersible barge, could be permanently moored at a site constructed for that purpose. Once the submersible barge carrying the STP was moved into place, it would be submersed, and gravel would be filled in around the unit. The STP would be fully functional upon arrival, following connections to a fuel pipeline, the water intake structure, communication systems, filtration system, power generation, water delivery pipeline, and heating system. In this scenario, winter site preparations would likely include ice road and ice pad construction, sheet and pipe pile driving, and excavation for water intake pipeline. Operations occurring prior to STP placement would include vessel transit from Dutch Harbor, mooring of the barge, and site dredging and/or screeding.

In this scenario, at the end of the STP service life, all anthropogenic materials would be removed, including all sheet and pipe piles. An island STP would likely be decommissioned in winter when surrounded by bottom-fast[2] ice to avoid generating underwater noise. However, for both construction and decommissioning, if pile driving activities (installation or extraction) were to extend into the open water season, sound transmission through the water would be expected and a thorough examination of noise impacts to marine mammals would be required. Following the abandonment of the STP, it is expected that waves and ice would naturally reshape the gravel over time.

If built on land, construction and operation of the STP would require at least 15 acres of surface disturbance, a road, a seawater transport pipeline, and a pipeline to deliver treated water to the

[2] The terms "bottom-fast", "ground-fast", and "grounded ice" are used interchangeably throughout the opinion and refer to ice that is fastened to the bottom.

injection well. Gravel roads typically require 7.5 acres of surface disturbance per mile. Screeding and/or dredging would be needed for the transfer of modular equipment to the shore and excavation of the seafloor would be needed for the installation of the seawater intake pipeline.

Per Lease Notice 4, BLM will make its approval of any development activity with the potential to take a marine mammal contingent upon the applicant having a valid MMPA incidental take authorization from NMFS. Thus, we expect any future federal actions that may affect ESA-listed marine mammals will undergo additional ESA section 7 consultation.

2.1.1.8 Construction of a Module Transfer Island

Modules needed to build central processing facilities (CPFs) or other large structures like STPs could be delivered to a gravel module transfer island (MTI) constructed in shallow water less than 3.5 m deep within 3 mi of shore. This coastal area is not part of the NPR-A and does not fall within the jurisdiction of the BLM. Lessees would need appropriate State permits to build in this area. Construction would occur in the winter. Boreholes would be drilled through the ice in multiple locations to determine that sea ice along the ice road route and surrounding and within the MTI footprint would be bottom-fast (frozen to the seafloor) before construction of the MTI would begin. The development scenario for the IAP estimates that 1–2 MTIs could be built. Island construction would commence once the ice road from a gravel mine site to the construction site is completed. During the process of construction during the winter to mid-April, sections of sea ice would be cut and removed from the location of the island and placed in shallow water. A Ditchwitch or similar equipment would be used to cut through the ice while a backhoe and support trucks move the ice away.

Once the ice is removed, gravel would be poured through the water column to the sea floor, building the island structure from the bottom up. A conical pile of gravel will form on the sea floor until it reaches the surface of the ice. The construction would continue with a sequence of removing additional ice and pouring gravel until the surface size is achieved. Estimated size of the module transfer islands is 12 acres (BLM 2020c).

Sheet piles would be needed to stabilize the perimeter of the island and to create a docking area. Winter pile driving would occur prior to sea ice breakup. Construction activities and materials are not anticipated to contact liquid seawater because the construction will occur through bottom-fast ice. Installation of the sheet-pile offload dock would occur once the initial gravel placement is sufficient to support pile driving activities and the staging of materials and equipment. Although it cannot be known with certainty at this point, it is estimated that sheet piles would be installed over 25–30 days, with 3–6 hours of pile driving occurring per day. Vibratory pile driving is expected, but the final setting of sheet piles often occurs with an impact pile driver. Pipe piles adjacent to the island may be needed for moorage.

At the end of the MTI service life, all gravel slope protection materials and other anthropogenic materials would be removed, including all sheet and pipe piles. MTIs would generally be decommissioned in winter when there is bottom-fast ice to avoid generating underwater noise. However, for both island construction and decommissioning, if pile driving activities (installation or extraction) were to extend into the open water season, sound transmission through the water would be expected and a thorough examination of noise impacts to marine mammals would be required. Following the abandonment of the island, it is expected that waves and ice would naturally reshape the island to resemble a natural barrier island in the Beaufort Sea (BLM 2020c).

2.1.1.9 Marine Transportation

Sealifts (large barges accompanied by two to several tugboats) would likely be used to deliver large processing and drill site modules, as well as bulk construction materials during the summer months (mid-July to late September) from Dutch Harbor to the North Slope (approximately 3,000 km (1,864 mi)) Figure 3. Under the proposed action, up to three major developments are projected in the NPR-A. Each development will require 3–4 sealift operations over a 5-year period to transport modules and construction material needed for the CPF, satellite pads, and associated infrastructure. A single sealift operation would consist of a maximum of 20 sealift barges and tugboat round trips during the open water summer season.

Vessel traffic (local to the North Slope) to support the sealift would consist of approximately 50 to 150 round trips by crew boats, screeding barges, and lightering barges per open-water season. Total vessel traffic over a 5-year sealift operational period would be approximately 35 barge round trips, 55 tugboat round trips, and 500 support vessel round trips. After a sealift operational period, vessel traffic to support an existing development would include 1-2 barge round trips per year and 10-20 support vessel round trips per year. It is possible that two developments could be in the sealift operational phase simultaneously. However, this is unlikely to occur during the life of this plan.

We anticipate that tugboats used for local (North Slope) ship-assist work would have a fuel capacity of 10,000 to 30,000 gallons and tugboats involved in the sealift operations from Dutch Harbor would have a capacity of approximately 100,000 gallons. In addition, it is reasonable to expect that fuel barges may be used to transport fuel to the North Slope as there are few roads available. We assume fuel barges will carry up to 517,800 gallons of fuel.

Throughout the life of the project, during the open-water season, barges, hovercraft, and other vessels would be used to transport equipment, personnel, and supplies along the coastline to and from established docks, barges, or the MTIs. The open-water season is typically July through October, but may extend from June through November, depending on the year and the timing of sea ice melt and freeze up.

The primary underwater noise associated with barging operations is the continuous cavitation noise produced by the propeller arrangement on the oceanic tugboats, especially when pushing, towing, or positioning a loaded barge. Slow speeds and designated routes around critical habitat can minimize the probability of striking cetaceans (see Mitigation Measures Section 2.2.).

2.1.1.10 Screeding and Dredging

Screeding and dredging are activities commonly done on an annual basis for oil and gas projects on the North Slope. These activities are used to smooth and grade landing areas for barges landing on shore or at an MTI. Ice gouging, waves, and currents can change the underwater topography in the winter; screeding and dredging are used to create suitable landing zones. In the screeding process, a tug and/or barge pushes or drags a beam or blade across the seafloor, removing high spots and filling local depressions in the seabed without the need for excavation or disposal of seabed materials. The screeding process will redistribute the seabed materials to provide a flat and even surface on which the module cargo barges can be grounded. Screeding would likely be performed in the summer immediately prior to the arrival of each sealift and as soon as sea ice conditions would allow mobilization of the screeding barge.

2.1.1.11 Air Transportation

Helicopters and fixed-wing aircraft capable of landing on unimproved airstrips, tundra, lakes, rivers, and gravel bars are the primary mode of transport of people and equipment during summer in undeveloped portions of NPR-A. These aircraft can provide access to remote areas for research projects by the State of Alaska, federal government, and research institutions as well as activities necessary for oil and gas exploration and development. Exclusive of the oil and gas industry, these activities include air support or provide a platform for compliance of BLM stipulations by permittees; research and monitoring of plants, fish, birds and mammals; and community infrastructure projects by various federal, state and local governmental agencies and research institutions. Within the oil and gas industry, activities include air support for seismic surveys and exploratory drilling; aerial wildlife surveys; support for ground surveys of wildlife, archaeological, and other resources; road and pipeline route surveys; pipeline inspections; and support for other development, operations, and decommissioning activities.

The location, timing, and frequency of such flights and the type of aircraft used will be influenced by many variables and will likely be different depending on whether or not the activity is associated with the oil and gas industry. Although crew will be transported by plane in winter to camps during 3D seismic surveys, the vast majority of flights will take place between May and October and the majority will take place inland using helicopters (BLM 2020c).

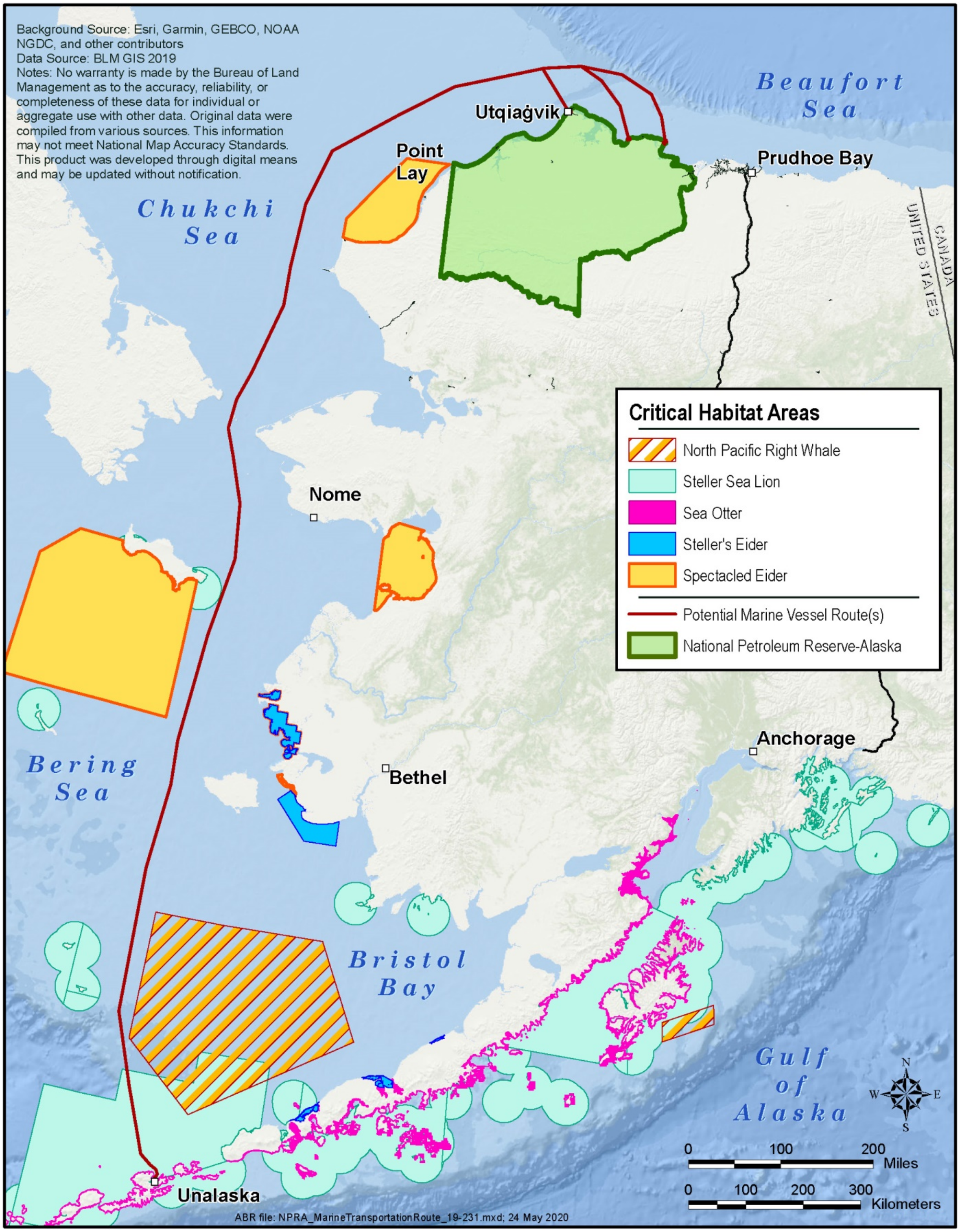

Figure 3. Marine Transportation Route (MTR) between Dutch Harbor, Alaska and the NPR-A.

Since 2006, the BLM has required that all aircraft take-off and landing (TOL) locations occurring within and associated with authorized activities within the NPR-A be predicted pre-season and then reported post-season in order to comply with the yearly ESA section 7 consultation with the U.S. Fish and Wildlife Service for summer activities in NPR-A. The data show that most often the number of flights estimated to occur in a season are fewer than those that actually occur. For example, although up to 10,363 flights were requested in 2018, only 6,559 occurred (BLM 2020d). The number of requested flights has risen steadily over the years; however, the BLM estimates that 10,000 TOLs per year is likely the number that will occur under the new IAP over time. A graphic display of TOLs through 2016 shows that the majority of TOLs associated with industry have been inland, compared to along the coast (BLM 2020d). However, if coastal leases are bought and developed, we would expect an increase of air traffic in coastal areas.

2.1.1.12 Other Activities Not Related to Oil and Gas Production

The NPR-A is host to a variety of non-oil and gas activities that are described in the IAP. These activities include: aircraft use for the transport of personnel and supplies, surveys and monitoring; watercraft use for summer transportation needed for permitted activities; excavation and collection of archaeological, paleontological, geologic, and soil resources; land-based travel and camping by scientists, subsistence users, or recreationalists; community overland moves to provide supplies to villages in the winter; solid and hazardous waste removal; and recreation and film permits. These activities are not concentrated on the coast, are dispersed across the landscape, and are limited spatially and temporally. The larger scale projects must receive a BLM permit, right-of-way, or land-use authorization, and would be regulated through that process. For example, commercial recreation operators for hunting or float-guide trips require a permit, but small parties of non-commercial recreationalists (backpackers, pack rafters) do not need permits. Other than the community overland moves, the activities will occur in the summer when neither seals nor whales would be close to shore. We acknowledge that these activities will occur, but it is highly unlikely that they will overlap in space or time with listed marine mammals. For this reason, we do not consider the effects of these activities in this opinion.

2.2 Mitigation Measures

At the lease sale stage, mitigation measures typically include lease stipulations; post-lease activities may have mitigation measures imposed through conditions of approval of plans, permit conditions, or other mechanisms. Leaseholders and other permittees routinely request, and are expected to obtain, authorizations, including MMPA incidental take authorization from NMFS for activities that could result in the take of marine mammals. As specific projects are proposed in this multi-phase oil and gas program, more precise information about the nature and extent of the activities - including the number, timing, scale, frequency, intensity, and location of the activities and a description of the particular technologies to be employed - will be considered and evaluated in additional ESA section 7 consultations and other analyses (e.g., NEPA and MMPA) as appropriate. Through this multi-phase process, additional mitigation measures and protections may be developed at any stage based on the specific details of the particular proposed projects.

In addition to lease stipulations, the BLM lease notices provide information to permittees, including how BLM intends to assure compliance with certain laws and regulations that may apply to oil and gas activities conducted pursuant to the lease. Lease notices do not impose new requirements. The NPR-A leasing program will have three lease notices (Lease Notice 2, 3, and 4) pertaining to threatened and endangered species. These notices provide additional mechanisms to mitigate disturbance and protect species and habitat.

In addition to the protective measures outlined here, numerous State and Federal laws and regulations apply to oil and gas related activities (Figure 4).

2.2.1 BLM Lease Notices

BLM intends to apply the following Lease Notices:

Lease Notice 2. Compliance with the Endangered Species Act. The lease areas may now or hereafter contain plants, animals, or their habitats determined to be threatened or endangered. The BLM may require modifications to exploration and development proposals to further its conservation and management objective to avoid BLM-approved activities that would contribute to the need to list such a species or their habitat. The BLM would not approve any activity that may affect any such species or critical habitat until it completes its obligations under applicable requirements of the ESA, as amended (16 USC §§ 1531), including completion of any required procedure for conference or consultation.

Lease Notice 3: Reclamation of Land Used for Permitted Activities. In accordance with Onshore Order 1, permittees must submit a plan for the surface reclamation or stabilization of all disturbed areas. Prior to final abandonment, land used for infrastructure—including but not limited to well pads, production facilities, access roads, and airstrips—shall be reclaimed to ensure eventual return of ecosystem function. The BLM may grant exceptions to satisfy stated environmental purposes or community needs.

Lease Notice 4. The lease area and/or potential project areas may now or hereafter contain marine mammals. The BLM may require modifications to exploration and development proposals to ensure compliance with Federal laws, including the MMPA. The BLM would not approve any exploration or development activity absent documentation of compliance under the MMPA. Such documentation shall consist of a Letter of Authorization, Incidental Harassment Authorization, and/or written communication from US Fish and Wildlife Service (USFWS) and/or NMFS confirming that a take authorization is not warranted.

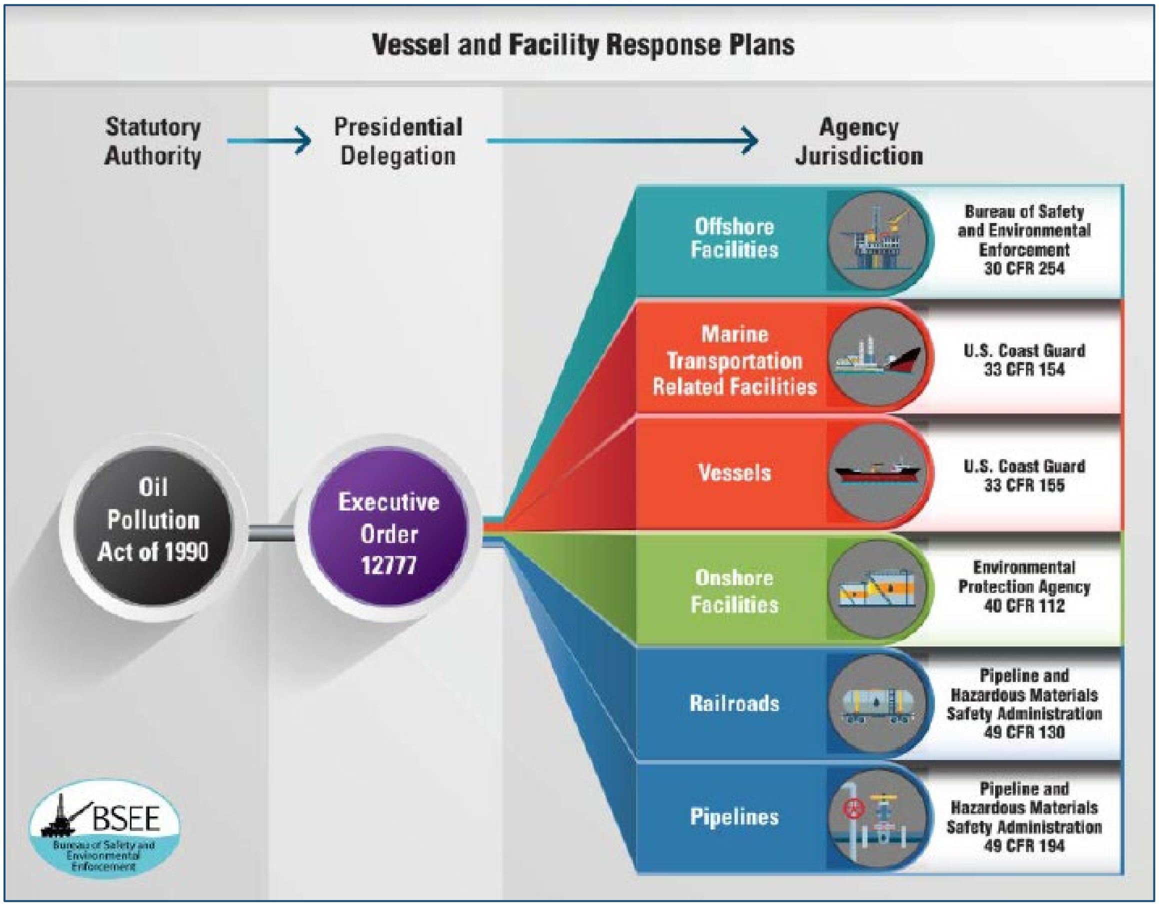

Figure 4. Federal agency jurisdiction for oil and gas related activities and facilities.

2.2.2 BLM Lease Stipulations

Lease stipulations become contractual obligations the lessee must follow. While BLM outlined many stipulations in its BA, the following are those pertinent to this opinion.

K-1 River Setbacks

No surface occupancy and no new infrastructure is allowed, except essential road and pipeline crossings. Permanent oil and gas facilities (e.g., gravel pads, roads, airstrips, and pipelines) are prohibited in the streambed and adjacent to the river at varying distances (0.5 to 5 miles). The setbacks may not be practical within river deltas; in such deltas, permanent facilities will be designed to withstand a 200-year flood event in consultation with the BLM AO. (see (BLM 2020c) for complete list of streams and set back distances).

K-2 Deep Water Lakes

Generally, permanent oil and gas facilities (e.g., gravel pads, roads, airstrips, and pipelines) and new infrastructure are prohibited on the lake or lakebed and within 0.25 miles of the ordinary high water mark of any deep lake, as determined to be in lake zone III (i.e., depth greater than 13 feet). The BLM may allow (through the normal review process) essential pipeline(s), road crossings, and other permanent facilities may be considered through the permitting process in these areas.

K-3 Waterbodies and Riparian Areas
Prohibit exploratory drilling in rivers, streams, lakes, and riparian habitat (as defined in the glossary of the Final IAP/EIS).

K-4 Kogru River, Dease Inlet, Admiralty Bay, Elson Lagoon, Peard Bay, Wainwright Inlet/Kuk and Ivisaruk Rivers, and Kasegaluk Lagoon, and their associated Islands
Peard Bay and Kasegaluk Lagoon, and their associated islands are unavailable for leasing and are closed to new infrastructure, with the exception of essential pipeline crossings.

The Kogru River, Dease Inlet, Admiralty Bay, Elson Lagoon and Wainwright Inlet/Kuk and Ivisaruk rivers (downstream from T12N, R32W, U.M.), and their associated islands are available for leasing subject to a no surface occupancy stipulation. Temporary (drilled and capped in one winter season) exploration and delineation wells may be drilled in these areas.

No new infrastructure except essential pipeline crossings in the Kogru River, Dease Inlet, Admiralty Bay, Elson Lagoon, Peard Bay and Kasegaluk Lagoon, and their associated islands.

Essential pipeline crossings would be permitted only over or under the water if they can meet all the following criteria:

a. Design and construction of facilities shall minimize impacts on subsistence uses, travel corridors, seasonally concentrated fish and wildlife resources.

b. Daily operational activities, including use of support vehicles, watercraft, and aircraft traffic, alone or in combination with other past, present, and reasonably foreseeable activities, shall be conducted to minimize impacts on subsistence uses, travel corridors, and seasonally concentrated fish and wildlife resources.

c. The location of oil and gas facilities, including artificial islands, platforms, associated pipelines, ice or other roads, bridges or causeways, shall be sited and constructed so as to not pose a hazard to navigation by the public using traditional high-use subsistence-related travel routes into and through the major coastal waterbodies, as identified by the North Slope Borough (NSB).

d. Demonstrated year-round oil spill response capability, or such alternative methods as seasonal drilling restrictions, improvements in blowout prevention technology, equipment and/or changes in operational procedures, “top-setting” wells above the hydrocarbon-bearing zone, etc.

e. Reasonable efforts shall be made to avoid or minimize impacts related to oil spill response activities, including vessel, aircraft, and pedestrian traffic that add to impacts or further compound direct spill-related impacts on area resources and subsistence uses.

f. Before conducting open water activities, the permittee shall consult with the Alaska Eskimo Whaling Commission and the NSB to minimize impacts on the fall and spring subsistence whaling activities of the communities of the North Slope.

In addition to these mitigation measures regarding pipelines, the State of Alaska enforces pipeline design and construction standards to minimize the potential for leaks under 18 AAC

75.005, 18 AAC 75.007, 18 AAC 75.045, 18 AAC 75.047, 18 AAC 75.055, 18 AAC 75.080 and 18 AAC 75.436. Federal standards for pipeline design and construction are regulated by the Department of Transportation's Pipeline and Hazardous Materials Safety Administration (Figure 4) under 49 CFR parts 105-199.

K-5 Coastal Area Setback

No surface occupancy would be allowed in coastal waters or on islands between the northern administrative boundary of the NPR-A and the mainland or in inland areas within 1 mile of the coast. However, barge landing areas, seawater treatment plants, or spill response staging and storage areas would not be precluded. Nor would this stipulation preclude infrastructure associated with offshore oil and gas exploration and production or construction, renovation, or replacement of facilities on existing gravel sites.

Marine vessels used as part of a BLM-authorized activity shall maintain a 1-mile buffer from the shore when transiting past an aggregation (3 or more) of seals and Steller sea lions using a terrestrial haul-out, unless doing so would endanger human health and safety, or violate safe boating practices.

Marine vessels shall not conduct ballast transfers or discharge any matter into the marine environment within 3 miles of the coast, except when necessary for the safe operation of the vessel.

2.2.3 BLM-Required Operating Procedures

Required operating procedures (ROPs) describe the protective measures that the BLM would impose on applicants during the permitting process. At the permitting stage, the BLM Authorized Officer (AO) would not include those ROPs that, because of their location or other inapplicability, are not relevant to a specific permit application. Relevant ROPs that would directly or indirectly minimize or mitigate effects on listed species or their critical habitat managed by NMFS are described below. For some ROPs, the Additional NMFS Mitigation Measures listed below in Section 2.2.2 (and sub-sections 2.2.2.1, 2.2.2.2, and 2.2.2.3) are more detailed than what is described in the ROP.

Required Operating Procedure A-1 and A-2 Waste Management

All solid waste and garbage must be disposed of in accordance with applicable federal, State, and local laws and regulations. Permittees must prepare and implement a waste management plan.

Required Operating Procedure A-3 Hazardous Substances

For oil and gas-related activities, a hazardous substances contingency plan shall be prepared and implemented before transportation, storage, or use of hazardous substances. The plan shall include the following:

- Identification of the hazardous substances
- Procedures for proper storage and handling of the hazardous substances
- Procedures for prompt response, notification, and cleanup in the event of a release

Required Operating Procedure A-4 Spill Prevention

Permittees with oil storage capacity of 1,320 gallons or greater shall prepare a spill prevention, control, and countermeasure plan as required by 40 CFR 112. Additionally, all permittees shall be required to do the following:

- Notice of any spill shall be given to the AO as soon as possible but no later than 24 hours after occurrence. Other federal, State, and NSB entities shall be notified as required by law.
- All spills shall be cleaned up immediately and to the satisfaction of the AO and all agencies with regulatory authority over spills.
- Sufficient oil spill cleanup materials (sorbent pads, containment devices, etc.) shall be stored at all fueling points and maintenance areas. Drip basins and/or sorbent pads would be placed under all non-dry disconnect type fuel line couplings and valves during fueling.
- All fuel and oil or petroleum product containers, including barrels, and propane tanks, shall be marked with the permittee's name and the product type. Duck ponds shall be marked with permittee's name.
- Fuel containers and hazardous materials containers of any size shall be stored in secondary containment.

Required Operating Procedure A-5 Refueling and Fuel Storage

Fuel storage and refueling of equipment within 100 feet of any lake shoreline or top of streambank is prohibited. Small fuel caches (up to 210 gallons) are permitted within this distance. The AO may allow larger fuel caches or refueling operations within the 100 foot setback if properly designed to account for local site conditions.

Required Operating Procedure A-13 Firefighting Foam Standards

At facilities where fire-fighting foam is required, permittees shall use fluorine-free foam unless otherwise approved in a State or federally-required plan. If aqueous film-forming foam use is approved in the permittee's plan, permittee shall contain, collect, treat, and properly dispose of all runoff, wastewater from training events, and, to the greatest extent possible, from any emergency response events. All discharges must be reported to the BLM AO as soon as possible, but no later than 24 hours after occurrence. Other federal, State, and NSB entities shall be notified as required by law. Measures should also be taken to fully inform workers/trainees of the potential health risks of fluorinated foams and to specify appropriate personal protective equipment to limit exposure during training and use. Training events shall be conducted in lined areas or basins to prevent the release of poly- and perfluoroalkyl substances associated with aqueous film-forming foam.

Required Operating Procedure C-1 Den Buffers and Survey Requirements

In order to limit disturbance of activities to seal lairs in the nearshore area (<9.8 feet water depth):

i. Specific to seismic operations:

    a) Prior to the initiation of winter seismic surveys on marine ice, the permittee will conduct a sound source verification test approved by BLM and NMFS. The test is to measure the attenuation distance to the 120 decibels re 1 micro Pascal of project-associated sound levels through grounded ice to areas potentially occupied by ice seals (ungrounded ice and open water). The permittee will share the results with the BLM and the NMFS. The attenuation distance will be used to buffer all marine on-ice seismic survey activity operations to areas potentially occupied by ice seals.

ii. For all activities:

a) Maintain airborne sound levels of equipment below 100 decibels re 20 micro Pascals at 66 feet. If equipment will be used that differs from what was originally proposed, the permittee must inform the BLM AO and share sound levels and air and water attenuation information for the new equipment.

b) On-ice operations after May 1 will employ a full-time, trained, protected species observer on vehicles to ensure that all basking seals are avoided by vehicles by at least 500 feet and will ensure that all equipment with airborne noise levels above 100 decibels re 20 micro Pascals are operating at distances from observed seals that allow for the attenuation of noise to levels below 100 decibels. All sightings of seals will be reported to the BLM using a NMFS-approved observation form.

c) Sea ice paths must not be greater than 12 feet wide. No driving will be allowed beyond the shoulder of the ice path or off planned routes unless necessary to avoid ungrounded ice or for other human or marine mammal safety reasons. On-ice driving routes shall minimize travel over snow/ice/topographical features that could foster the development of birthing lairs.

Required Operating Procedure D-1 Oil and Gas Exploratory Drilling

Construction of permanent or gravel oil and gas facilities shall be prohibited for exploratory drilling. Use and minor modification of a previously constructed road or pad may be permitted

Required Operating Procedure E-2 Infrastructure Siting near Water Bodies

Permanent infrastructure is prohibited within 500 feet of the ordinary high-water mark of fish-bearing waterbodies, except essential pipeline and road crossings (also refer to Stipulations K-1 and K-2 in Section 2.2.2).

Construction camps are prohibited on frozen lakes and river ice. Where leveling of trailers or modules is required and the surface has a vegetative mat, leveling shall be accomplished through blocking rather than use of a bulldozer.

Required Operating Procedure E-3 Shoreline Infrastructure

Linear infrastructure that connects to the shoreline (e.g., causeways and docks) is prohibited in river mouths or deltas. Artificial gravel islands and permanent bottom-founded structures are prohibited in river mouths or active stream channels on river deltas. In areas where it is permissible, linear infrastructure that connects to the shoreline shall be designed to ensure free passage of marine and anadromous fish and to prevent significant changes to nearshore oceanographic circulation patterns and water quality characteristics. BLM will require submittal of a minimum of 2 years of site-relevant data on fish, circulation patterns, and water quality before approving a permit for construction. If such data does not exist, the permittee may be required to gather this data. A post-construction monitoring program, developed in consultation with appropriate federal, State, and NSB regulatory and resource agencies, shall be required to track circulation patterns, water quality, and fish movements around the structure.

Required Operating Procedure E-5 Minimize Development Footprint

Facilities would be designed and located to minimize the development footprint and impacts. Issues and methods that are to be considered include:

- Using extended-reach drilling whenever practical for production drilling to minimize the number of pads and the network of roads between pads.
- Consider sharing facilities and infrastructure with existing developments,
- Collocating other oil and gas facilities with drill pads when feasible. Exceptions would generally include airstrips, docks, existing base camps, and saltwater treatment plants.
- Using gravel-reduction and gravel recovery technologies (e.g., insulated or pile-supported pads, and use of geotextile under gravel pads).
- When possible, locating facilities and other infrastructure outside areas identified as important for wildlife habitat, subsistence uses, and recreation. These areas would be identified during the project permitting phase through consultation with federal, State, and local agencies as well as consultation with appropriate Alaska Native organizations
- Optimize the size of gravel pads to balance storage space against the need to minimize aircraft traffic.

Required Operating Procedure F-3 Minimum Flight Altitudes

Except for takeoffs and landings, manned aircraft flights for permitted activities (fixed-wing and helicopters, unless specified) shall maintain a 1,500 foot minimum height above ground (agl) unless doing so would endanger human health and safety, or violate safe flying practices or if the purpose of the flight requires constant sight of the ground, such as sight of permitted wildlife or for archaeological or engineering survey flights or ice road planning and cleanup. Exception to the 1,500 foot agl minimum altitude are listed below:

- Aircraft will maintain 3,000 feet agl when within 1 mile of aggregation of marine mammals (three or more) listed as threatened or endangered.

Required Operating Procedure I-1 Employee Orientation Program

All personnel involved in permitted activities shall be provided with information concerning applicable stipulations, ROPs, standards, and specific types of environmental, social, traditional, and cultural concerns that relate to the region. The permittee shall ensure that all personnel involved in permitted activities shall attend an orientation program at least once a year. Elements of the program shall be provided to the AO for review upon request. The proposed orientation program shall include:

- Sufficient detail to notify personnel of applicable stipulations and ROPs as well as inform individuals working on the project of specific types of environmental, social, traditional, and cultural concerns that relate to the region.
- Address the importance of not disturbing archaeological, paleontological, and biological resources and habitats, including endangered species, fisheries, bird colonies, and marine mammals, and provide guidance on how to identify and avoid disturbance to these resources.
- Include guidance on the preparation, production, and distribution of information cards on endangered and/or threatened species

2.2.4 Additional Mitigation Measures

BLM expects that the following additional mitigation measures, which have typically been included in recent ESA section 7 consultations for oil and gas activities in the U.S. Arctic, will be followed for actions occurring under the Integrated Activity Plan. In addition to the measures presented here in Section 2.2.4, measures are detailed in Sections 2.2.4.1, 2.2.4.2, and 2.2.4.3, that pertain to ice road best management practices, Arctic oil spill response, and data collection and reporting. If these measures (or alternate measures that are more protective of listed species) are not incorporated in future actions by BLM's lessees or permittees (or their agents) through the MMPA permitting process, ESA consultation, or otherwise, BLM will reinitiate consultation on this action.

1. Shallow, Nearshore, Open-water Activities (i.e., barge landing)
    a. If marine mammals enter within 100 yards of the barge landing area prior to or during moving the vessel or equipment, all activity in the vicinity of the marine mammals will stop and will not resume until marine mammals are at least 100 yards (91 meters) from the vessel/equipment.
2. Dredging/Screeding
    a. PSOs will monitor marine waters that are subjected to project sound capable of harassing marine mammals; these waters will be monitored for 30 minutes prior to the production of sound, and the duration of the sound production.
    b. The project will incorporate measures to control erosion and minimize turbidity such as limiting dredging/screeding to periods without heavy wave action and/or unusually strong near shore currents.
    c. The BLM will require that pilots of the dredge and barge and support vessels will have clear views of the monitoring zones around each vessel to facilitate effective observations for all protected species. If shutdown zones are established, the pilots will enforce the shutdown zones for all vessels.
3. Nearshore Seismic Activities (vibroseis) [3]
    a. Prior to the start of vibroseis operations, the operator will conduct a sound source verification (SSV) test to measure the distance to attenuate vibroseis sound levels through grounded ice to the 120 dB re 1 μPa threshold in open water and water within ungrounded ice. Once the distance to the 120 dB threshold has been determined, it will be shared with the BLM Authorized Officer (AO) and NMFS. All subsequent vibroseis operations will maintain at least this distance from open water or ungrounded ice. The operator will draft a formal study proposal for vibroseis SSV that will be submitted to the BLM and the NMFS for review and approval six weeks before operations begin.
    b. Ensure airborne sound levels of equipment remain below 100 dB re 20 μPa at 20 meters. If different equipment would be used than was originally proposed, lessee must inform the AO and share sound source level and air and water attenuation

[3] These mitigation measures will apply to nearshore seismic activities conducted pre-lease sale and post-lease sale.

information for the new equipment.

c. Operations after May 1 will employ a full-time protected species observer (PSO) on all vibroseis vehicles to ensure all basking seals will be avoided by vehicles. Vehicles will remain at least 500 feet (152 meters) from observed seals. Any sightings of basking seals will require a 500-foot (152 meter) buffer be placed around the location, and the location will be reported to the AO using a NMFS-approved observation form. A draft form will be provided to NMFS for review and approval six weeks before operations begin.

d. All seismic work is restricted to areas with grounded ice. All vehicle operations on sea ice will take place on grounded ice, with the exception of snow machines to set and retrieve recorders. On ungrounded ice, snow machine ice paths must not be greater than 3 feet (1 meter) wide. No vehicles may drive beyond the edges of the ice path unless it is necessary to avoid ungrounded ice or for other human or marine mammal safety reasons.

e. No unnecessary equipment or operations (e.g. camps) will be located on ungrounded sea ice or within the 120 dB isopleth specified in mitigation measure 3.a. In addition, no equipment will be operated within 500 feet (152 meters) of basking seals as identified in mitigation measure 3.c.

f. A NMFS and BLM approved training session for all staff will be held prior to workers entering the field. The training will cover seal identification, biology, and status; seal lair descriptions; snow/ice/topographical factors that lead to birthing lair development; minimizing driving over such areas; and all applicable mitigation measures.

4. Vessel Transit

a. Operational and support vessels will be staffed with dedicated PSOs to alert crew of the presence of marine mammals and to initiate adaptive mitigation responses.

b. When weather conditions require, such as when visibility drops, support vessel operators must reduce speed and change direction, as necessary (and as operationally practicable), to avoid the likelihood of injuring marine mammals.

c. The transit of operational and support vessels is not authorized before July 1. This operating condition is intended to allow marine mammals the opportunity to disperse from the confines of the spring lead system and minimize interactions with subsistence hunters. Exemption waivers to this operating condition may be issued by the NMFS and USFWS on a case-by-case basis, based on a review of seasonal ice conditions and available information on marine mammal distributions in the area of interest.

d. Vessel operators will maintain a vigilant watch for listed species to avoid vessel strikes.

e. Vessels may not be operated in such a way as to separate members of a group of listed species from other members of the group. A group is defined as being three or more marine mammals observed within a 500-meter (1,641-foot) area and displaying behaviors of directed or coordinated activity (e.g., group feeding).

f. Vessels will stay at least 300 meter away from cow-calf pairs, feeding aggregations, or whales that are engaged in breeding behavior.

g. Vessels will avoid multiple changes in direction and speed when within 274 meters (300 yards) of whales and also operate the vessel(s) to avoid causing a whale to make multiple changes in direction.

h. Consistent with NMFS Alaska Humpback Whale Approach Regulations (50 CFR §§ 216.18, 223.214, and 224.103(b)), operators of vessels will not approach within 100 yards (91 meters) of humpback whales. Vessel operators will not intercept or place vessel(s) in the path of oncoming humpback whales causing them to surface within 100 yards (91 meters) of the vessel(s).

i. Consistent with NMFS marine mammal viewing guidelines (https://www.fisheries.noaa.gov/alaska/marine-life-viewing-guidelines/alaska-marine-mammal-viewing-guidelines-and-regulations), operators of vessel should, at all times, avoid approaching all other listed species within 100 yards (91 meters).

j. If the vessel approaches within 1.6 km (1 mi) of a whale, except when providing emergency assistance to whalers or in other emergency situations, the vessel operator will take reasonable precautions to avoid potential interaction with the whales by taking one or more of the following actions, as appropriate:

    i. Reducing vessel speed to less than 5 knots (9 km/hour) within 274 meters (300 yards or 900 feet) of the whale(s).

    ii. Steering to the rear of the whale(s).

    iii. Operating the vessel(s) to avoid causing a whale to make changes in direction.

    iv. Checking the waters immediately adjacent to the vessel(s) to ensure that no whales will be injured when the propellers are engaged.

    v. Reducing vessel speed to 9 knots (17 km/hour) or less when weather conditions reduce visibility to avoid the likelihood of injury to whales.

k. If a whale approaches the vessel and if maritime conditions safely allow, the engine will be put in neutral and the whale will be allowed to pass beyond the vessel; and

l. If the vessel is taken out of gear, vessel crew will ensure that no whales are within 50 meters (55 yards) of the vessel when propellers are re-engaged, thus minimizing risk of marine mammal injury.

m. Vessels shall not exceed speeds of 10 knots in order to reduce potential whale strikes.

n. Vessels should take reasonable steps to alert other vessels in the vicinity of whale(s).

o. Vessels will not allow tow lines to remain in the water, and no trash or other debris will be thrown overboard, thereby reducing the potential for marine mammal entanglement.

p. The applicant will implement measures to minimize risk of spilling hazardous substances as a result of accidentally striking ice, reefs, rocks or submerged objects. These measures will include: avoiding operation of watercraft in the presence of sea ice to the extent practicable and using fully-operational vessel navigation systems composed of radar, chartplotter, sonar, marine communication systems, and satellite navigation receivers, as well as Automatic Identification System (AIS) for vessel tracking.

5. Special considerations of North Pacific Right Whales and their critical habitat
    a. Vessels will maneuver to keep at least 500 yards away from any observed North Pacific right whale (NPRW) and avoid approaching whales head-on consistent with vessel safety.
    b. Relative to designated NPRW critical habitat, project vessels will either:
        i. Avoid transiting through designated NPRW whale critical habitat (73 FR 19000); or
        ii. If transit through NPRW critical habitat cannot be avoided:
            1. In the absence of on-duty PSOs or trained crew members, travel at speeds of 5 knots (kn) or less within the boundaries of designated North Pacific right whale critical habitat; or
            2. With the presence of PSOs or trained crew members, vessels may travel at speeds of 10 kn (or less) while traveling within the boundaries of designated North Pacific right whale critical habitat.
                a. PSOs or trained crew members will maintain a constant watch for listed species from the bridge or other similar vantage points.
                b. PSOs or trained crew members will maintain direct contact with the vessel pilot, advising the pilot/operator of the position of all observed listed species as soon as they are observed.
        iii. Operators will maintain a ship log indicating the time and geographic coordinates at which vessels enter and exit NPRW critical habitat.
6. Bowhead Whale-Specific Mitigation Measures
    a. Project-related in-water sound above 120 decibels will not occur during the fall bowhead whale migration.
    b. Aircraft will maintain a 3,000 feet (914 meters) altitude while flying over marine waters that are not part of a barrier island/lagoon system during the bowhead whale migration in (spring migration, April 1 through June 30) and fall (August 1 to October 31).
7. Special Considerations of Steller sea lions and their critical habitat

   a. Vessels will not approach within 5.5 km (3 nm) of designated critical habitat for Steller sea lion rookeries west of 144° W longitude (50 CFR § 224.103(d) and 226.202(a)).

8. Protected Species Observer Requirements
   a. PSOs must:
      i. Be in good physical condition and be able to withstand harsh weather conditions for an extended period of time;
      ii. Must have vision correctable to 20-20;
      iii. Have the ability to effectively communicate orally, by radio and in person, with project personnel;
      iv. Have prior experience collecting field observations and recording field data accurately according to project protocols;
      v. Be able to complete data entry forms accurately;
      vi. Be able to identify marine mammals in Alaska to species;
      vii. Be able to identify, classify, and record marine mammal behavior; and
      viii. Have technical writing skills sufficient to create understandable reports of observations.
   b. PSOs will complete will complete on-the-job or project specific training prior to deployment to the project site. The training will include:
      i. Field identification of marine mammals and marine mammal behavior;
      ii. Ecological information on Alaska's marine mammals and specifics on the ecology and management concerns of those marine mammals;
      iii. Overview of applicable ESA and MMPA regulations;
      iv. Mitigation measures outlined in this Biological Opinion;
      v. Proper equipment use;
      vi. Methodologies in marine mammal observation and data recording and proper reporting protocols; and
      vii. PSO roles and responsibilities.
   c. PSOs will have the ability to effectively communicate orally, by radio and in person, with project personnel to provide real-time information on listed species.
   d. PSOs will have the ability and authority to order appropriate mitigation response to avoid takes of all listed species.
   e. The PSOs will have the following equipment to address their duties:
      i. Tools which enable them to accurately determine the position of a marine mammal in relationship to the shutdown zone (e.g. range finder, compass);
      ii. Two-way radio communication, or equivalent, with onsite project

manager;

iii. Appropriate personal protective equipment;

iv. Daily tide tables for the project area;

v. Watch or chronometer;

vi. Binoculars (7x50 or higher magnification) with built-in rangefinder or reticles (rangefinder may be provided separately);

vii. Handheld global positioning system;

viii. A copy of these mitigation measures, and if applicable, the Marine Mammal Monitoring and Mitigation Plan, printed on waterproof paper and bound; and

ix. Observation record forms printed on waterproof paper, or weatherproof electronic device allowing for required PSO data entry.

f. PSOs will work in shifts lasting no longer than 4 hours with at least a 1-hour break from marine mammal monitoring duties between shifts. PSOs will not perform PSO duties for more than 12 hours in a 24-hour period.

g. PSOs will have no other primary duties beyond watching for, acting on, and reporting events related to marine mammals.

h. Prior to commencing in-water work or at changes in watch, PSOs will establish a point of contact with the project crew. The PSO will brief the point of contact as to the shutdown procedures if listed species are observed within or likely to enter the shutdown zone, and shall request that the point of contact instruct the crew to notify the PSO when a marine mammal is observed. If the point of contact goes "off shift" and delegates their duties, the PSO must be informed and brief the new point of contact.

9. Aircraft

a. Except during takeoff and landing and in emergency situations, all aircraft will transit at an altitude of 1,500 feet (457 meters) or higher while maintaining Federal Aviation Administration flight rules (e.g., avoidance of cloud ceiling, etc.). If flights must occur at altitudes less than 1,500 feet due to environmental conditions, aircraft will make course adjustments, as needed, to maintain at least a 1,500 foot (457 meters) horizontal separation from all observed marine mammals.

b. Helicopter flights shall minimize travel over marine waters. Aircraft will not hover or circle above or within 1,500 feet (457 meters) of groups of marine mammals.

c. If ice over-flights or similar repeated aerial surveys are conducted, a PSO shall be stationed aboard all flights and will document all marine mammal sightings.

d. Aircraft shall avoid flying over polynyas (open-water surrounded by ice) and along ice margins to minimize potential disturbance to whales.

e. Aircraft will remain at least 1 nautical mile (1.9 kilometers) from groups of 3 or more marine mammals.

f. Aircraft will not land on ice within 1 nautical mile (1.9 kilometers) of hauled out pinnipeds.

10. Trash and Debris

    a. All personnel will be responsible for cutting all unused packing straps, plastic rings, and other synthetic loops that have the potential to become entangled around fish or wildlife.

11. Arctic-Specific Mitigation Measures

    a. If the construction or remediation of the MTI or STP occurs during open water season, a sound source verification study will be done to determine the extent of sound transmission. Appropriate shutdown zones will be determined at that time and PSOs will monitor the zone appropriately. All activities will be conducted at least 150 m (500 ft) from any observed ringed seal lair.

2.2.4.1 Ice Road and Ice Trail Best Management Practices

The following mitigation measures apply to best management practices and monitoring activities for sea ice roads and sea ice trails. A sea ice road and a sea ice trail are defined as follows:

Sea Ice Road: An ice road is constructed to provide a route across sea ice; improved ice roads can be used by any wheeled vehicle, such as pick-up trucks, SUVs, buses, and other trucks to transport personnel and equipment to and from the site during the ice-covered period. Snow is cleared and graded, and then holes are drilled in the ice to pump seawater across the surface until the desired thickness is achieved.

Sea Ice Trail: a route across sea ice created, used, and maintained by equipment such as Tuckers, PistenBullys, snow machines, or similar tracked equipment. Sea ice trails do not require seawater flooding.

These BMPs and monitoring activities are organized into the following categories:

Section 1: Wildlife Training

Section 2: General BMPs Implemented throughout the Ice Road/Trail Season

Section 3: BMPs Implemented Before **March 1st**

Section 4: BMPs Implemented After **March 1st**

Section 5: Data Collection for Ice Covered Season

Section 6: Reporting

Section 1: Wildlife Training

Prior to initiation of sea ice road- and ice trail-related activities, project personnel associated with ice road construction, maintenance, use, or decommissioning (i.e., ice road construction workers, surveyors, security personnel, and the environmental team) will receive annual training on these BMPs. Personnel are advised that interactions with, or approaching, any wildlife is prohibited.

Annual training also includes reviewing the lessee's Wildlife Management Plan. In addition to the BMPs, other topics in the training will include:

1. Ringed seal identification and life history
2. Physical environment (habitat characteristics and how to identify potential habitat)
3. Ringed seal use in the ice road region (timing, location, habitat use, birthing lairs, breathing holes, basking, etc.)
4. Potential effects of disturbance
5. Importance of lairs, breathing holes, and basking to ringed seals
6. Brief summary of applicable laws and regulatory requirements including:
    a. Marine Mammal Protection Act (MMPA)
    b. Endangered Species Act (ESA)

Section 2: General BMPs Implemented Throughout the Ice Road/Trail Season

General BMPs will be implemented through the entire ice road/trail season including during construction, maintenance, use, and decommissioning. Ice road/trail/pad construction occurs from approximately December 1st to mid-February and operations and maintenance generally occur from mid-February through mid- to late May. Ringed seals begin to establish lairs in late March. Prior to establishing lairs, ringed seals are mobile and are expected to generally avoid the ice roads/trails and construction activities. Therefore, ice road/trail/pad construction will be initiated no later than March 1st to reduce the potential for disturbance to ringed seal birth lairs or dens.

1. Ice road/trail speed limits will be no greater than 45 miles per hour (mph); speed limits will be determined on a case-by-case basis based on environmental conditions, road conditions and ice road/trail longevity considerations. Travel on ice roads and trails will be restricted to authorized personnel.
2. Following existing safety measures for <u>ice roads</u>, delineators will mark the roadway at ¼-mile increments (or more frequently) on <u>both sides</u> of the ice road to delineate the path of vehicle travel and areas of planned on-ice activities (e.g., emergency response exercises). Following existing safety measures currently used for <u>ice trails</u>, delineators will mark <u>one side</u> of an ice trail at ¼ mile increments (or more frequently) Delineators will be color-coded, following existing safety protocol, to indicate the direction of travel and location of the ice road or trail.
3. Corners of rig mats, steel plates, and other materials used to bridge sections of hazardous ice, will be clearly marked and mapped using GPS coordinates of the locations.
4. Project personnel will be instructed that approaching or interacting with ringed seals or any other marine mammal is prohibited.

5. Personnel will be instructed to remain in the vehicle and continue uninterrupted travel if they encounter a ringed seal or any other marine mammal while driving on the road.
6. If a ringed seal is observed within 150 feet (46 meters) of the center of an ice road or trail, the operator's Environmental Specialist will be immediately notified with the information provided in the Reporting section below.
   a) The location of the seal will be indicated with a visible marker. The marker will be placed a distance of at least 50 feet (15 meters) from the seal.
   b) The Environmental Specialist will relay the seal sighting location information to all ice road personnel and the company's office personnel responsible for wildlife interaction, following notification protocols described in the company-specific Wildlife Management Plan. All other data regarding the seal will be recorded and logged.
   c) The Environmental Specialist or designated person will monitor the ringed seal to document the animal's location relative to the road/trail. All work that is occurring when the ringed seal is observed and the behavior of the seal during those activities will be documented until the animal is at least 150 feet (46 meters) away from the center of the road/trail or is no longer observed.
   d) The Environmental Specialist or designated person will contact appropriate state and federal agencies as required (see specific Wildlife Plans for notification details).

Section 3: BMPs Implemented Prior To March 1st

Winter sea ice road/trail construction and use will begin prior to March 1st (typically December 1st through mid-February), before the time when female ringed seals establish birth lairs. Prior to establishing lairs, ringed seals are mobile and are expected to generally avoid the ice roads/trails and construction activities.

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

Section 4: BMPs Implemented After March 1st

After March 1st, and continuing until decommissioning of ice roads/trails, the on-ice activities mentioned above (e.g., ice trail construction and maintenance, spill training exercises, and other exercises Section 3) can occur anywhere on sea ice where water/ice depth is less than 10 feet (3 meters) at MLLW (i.e., habitat is not suitable for ringed seal lairs). However, if the water and ice is greater than 10 feet (3 meters) in depth at MLLW, these activities will only occur within the boundaries of the driving lane or shoulder area of the ice road/trail.

In addition to the general BMPs, the following BMPs will also be implemented after March 1st:

1. Ice road/trail construction, maintenance, and decommissioning will be performed within the boundaries of the road/trail and shoulders. To the extent practicable

and when safety of personnel is ensured, travel will be restricted to within the driving lane and shoulder areas.

2. Blading and snow blowing of ice roads will be limited to the previously disturbed ice road/shoulder areas to the extent safe and practicable.
3. In the event snow is accumulating on a road within a 150 foot (46 meters) radius of an identified downwind seal or seal lair, operational measures will be used to avoid seal impacts, such as pushing snow further down the road before blowing it off the roadway. Vehicles will not stop within 150 feet (46 meters) of identified seals or within 500 feet (152 meters) of known seal lairs.
4. Tracked vehicle operation will be limited to the previously disturbed ice trail areas when safety of personnel can be ensured. New ice trails will be constructed after March 1 only to address human safety concerns. In those instances, construction activities will be conducted only during daylight hours with good visibility. Ringed seals and their breathing holes and lairs shall be avoided by a minimum of 150 feet (46 meters). Any observed ringed seal structures will be reported following BMP Section 2, #6 (General BMPs Implemented Throughout the Ice Road/Trail Season), above. Once the new ice trail is established, tracked vehicle operation will be limited to the disturbed area to the extent practicable.
5. If an ice road or trail is being used during daylight conditions with good visibility, a dedicated observer (not the vehicle operator) will conduct a survey along the sea ice road/trail to determine whether ringed seals are within 500 feet (152 meters) of the roadway corridor. The following survey protocol will be implemented:
   a) Surveys will be conducted every other day during daylight hours. Survey protocol consists of driving the ice road/trail and stopping every ½ mile to observe the exposure area for approximately 5 minutes on either side of the corridor to check for the presence of seals.
   b) Observers for ice road activities need not be trained Protected Species Observers (PSOs), but they must have received the training described in Section 1, have read, and understand the applicable sections of the Wildlife Management Plan. In addition, they must be capable of 1) detecting, observing and monitoring ringed seal presence and behaviors, and 2) accurately and completely recording data.
   c) Observers will have no other primary duty than to watch for and report observations related to ringed seals during this survey. If weather conditions become unsafe, or visibility degrades to less than 500 feet (152 meters), the survey may be suspended until conditions improve.
6. If a seal is observed on ice within 150 feet of the centerline of the ice road/trail, BMP Section 2, measure #6 above (General BMPs Implemented Throughout the Ice Road/Trail Season) shall be initiated and:
   a) Construction, maintenance or decommissioning activities associated with ice roads and trails will not occur within 150 feet (46 meters) of the observed

ringed seal, but may proceed as soon as the ringed seal, of its own accord, moves farther than 150 feet (46 meters) from the activities or has not been observed within that area for at least 24 hours. Transport vehicles (i.e., vehicles not associated with construction, maintenance or decommissioning) may continue operating within the designated road/trail provided they do not stop within 150 feet (46 meters) of any seal.

7. If a ringed seal structure (i.e., breathing hole or lair) is observed within 150 feet (46 meters) of the ice road/trail, the location of the structure will be reported to the lessee's Environmental Specialist who will then carry out notification protocols identified in BMP Section 2, measure #6 above (General BMPs Implemented Throughout the Ice Road/Trail Season), and:
   a) If a seal creates a breathing hole near a road or if it is determined that a breathing hole near (≤ 150 ft 46 m) a road is being used, a markers will be placed on the road before and after the site in such a way to alert passing vehicles; vehicles shall not stop near the breathing hole.
   b) Construction, maintenance, or decommissioning work will proceed following all other BMPs to minimize impacts or disturbance in the area.

Section 5: Data Collection

The Environment Specialist, or designated person, will record the following information during survey efforts and sighting events:

1. The date and start/stop time for each survey including effort in total number of hours of observation. This will include a summary of environmental conditions such as visibility that can affect ringed seal or lair detection;
2. Date and time of each significant event (e.g., seal or seal structure sighting) and subsequent monitoring;
3. Date, time, and duration for each sighting event;
4. Number of animals per sighting event; and number of adults/juveniles/pups per sighting event;
5. Primary, and, if observed, secondary behaviors of seals in each sighting event;
6. Geographic coordinates for the observed animals or structure (breathing hole or lair), with the position recorded by using the most precise coordinates practicable (coordinates must be recorded in decimal degrees, or similar standard, and defined coordinate system); and
7. Mitigation measures implemented to minimize impacts

Section 6: Reporting

1. An annual monitoring report shall be submitted to NMFS AKR after the end of the ice road/ice trail/ice pad season. This report shall summarize the activities during ice road/trail/pad construction, maintenance, use, and de-commissioning that occurred that year, as well as data and records associated with all ringed seal observations and

monitoring. This report should be submitted with (and consistent with the requirements for) the final reports required under *Data Collection and Reporting Requirements* (Section 2.2.2.3below).

2. If a seal is observed within 50 meters (164 feet) or a seal structure (i.e., breathing hole or lair) is observed within 150 meters (about 500 feet) of the roadway during ice road/trail activities or the edge of the ice pad or on the ice pad, then notification to the Environmental Specialist and other staff and agency personnel will be undertaken as described in Section 5 above.
3. Annual and final reports will be submitted via electronic mail to the NMFS AKR Protected Resources Division at AKR.section7@noaa.gov. (Table 3).
4. Digital, queryable documents containing all observations and records, and digital, queryable reports will be submitted to the NMFS AKR Protected Resources Division at AKR.section7@noaa.gov. (Table 3).

2.2.4.2 Arctic Spill Response

This mitigation measure applies to lessees 1) obtaining equipment, materials, or services transported by sea, and 2) building, operating, or decommissioning facilities or infrastructure located in an area where an oil spill could enter the marine environment.

Lessees will submit oil spill response plans (OSRPs) in accordance with appropriate agencies. The OSRP must address all aspects of oil spill response readiness, including an analysis of potential spills and spill response strategies; type, location, and availability of appropriate oil spill equipment; response times and equipment capability for the proposed activities; and response drills and training requirements.

In the event of an oil spill incident, the Incident Command System (ICS) will provide the on-scene management structure that guides response efforts. The responsible party (RP) will be prepared to support response efforts as part of ICS. Under the ICS structure, the operator will coordinate with the appropriate authorities within NMFS including the Regional Stranding Coordinator (RSC) or Headquarters Marine Mammal Health and Stranding Response Program (MMHSRP) staff (or their designee), to comply with the response effort in accordance with stranding agreements (SA) as described here and in NOAA's Marine Mammal Oil Spill Response Guidelines. The North Slope Borough Department of Wildlife Management (NSBDWM) holds an SA and is the appropriate regional point of contact in this region. The Alaska SeaLife Center (ASLC) is currently the only Oiled Wildlife Response Organization (OWRO) in Alaska that is permitted to clean and rehabilitate oiled wildlife under NMFS's jurisdiction.

1. Preparedness and Response Standards and Thresholds (Initial Immediate Response)
   Samples: In coordination with NMFS, Oil Spill Removal Organizations (OSROs), OWROs, and SA holders, the RP will be prepared to sample 50 live or dead pinnipeds (i.e., bearded seal, harbor seal, ribbon seal, ringed seal, spotted seal, northern fur seal, and/or Steller sea lion) during the first week following a spill incident, as well as prepared to sample 5 live or dead cetaceans (i.e., whales and porpoise) the first week. After the first week, the RP has the responsibility to

fund the storage of carcasses, fund transport to approved facilities for analysis, and fund additional sampling or any live or dead pinnipeds or cetaceans. Sampling shall be performed by an individual or entity approved under the NMFS Marine Mammal Health and Stranding Permit #18786.

a) Necropsy: In coordination with NMFS, OSROs, and SA holders, the RP will be prepared to fund and support the necropsy of 50 dead pinnipeds and/or cetaceans by individuals authorized by NMFS. Necropsies shall be performed and samples stored by an individual or entity approved under the NMFS Marine Mammal Health and Stranding Permit #18786. If mortalities exceed 50 animals, the RP has the responsibility to fund the storage of carcasses and fund transport to approved facilities for analysis.

b) Sample storage: Maintain a level of readiness to store 1,000 marine mammal samples, which likely includes multiple samples from individual animals, and therefore, does not represent 1,000 animals. Samples shall be stored by an individual or entity approved under NMFS Marine Mammal Health and Stranding Permit #18786.

c) Cleaning/rehabilitation threshold: The following thresholds apply for live moribund animals whose condition can withstand transport.

   1) *Pinnipeds:* The RP should maintain a level of readiness for 25 live pinnipeds to be cleaned and rehabilitated in coordination with NMFS, OSROs, and SA holders.

      i. This applies to bearded, ringed, ribbon, spotted, harbor, and northern fur seals and Steller sea lions. However, capturing and cleaning oiled adult Steller sea lions is generally not feasible given their size and the difficulties in their collection and transport, as well as danger to response personnel.

      ii. It may not be feasible to capture oiled northern fur seals. Human safety must be a primary consideration as it may be dangerous to response personnel to capture oiled fur seal pups because of territorial bulls, and oiled adult fur seals would be extremely dangerous to handle, even if partially debilitated. Also, separating a pup from its mother temporarily may lead to abandonment.

      iii. Authorized responders will use approved cleaning protocols and practices by species, which can be found in the Wildlife Protection Guidelines in the Alaska Unified Response Plan and NMFS National Marine Mammal Oil Spill Guidelines.

      iv. All cleaned pinnipeds must be tagged by approved OWROs prior to release to monitor survival. Release of rehabilitated oiled wildlife will be coordinated with NMFS.

   2) *Cetaceans:* The RP should maintain a level of readiness for two live small cetaceans (e.g., young beluga whale, young killer whale, or porpoise) to be cleaned and rehabilitated. As stated in NOAA Marine

Mammal Response Guidelines, depending on the size and health of oiled cetaceans, euthanasia may be considered if rehabilitation is not in the best interest of the oiled animals.

2. Readiness Time Horizon

   a) Maintain readiness for additional sampling, necropsies, sample storage, and cleaning/rehabilitation for up to one year post-spill.

   b) After the official closure of a spill response, RPs should remain prepared to support NMFS and wildlife response organizations to respond to oil-affected marine mammals under NMFS jurisdiction.

   c) Authority

      1) Response authority for oiled marine mammals under NMFS jurisdiction is always retained by NMFS, and interventions can be authorized only by NMFS on a case by case basis. During a spill, authority to respond to oiled marine mammals may be granted under the NMFS Marine Mammal Health and Stranding Response Permit #18786 issued to Dr. Teri Rowles and her authorized NMFS Co-Investigators. Pre-authorization is not a component of this response structure.

      2) In the future, NMFS plans to add a spill response component to language in Regional Stranding Agreements, which would allow agreement holders to respond to non-ESA listed MMPA species in the event of an oil spill. Response to ESA-listed marine mammals would still require authorization under NMFS permit #18786 as specified above.

3. Spill Response Network Model

   a) Preparedness and response shall be led through a NMFS approved contractor (e.g., ASLC) under U.S. Coast Guard's OSRO program, after obtaining authorization through NMFS permit #18786. NMFS will provide guidance regarding: 1) marine mammal response standards, 2) training requirements, and 3) regulatory pathways for response authorizations (e.g., authorizing marine mammal responses pursuant to NMFS permit #18786). NMFS will maintain contact information on trained stranding network members and Incident Command System staff. NMFS-approved wildlife responders will facilitate preparedness for the stranding network as a primary field response participant, along with trained stranding network members. OSROs will need to work with NMFS-approved wildlife response organizations to ensure preparedness levels are sufficient for a rapid response to oiled marine mammal under NMFS jurisdiction. Currently, NMFS does not have the in-house capacity to lead field efforts, so will act in a guidance and oversight capacity through the Wildlife Protection Branch.

Data Collection and Reporting Requirements

1. Data Collection
    a. PSOs will record observations on data forms or into electronic data sheets. Electronic copies will be submitted to NMFS along with data in a digital spreadsheet or database format with the final report.
    b. PSOs will record the following:
        i. The date, location, and start and stop time for each PSO shift, along with a unique PSO identifier;
        ii. Date and time of each significant event (e.g., a marine mammal sighting, operation shutdown, lair discovery);
        iii. Weather parameters (e.g., percent cloud cover, percent glare, visibility) and sea state where the Beaufort Wind Force Scale will be used to determine sea-state (https://www.weather.gov/mfl/beaufort);
        iv. Species numbers, and, if possible, sex and age class of observed marine mammals, along with the date, time, and location of the marine mammal observation;
        v. The predominant sound-producing activities occurring during each marine mammal sighting;
        vi. Marine mammal behavior patterns observed, including bearing and direction of travel;
        vii. Behavioral reactions of marine mammals just prior to, or during, sound producing activities;
        viii. Initial, closest, and last location of marine mammals, including distance from observer to the marine mammal, and distance from the predominant sound-producing activity or activities to marine mammals;
        ix. Whether the presence of marine mammals necessitated the implementation of mitigation measures, and the duration of time that normal operations were affected by the presence of marine mammals; and
        x. Geographic coordinates for the observed animals, with the position recorded by using the most precise coordinates practicable (coordinates must be recorded in decimal degrees, or similar standard and defined coordinate system).
2. Unauthorized Take
    a. If a listed marine mammal is determined by the PSO to have been taken in a manner or to an extent other than that which has been authorized, that take must be reported to NMFS within one business day to NMFS AKR (Table 3). These PSO records must include:
        i. Information specified in Mitigation Measure 1, Section 2.2.4.3);
        ii. Number and species of listed animals affected;

iii. The date, time, and location of each event (provide coordinates: latitude/longitude);

iv. The cause/description of the event;

v. The time the animal(s) were first observed or entered the monitoring zone, and, if known, the time the animal was last seen or exited the zone, including the fate of the animal;

vi. Mitigation measures implemented prior to and after the animal was taken;

vii. If a vessel strike, the contact information for PSO on duty, ship's Pilot, or ship's Captain at time of collision; and

viii. Photographs or video footage of the animal(s) (if available).

3. North Pacific Right Whale (NPRW) Reporting
   a. Sightings of NPRW (within or outside of NPRW critical habitat) shall be reported to NMFS within 24 hours. These sighting reports will include the following information:
      i. Date, time, and geographic coordinates of the sighting(s);
      ii. Number of animals observed per sighting event;
      iii. Number of adults/juveniles/calves per sighting event (if determinable), and
      iv. Because sightings of North Pacific right whales are uncommon, and photographs that allow for identification of individual whales from markings are extremely valuable, photographs will be taken if feasible, but in a way that does not involve disturbing the animal (e.g., if vessel speed and course changes are not otherwise warranted, they will not take place for the purpose of positioning a photographer to take better photos). Photographs taken of North Pacific right whales will be submitted to NMFS AKR (Table 3).
   b. When project vessels are travelling through North Pacific right whale critical habitat in a manner that requires the use of PSOs (see Mitigation Measure 5, Section 2.2.4), PSOs will collect, organize, and report on vessel travel within NPRW critical habitat and marine mammal observations that occur within that critical habitat. These reports will be submitted to NMFS AKR (Table 3) by the end of the every calendar year or 90 days after transit during which observations were made. The report will outline the following information:
      i. Ship logs (time and location for when a vessel entered and exited North Pacific right whale critical habitat);
      ii. Species, date, and time for each observation;
      iii. Number of animals per sighting event; and number of adults/juveniles/calves per sighting event (if determinable);
      iv. Geographic coordinates for the observed animals, with the position

recorded by using the most precise coordinates practicable (coordinates must be recorded in decimal degrees, or similar standard (and defined) coordinate system);

v. Environmental conditions as they existed during each sighting event, including sea conditions, weather conditions, visibility (km/mi), lighting conditions, and percent ice cover;

vi. Documentation of vessel route through critical habitat; and

vii. Photographs and video obtained.

c. Ice Seal Reporting

i. A final end-of-season report compiling all marine mammal observations will be submitted to NMFS Alaska Region Protected Resources Division (Table 3) within 90 days of decommissioning the ice road/trail. The report will include:

1. Date, time, and location of observation;
2. Ice seal characteristics (i.e., species, adult or pup, behavior [avoidance, resting, etc.]);
3. Activities occurring during observation including equipment being used and its purpose, and approximate distance to seal(s);
4. Actions taken to mitigate effects of interaction emphasizing: 1) which BMPs were successful; 2) which BMPs may need to be improved to reduce interactions with ringed seals; 3) the effectiveness and practicality of implementing BMPs; 4) any issues or concerns regarding implementation of BMPs; and 5) potential effects of interactions based on observation data;
5. Proposed updates (if any) to Wildlife Management Plan(s) or BMPs; and
6. Reports must be able to be queried for information.

d. Stranded, Injured, Sick, or Dead Marine Mammal (not associated with the project)

i. If PSOs observe an injured, sick, or dead marine mammal (i.e., stranded marine mammal), they shall notify the Alaska Marine Mammal Stranding Hotline at 877-925-7773. The PSOs will submit photos and data that will aid NMFS in determining how to respond to the stranded animal. Data submitted to NMFS in response to stranded marine mammals will include date/time, location of stranded marine mammal, species and number of stranded marine mammals, description of the stranded marine mammal’s condition, event type (e.g., entanglement, dead, floating), and behavior of live-stranded marine mammals.

e. Oil Spill Response

i. In the event of an oil spill in the marine environment, the permittees shall immediately report the incident to: the U.S. Coast Guard 17th District

Command Center at 907-463-2000, and NMFS AKR, Protected Resources Division Oil Spill Response Coordinator at 907-586-7630 and/or email (sadie.wright@noaa.gov) (Table 3).

f. Illegal Activities

   i. If PSOs observe marine mammals being disturbed, harassed, harmed, injured, or killed (e.g., feeding or unauthorized harassment) not related to project activities, these activities will be reported to NMFS Alaska Region Office of Law Enforcement (Table 3). Data submitted to NMFS will include date/time, location, description of the event, and any photos or videos taken.

g. Monthly Report

   i. Monthly reports will be submitted via email to NMFS AKR (Table 3) for all months with project activities by the 15th of the month following the monthly reporting period. For example, for the monthly reporting period of June 1-30, the monthly report must be submitted by July 15th. The monthly report will contain and summarize the following information:

      1. Effects analyses of the project activities on listed marine mammals;

      2. Number of marine mammals observed (by species) during periods with and without project activities (and other variables that could affect detectability);

      3. Initial location of each marine mammal sighting and closest point of approach of each marine mammal to the (specified) sound source.

      4. Observed marine mammal behaviors and movement types versus project activity at time of sighting;

      5. Numbers of marine mammal sightings/individuals seen versus project activity at time of sighting;

      6. Distribution of marine mammals around the action area versus project activity at time of sighting;

      7. Digital queryable documents containing PSO observations and records, and digital, queryable reports.

   ii. Submit interim monthly marine mammal monitoring reports, including data sheets. These reports must include a summary of marine mammal species and behavioral observations, shutdowns or delays, and work completed.

h. Annual Report

   i. Within 90 calendar days of the cessation of in-water and on-ice work each year, a comprehensive annual report will be submitted to NMFS AKR for review. The report will synthesize all sighting data and effort during each activity for each year:

1. Summaries of monitoring effort including total hours, total distances, and marine mammal distribution through the study period, accounting for sea state and other factors affecting visibility and detectability of marine mammals.
2. Analyses of the effects of various factors that may have influenced detectability of marine mammals (e.g., sea state, number of observers, fog/glare, and other factors as determined by the PSOs).
3. Species composition, occurrence, and distribution of marine mammal sightings, including date, water depth, numbers, age/size/gender categories (if determinable), group sizes, and ice cover.
    a. Effects analyses of the project activities on listed marine mammals;
    b. Number of marine mammals observed (by species) during periods with and without project activities (and other variables that could affect detectability);
    c. Initial, closest, and last marine mammal sighting distances versus project activity at time of sighting;
    d. Observed marine mammal behaviors and movement types versus project activity at time of sighting;
    e. Numbers of marine mammal sightings/individuals seen versus project activity at time of sighting;
    f. Distribution of marine mammals around the action area versus project activity at time of sighting; and
    g. Digital, queryable documents containing PSO observations and records, and digital, queryable reports.

i. Final Report
    i. In addition to providing NMFS monthly and annual reporting of marine mammal observations and other parameters described above, lessees will provide NMFS AKR, within 90 days of project completion, a report of all parameters listed in the monthly and annual report requirements above, noting also all operational shutdowns or delays necessitated due to the proximity of marine mammals. NMFS AKR will provide comments within 30 days after receiving this report, and the lessees must address the comments and submit revisions within 30 days after receiving NMFS comments. If no comments are received from the NMFS within 30 days, the final report is considered as final.

Table 3. Summary of Agency Contact Information

Reason for Contact	Contact Information
Consultation Questions & Unauthorized Take	Greg Balogh: greg.balogh@noaa.gov Marilyn Myers: Marilyn.myers@noaa.gov and Jon Kurland: jon.kurland@noaa.gov
Reports & Data Submittal	AKR.section7@noaa.gov (please include NMFS AKRO tracking number in subject line)
Stranded, Injured, or Dead Marine Mammal *(not related to project activities)*	Stranding Hotline (24/7 coverage) 877-925-7773
Oil Spill & Hazardous Materials Response	U.S. Coast Guard National Response Center: 1-800-424-8802 (or U.S. Coast Guard 17th District Command Center: 907-463-2000) & NMFS AKR Protected Resources Oil Spill Response Coordinator: 907-586-7630 AKRNMFSSpillResponse@noaa.gov and/or Sadie.wright@noaa.gov
Illegal Activities *(not related to project activities; e.g., feeding, unauthorized harassment, or disturbance to marine mammals)*	NMFS Office of Law Enforcement (AK Hotline): 1-800-853-1964
In the event that indicated contact information becomes obsolete, call:	NMFS Anchorage Main Office: 907-271-5006 Or NMFS Juneau Main Office: 907-586-7236

2.3 Action Area

"Action area" means all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02). For this reason, the action area is typically larger than the project area and extends out to a point where no measurable effects from the proposed action occur.

The NPR-A is located on the North Slope of Alaska (Figure 1). With nearly 22.8 million surface and subsurface acres under federal jurisdiction, it is the largest block of public land in the United States. Although most of the NPR-A is terrestrial, approximately 429,000 acres are in marine bays, inlets, and lagoons of the Chukchi and Beaufort seas. In most of the NPR-A, the administrative boundary is the coastline. However, inland waters between barrier islands and the coastline in Kassegaluk Lagoon, Peard Bay, Wainwright Inlet, Elson Lagoon, Admiralty Bay, and Dease Inlet are also part of the NPR-A and in these areas the administrative boundary is the barrier islands. For the purposes of this consultation the action area includes all federal and non-federal lands and waters within the NPR-A boundaries and adjacent marine waters extending into the Beaufort and Chukchi seas to the ten foot bathymetry line (Figure 1 and Figure 5). Included in the action area is a marine transportation route (MTR) between Dutch Harbor and the NPR-A.

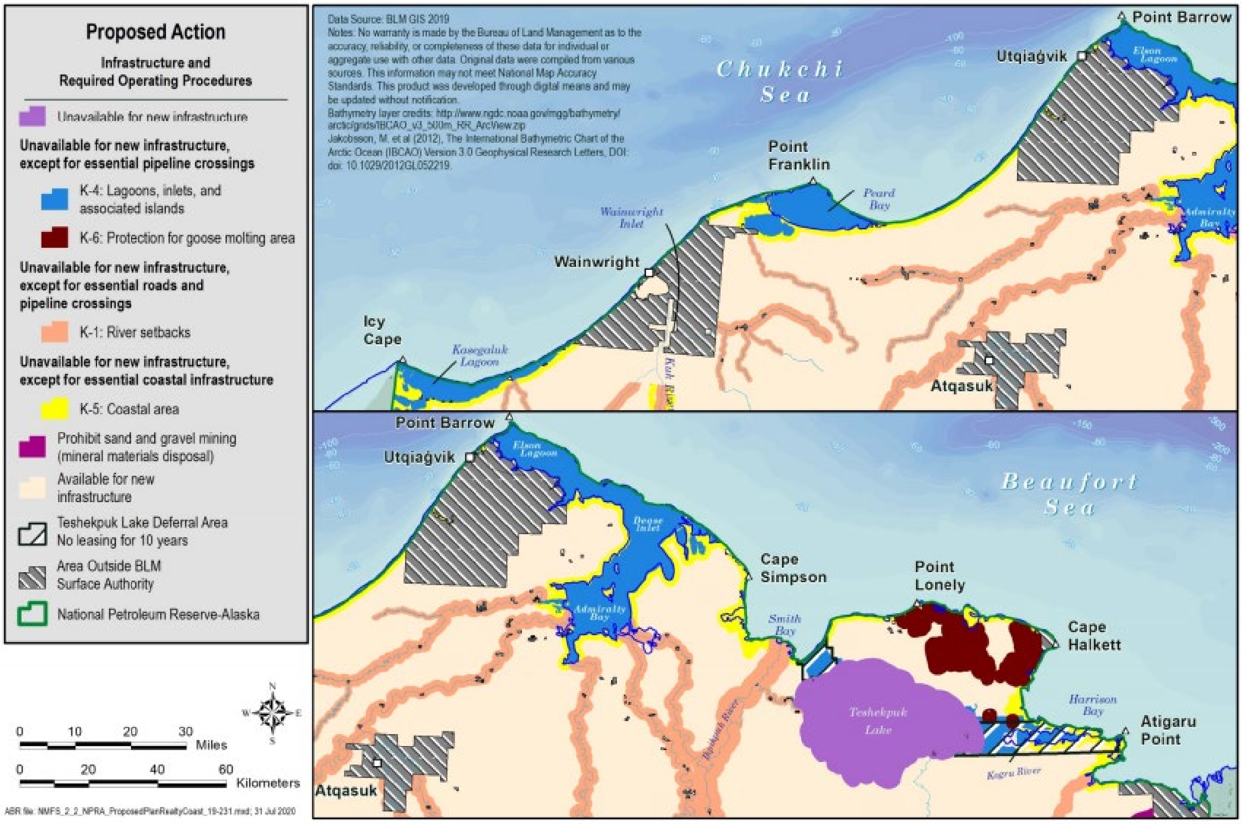

Figure 5. Expanded view of the coastal areas of NPR-A. Yellow line represents the one-mile coastal area setback.

3 APPROACH TO THE ASSESSMENT

Section 7(a)(2) of the ESA requires Federal agencies, in consultation with NMFS, to ensure that their actions are not likely to jeopardize the continued existence of endangered or threatened species, or adversely modify or destroy their designated critical habitat. The jeopardy analysis considers both survival and recovery of the species. The adverse modification analysis considers the impacts to the conservation value of the designated critical habitat.

To jeopardize the continued existence of a listed species means to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species (50 CFR § 402.02). As NMFS explained when it promulgated this definition, NMFS considers the likely impacts to a species' survival as well as likely impacts to its recovery. Further, it is possible that in certain, exceptional circumstances, injury to recovery alone may result in a jeopardy biological opinion (51 FR 19926, 19934; June 3, 1986).

Under NMFS's regulations, the destruction or adverse modification of critical habitat means a direct or indirect alteration that appreciably diminishes the value of critical habitat as a whole for the conservation of a listed species (50 CFR § 402.02).

The designations of critical habitat for North Pacific right whales and Steller sea lions use the term primary constituent element (PCE) or essential features. The 2016 critical habitat regulations (81 FR 7414; February 11, 2016) replaced this term with physical or biological features (PBFs). The shift in terminology does not change the approach used in conducting a "destruction or adverse modification" analysis, which is the same regardless of whether the original designation identified PCEs, PBFs, or essential features. In this biological opinion, we use the term PBF to mean PCE or essential feature, as appropriate for the specific critical habitat.

We use the following approach to determine whether the proposed action described in Section 2 of this opinion is likely to jeopardize listed species or destroy or adversely modify critical habitat:

- Identify those aspects (or stressors) of the proposed action that are likely to have effects on listed species or critical habitat. As part of this step, we identify the action area – the spatial and temporal extent of these effects.
- Identify the rangewide status of the species and critical habitat likely to be adversely affected by the proposed action. This section describes the current status of each listed species and its critical habitat relative to the conditions needed for recovery. We determine the rangewide status of critical habitat by examining the condition of its PBFs - which were identified when the critical habitat was designated. Species and critical habitat status are discussed in Section 4 of this opinion.
- Describe the environmental baseline including: past and present impacts of Federal, state, or private actions and other human activities *in the action area*; anticipated impacts of proposed Federal projects that have already undergone formal or early section 7 consultation, and the impacts of state or private actions that are contemporaneous with the consultation in process. The environmental baseline is discussed in Section 5 of this opinion.
- Analyze the effects of the proposed action. Identify the listed species that are likely to co-occur with these effects in space and time and the nature of that co-occurrence (these represent our *exposure analyses*). In this step of our analyses, we try to identify the number, age (or life stage), and gender of the individuals that are likely to be exposed to stressors and the populations or subpopulations those individuals represent. NMFS also evaluates the proposed action's effects on critical habitat PBFs. The effects of the action are described in Section 6 of this opinion with the exposure analysis described in Section 6.2 of this opinion.
- Once we identify which listed species are likely to be exposed to an action's effects and the nature of that exposure, we examine the scientific and commercial data available to determine whether and how those listed species are likely to respond given their exposure (these represent our *response analyses*). Response analysis is considered in Section 6.2 of this opinion.

- Describe any cumulative effects. Cumulative effects, as defined in NMFS's implementing regulations (50 CFR § 402.02), are the effects of future state or private activities, not involving Federal activities, that are reasonably certain to occur within the action area. Future Federal actions that are unrelated to the proposed action are not considered because they require separate section 7 consultation. Cumulative effects are considered in Section 7 of this opinion.
- Integrate and synthesize the above factors to assess the risk that the proposed action poses to species and critical habitat. In this step, NMFS adds the effects of the action (Section 6) to the environmental baseline (Section 5) and the cumulative effects (Section 7) to assess whether the action could reasonably be expected to: (1) appreciably reduce the likelihood of both survival and recovery of the species in the wild by reducing its numbers, reproduction, or distribution; or (2) appreciably diminish the value of designated or proposed critical habitat for the conservation of the species. These assessments are made in full consideration of the status of the species and critical habitat (Section 4). Integration and synthesis with risk analyses occurs in Section 8 of this opinion.
- Reach jeopardy and adverse modification conclusions. Conclusions regarding jeopardy and the destruction or adverse modification of critical habitat are presented in Section 9. These conclusions flow from the logic and rationale presented in the Integration and Synthesis Section 8.
- If necessary, define a reasonable and prudent alternative to the proposed action. If, in completing the last step in the analysis, NMFS determines that the action under consultation is likely to jeopardize the continued existence of listed species or destroy or adversely modify designated critical habitat, NMFS must identify a reasonable and prudent alternative (RPA) to the action. The reasonable and prudent alternative must not be likely to jeopardize the continued existence of ESA-listed species nor adversely modify their designated critical habitat and it must meet other regulatory requirements.

For all analyses, we use the best available scientific and commercial data. For this consultation, we primarily relied on:

- BLM's Biological Assessment, and other BLM documents (e.g., draft PEIS, appendices)
- Recovery Plans –blue whale (draft), humpback whale, North Pacific right whale, fin whale, sperm whale, Steller sea lion (Western DPS),
- Stock Assessment Reports
- Published and unpublished scientific information on endangered and threatened species and their surrogates
- Scientific information such as reports from government agencies and peer-reviewed literature

4 RANGEWIDE STATUS OF THE SPECIES AND CRITICAL HABITAT

Ten species of marine mammals listed under the ESA under NMFS's jurisdiction may occur in the action area. The action area also includes designated critical habitat for two species. This opinion considers the effects of the proposed action on these species and designated critical habitats (Table 4).

Table 4. Listing status and critical habitat designation for marine mammals considered in this opinion.

Species	Status	Listing	Critical Habitat
Bowhead Whale (*Balaena mysticetus*)	Endangered	NMFS 1970, 35 FR 18319	Not designated
Blue whale (*Balaenoptera musculus*)	Endangered	NMFS 1970, 35 FR 18319	Not designated
Fin Whale (*Balaeneoptera physalus*)	Endangered	NMFS 1970, 35 FR 18319	Not designated
Humpback Whale, Western North Pacific DPS (*Megaptera novaeangliae*)	Endangered	NMFS 2016, 81 FR 62260	Not designated
Humpback Whale, Mexico DPS (*Megaptera novaeangliae*)	Threatened	NMFS 2016, 81 FR 62260	Not designated
North Pacific Right Whale (*Eubalaena japonica*)	Endangered	NMFS 2008, 73 FR 12024	NMFS 2008, 73 FR 19000
Sperm Whale (*Physeter macrocephalus*)	Endangered	NMFS 1970, 35 FR 18319	Not designated
Ringed Seal, Arctic Subspecies (*Phoca hispida hispida*)	Threatened	NMFS 2012, 77 FR 76706	Not designated
Bearded Seal, Beringia DPS (*Erignathus barbatus nauticus*)	Threatened	NMFS 2012, 77 FR 76740	Not designated
Steller Sea Lion, Western DPS (*Eumetopias jubatus*)	Endangered	NMFS 1997, 62 FR 24345	NMFS 1993, 58 FR 45269

We note that BLM determined that this action was not likely to adversely affect all listed species in the action area except the Western North Pacific gray whale, for which they determined no project effects (BLM 2020). In our Biological Opinion, we explain our rationale for determining that this action is likely to adversely affect bowhead, Mexico DPS humpback, Western North Pacific humpback, fin, and sperm whales, as well as Beringia DPS bearded and Arctic ringed seals.

4.1 Climate Change

The listed marine mammals we consider in this opinion live in the ocean and depend on the ocean for nearly every aspect of their life history. Factors which affect the ocean, like temperature and pH can have direct and indirect impacts on marine mammals and the resources they depend upon. Global climate change may affect all the species we consider in this opinion, but it is expected to affect them differently. Because it is a shared threat, we present this narrative here rather than in each of the species-specific narratives that follow. First, we provide background on the physical effects climate change has caused on a broad scale; then we focus on changes that have occurred in Alaska. Next, we provide an overview of how these physical changes translate to biological effects.

4.1.1 Physical Effects

4.1.1.1 Air Temperature

There is consensus throughout the scientific community that atmospheric temperatures are increasing, and will continue to increase, for at least the next several decades (Watson and Albritton 2001; Oreskes 2004). The Intergovernmental Panel on Climate Change (IPCC) estimated that since the mid-1800s, average global land and sea surface temperature has increased by 0.85°C (±0.2°C), with most of the change occurring since 1976 (IPCC 2019). This temperature increase is greater than what would be expected given the range of natural climatic variability recorded over the past 1,000 years (Crowley 2000).

Continued emission of greenhouse gases is expected to cause further warming and long-lasting changes in all components of the climate system, increasing the likelihood of severe, pervasive and irreversible impacts for people and ecosystems (IPCC 2019). Data show that 2019 was the second warmest year in the 140-year record, and global land and ocean surface temperatures departed +0.95°C (+1.71°F) from average[4]. The five warmest years in the 1880–2019 record have all occurred since 2015, with nine of the 10 warmest years having occurred since 2005[4]. July, 2019, was Earth's hottest month on record (Blunden and Arndt 2020).

The impacts of climate change are especially pronounced at high latitudes. Since 2000, the Arctic (latitudes between 60ºN and 90ºN) has been warming at more than two times the rate of lower latitudes because of "Arctic amplification," a characteristic of the global climate system influenced by changes in sea ice extent, atmospheric and oceanic heat transports, cloud cover, albedo, black carbon, and many other factors[5] (Serreze and Barry 2011; Overland et al. 2017). Across Alaska, average air temperatures have been increasing, and the average annual temperature is now 1.65-2.2°C (3-4°F) warmer than during the early and mid-century (Thoman and Walsh 2019). Winter temperatures have increased by 3.3°C (6˚F) (Chapin et al. 2014) and the snow season is shortening (Thoman and Walsh 2019). Alaska had its warmest year on record in 2019, with a statewide average temperature of 32.2°F, 6.2°F above the long-term average.

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[4] NOAA National Centers for Environmental Information webpage. Assessing the global climate in 2019. Available from https://www.ncei.noaa.gov/news/global-climate-201912, accessed November 10, 2020.

[5] NASA wepbage. State of the Climate: How the World Warmed in 2019. Available at https://www.carbonbrief.org/state-of-the-climate-how-the-world-warmed-in-2019, accessed January 20, 2020.

This surpassed the previous record of 31.9°F in 2016. The four warmest years on record for Alaska have occurred in the past 6 years[6].

4.1.1.2 Ocean Heat

Higher air temperatures have led to higher ocean temperatures. More than 90% of the excess heat created by global climate change is stored in the world's oceans, causing increases in ocean temperature (IPCC 2019; Cheng et al. 2020). The upper ocean heat content, which measures the amount of heat stored in the upper 2000 m (6,561 ft) of the ocean, was the highest on record in 2019 by a wide margin, and is the warmest in recorded human history (Cheng et al. 2020). The seas surrounding Alaska have been unusually warm in recent years, with unprecedented warmth in some cases (Thoman and Walsh 2019). This effect can be seen throughout the Alaska region, including the Bering, Chukchi, and Beaufort seas (Figure 6) (Thoman and Walsh 2019).

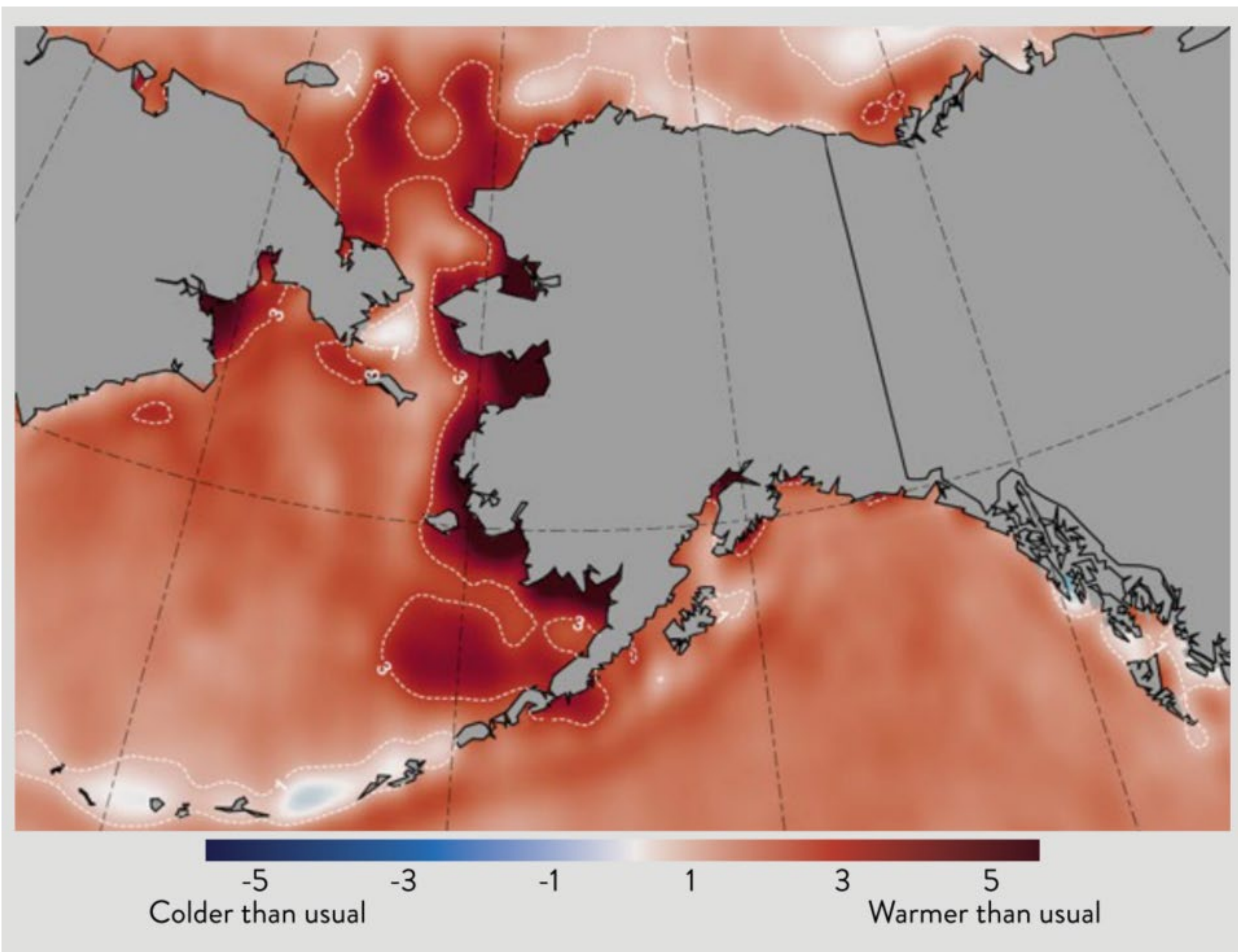

Figure 6. Arctic summer sea surface temperatures, 2019 (Thoman and Walsh 2019).

Warmer ocean water affects sea ice formation and melt. In the first decade of the 21st century, Arctic sea ice thickness and annual minimum sea ice extent (i.e., September sea ice extent)

[6] NOAA National Centers for Environmental Information webpage. Assessing the U.S. Climate in 2019. Available at https://www.ncei.noaa.gov/news/national-climate-201912, accessed November 10, 2020.

declined at a considerably accelerated rate and continues to decline (Stroeve et al. 2007; Stroeve and Notz 2018) (Figure 7). Approximately three-quarters of summer Arctic sea ice volume has been lost since the 1980s (IPCC 2013). In addition, old ice (> 4 years old), which is thicker and more resilient to melting than young ice, constituted 33% of the ice pack in 1985, but by March 2019, it represented only 1.2% of the ice pack in the Arctic Ocean (Perovich et al. 2019). Overland (2020) suggests that the loss of the thicker older ice makes the Arctic ecosystem less resilient. Both the maximum sea ice extent (March) and the minimum (September) have consistently been decreasing, although the summer minimums are more pronounced (Perovich et al. 2019) (Figure 7). The minimum Arctic sea ice extent in 2019 was effectively tied with 2007 and 2016 for second lowest, only behind 2012, which is the record minimum[7].

Wang and Overland (2009) estimated that the Arctic will become essentially ice-free (i.e., sea ice extent will be less than 1 million km^2) during the summer between the years 2021 and 2043 and modeling with the new generation climate models provides independent support of an ice-free Arctic in mid-century or earlier (Notz and Stroeve 2016; Guarino et al. 2020; SIMIP Community 2020). Notz and Stroeve (2016) found that sea-ice loss directly follows anthropogenic CO_2 emissions and suggest that there is a loss of approximately 3 m^2 of September Arctic sea ice per metric ton of CO_2 emission. Under the Paris Agreement, emissions scenarios are pursued that would stabilize the global mean temperature at 1.5–2.0 °C above pre-industrial levels. If the climate were to stabilize at plus 1.5 °C, Sigmond et al. (2018) project that Arctic ice-free conditions would occur once every forty years. On the other hand if temperatures rose to plus 2.0 °C, ice-free conditions would occur once every 5 years. These and other researchers conclude that any measures taken to mitigate CO_2 emissions would directly slow the ongoing loss of Arctic summer sea ice (Sigmond et al. 2018; Stroeve and Notz 2018). Once the entire Arctic Ocean becomes a seasonal ice zone, its ecosystem will change fundamentally as sea ice is the key forcing factor in polar oceans (Wassmann et al. 2011).

[7] National Snow and Ice Data Center. Monthly Archives: October 2019. Available at: http://nsidc.org/arcticseaicenews/2019/10/, accessed November 25, 2020.

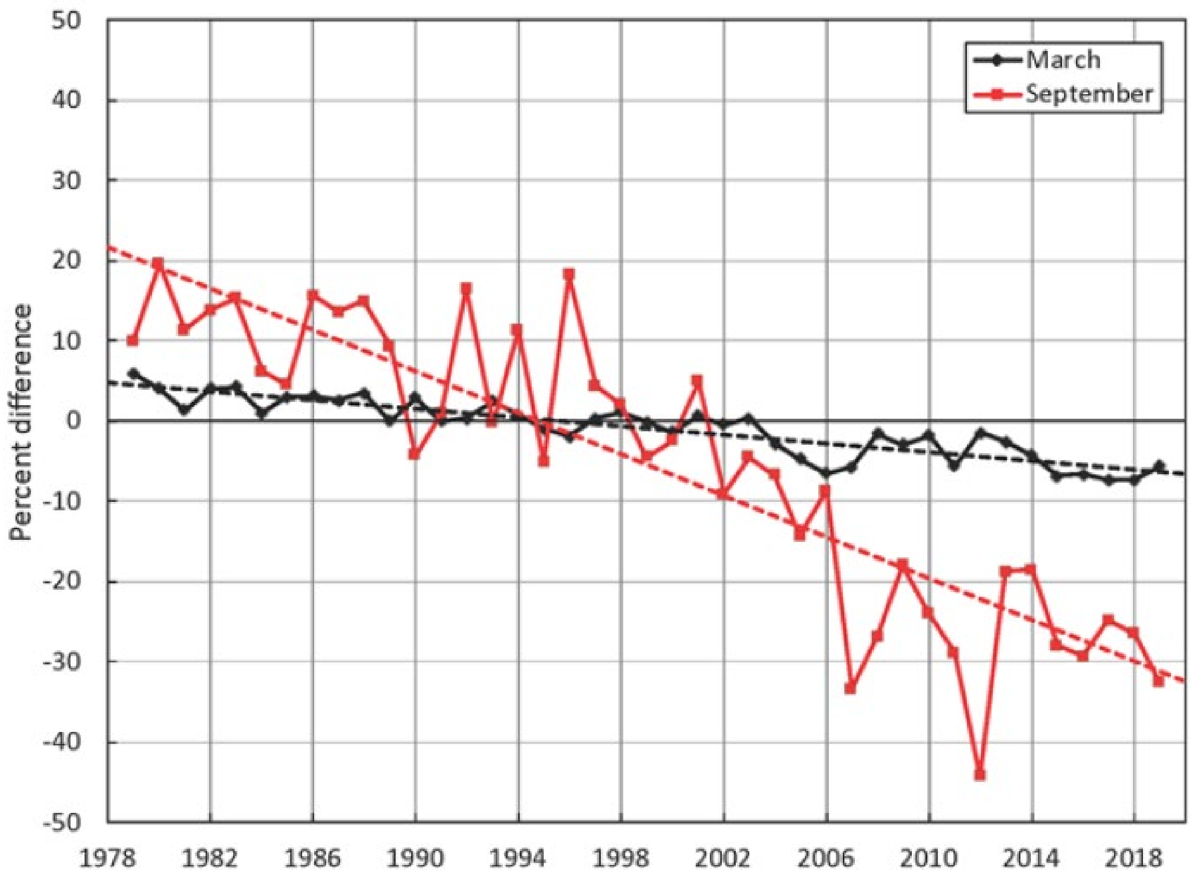

Figure 7. Arctic ice extent declines in September (red) and in March (black). The value for each year is the difference in percent in ice extent relative to the mean values for 1981-2010. Both trends are significant at the 99% confidence level. The slopes of the lines indicate losses of -2.7 for the maximum ice extent and -12.9 percent for the minimum ice extent, per decade.

Related to the loss of sea ice is the northward shift and near loss of the cold-water pool in the eastern Bering Sea. Winter sea ice creates a pool of cold (<2ºC) bottom water that is protected from summer mixing by a thermocline (Mueter and Litzow 2008). With the reduction in winter sea ice, the cold-water pool has shrunk (Figure 3). Many temperate species, especially groundfish, are intolerant of the low temperatures so the extent of sea ice determines the boundary between arctic and subarctic seafloor communities and demersal vs pelagic fish communities (Grebmeier et al. 2006). In the Pacific Arctic, large scale, northward movements of commercial stocks are underway as previously cold-dominated ecosystems warm and fish move northward to higher latitude, relatively cooler environments (Grebmeier et al. 2006; Eisner et al. 2020). Not only fish, but plankton, crabs and ultimately, sessile invertebrates like clams are affected by these changes in water temperature (Grebmeier et al. 2006; Fedewa et al. 2020).

Another ocean water anomaly is described as a marine heat wave. These are described as a coherent area of extreme warm temperature at the sea surface that persists (Frölicher et al. 2018). The largest recorded marine heat wave occurred in the northeast Pacific Ocean from 2013-2015 (Frölicher et al. 2018). It was called “the blob”. The blob first appeared off the coast of Alaska in the winter of 2013-2014 and by the end of 2015 it stretched from Alaska to Baja California. Consequences of this event included an unprecedented harmful algal bloom that extended from the Aleutian Islands to southern California, mass strandings of marine mammals, shifts in the distribution of invertebrates and fish, and shifts in abundance of several fish species (Cavole et al. 2016). The 2018 Pacific cod stock assessment[8] estimated that the female spawning biomass of Pacific cod is at its lowest point in the 41-year time series, following three years of poor recruitment and increased natural mortality as a result of the blob. It is thought that marine mammals in the Gulf of Alaska were also likely impacted by the low prey availability associated with warm ocean temperatures that occurred (Bond et al. 2015; Peterson et al. 2016; Sweeney et al. 2018).

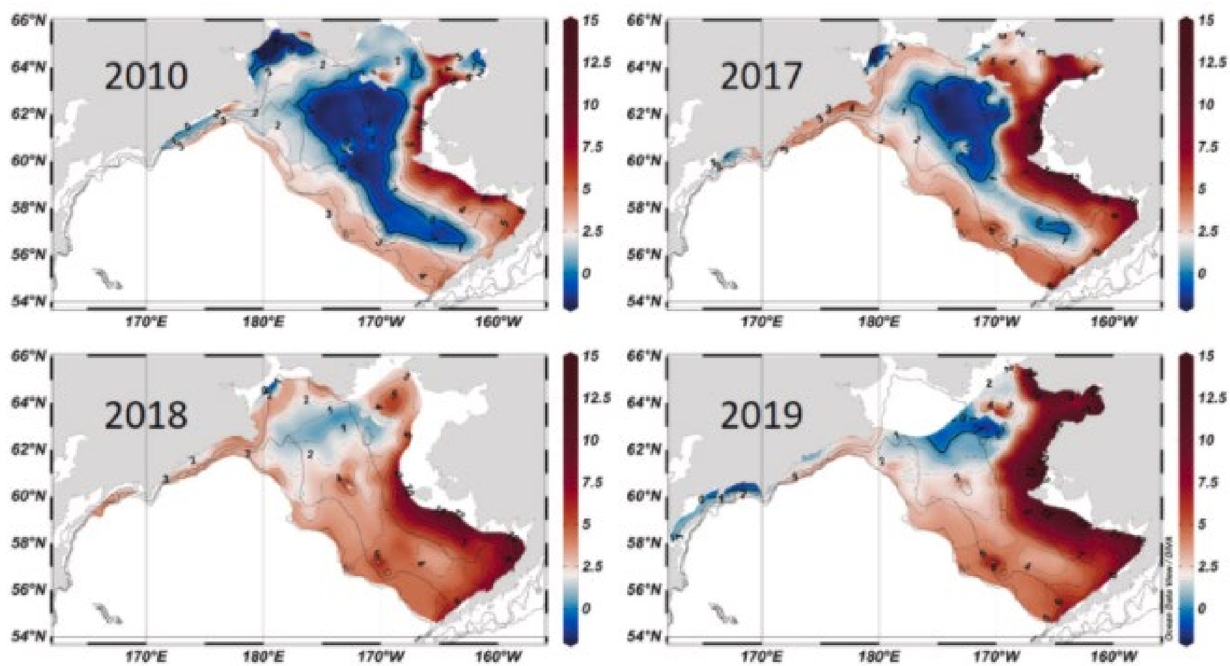

Figure 8. Bottom temperatures from summer oceanographic surveys. Graphic display of the shrinkage of the cold pool over time. From (Eisner et al. 2020).

4.1.1.3 Ocean Acidification

For 650,000 years or more, the average global atmospheric carbon dioxide (CO_2) concentration varied between 180 and 300 parts per million (ppm), but since the beginning of the industrial revolution in the late 1700s, atmospheric CO_2 concentrations have been increasing rapidly, primarily due to anthropogenic inputs (Fabry et al. 2008; Lüthi et al. 2008). The world's oceans have absorbed approximately one-third of the anthropogenic CO_2 released, which has buffered the increase in atmospheric CO_2 concentrations (Feely et al. 2004; Feely et al. 2009). Despite the oceans' role as large carbon sinks, the CO_2 level continues to rise and is currently over 410 ppm[9].

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[8]NOAA Fisheries, Alaska Fisheries Science Center website. Available at https://apps-afsc.fisheries.noaa.gov/REFM/stocks/Historic_Assess.htm, accessed December 2, 2020.

[9] NOAA Global Monitoring Laboratory website. Trends in Atmospheric Carbon Dioxide. Available at

As the oceans absorb CO_2, the pH of seawater is reduced. This process is referred to as ocean acidification. Ocean acidification reduces the saturation states of certain biologically important calcium carbonate minerals like aragonite and calcite that many organisms use to form and maintain shells (Bates et al. 2009; Reisdorph and Mathis 2014). When seawater is supersaturated with these minerals, calcification (growth) of shells is favored. Likewise, when the sea water becomes undersaturated, dissolution is favored (Feely et al. 2009).

High latitude (colder) oceans have naturally lower saturation states of calcium carbonate minerals than more temperate or tropical waters, making Alaska's oceans more susceptible to the effects of ocean acidification (Fabry et al. 2009; Jiang et al. 2015). Model projections indicated that aragonite undersaturation would start to occur by about 2020 in the Arctic Ocean and by 2050, all of the Arctic will be undersaturated with respect to aragonite (Feely et al. 2009; Qi et al. 2017). Large inputs of low-alkalinity freshwater from glacial runoff and melting sea ice contribute to the problem by reducing the buffering capacity of seawater to changes in pH (Reisdorph and Mathis 2014). As a result, seasonal undersaturation of aragonite was already detected in the Bering Sea at sampling stations near the outflows of the Yukon and Kuskokwim Rivers, and the Chukchi Sea (Fabry et al. 2009). Models and observations indicate that rapid sea ice loss will increase the uptake of CO_2 and exacerbate the problem of aragonite undersaturation in the Arctic (Yamamoto et al. 2012; DeGrandpre et al. 2020).

Undersaturated waters are potentially highly corrosive to any calcifying organism, such as corals, bivalves, crustaceans, echinoderms and many forms of zooplankton such as copepods and pteropods, and consequently may affect Arctic food webs (Fabry et al. 2008; Bates et al. 2009). Pteropods, which are often considered indicator species for ecosystem health, are prey for many species of carnivorous zooplankton, fishes including salmon, mackerel, herring, and cod, and baleen whales (Orr et al. 2005). Because of their thin shells and dependence on aragonite, under increasingly acidic conditions, pteropods may not be able to grow and maintain shells (Lischka and Riebesell 2012). It is uncertain if these species, which play a large role in supporting many levels of the Alaskan marine food web, may be able to adapt to changing ocean conditions (Fabry et al. 2008; Lischka and Riebesell 2012)

4.1.2 Biological Effects

Climate change is projected to have substantial direct and indirect effects on individuals, populations, species, and the structure and function of marine, coastal, and terrestrial ecosystems in the foreseeable future (Hinzman et al. 2005; Burek et al. 2008; Doney et al. 2012; Huntington et al. 2020). The physical effects on the environment described above have impacted, are impacting, and will continue to impact marine species in a variety of ways (IPCC 2014), such as:

- Shifting abundances
- Changes in distribution
- Changes in timing of migration
- Changes in periodic life cycles of species.

Some of the biological consequences of the changing Arctic conditions are shown in Table 5.

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https://www.esrl.noaa.gov/gmd/ccgg/trends/, accessed November 10, 2020.

Table 5. A summary of possible direct and indirect health effects for Arctic marine mammals related to climate change, adapted from (Burek et al. 2008).

Effect	Result
Direct	
Increase in ocean temperature	Changes in distribution and range (fish, whales) Increase in harmful algal blooms (all affected) Loss of suitable habitat Change in prey base
Loss of sea ice platform (seals)	Reduction of suitable habitat for feeding, resting, molting, breeding Movement, distribution, life history may be affected
Changes in weather	Reduction in snow on sea ice, loss of suitable lair habitat for ringed seals
Ocean acidification	Changes in prey base (all affected)
Indirect	
Changes in infectious disease transmission (changes in host–pathogen associations due to altered pathogen transmission or host resistance)	Increased host density due to reduced habitat, increasing density-dependent diseases. Epidemic disease due to host or vector range expansion. Increased survival of pathogens in the environment. Interactions between diseases, loss of body condition, and increased immunosuppressive contaminants, resulting in increased susceptibility to endemic or epidemic disease.
Alterations in the predator–prey relationship	Affect body condition and, potentially, immune function.
Changes in toxicant pathways (harmful algal blooms, variation in long-range transport, biotransport, runoff, increased use of the Arctic)	Mortality events from biotoxins Toxic effects of contaminants on immune function, reproduction, skin, endocrine systems, etc.
Other negative anthropogenic impacts related to longer open water period	Increased likelihood of ship strikes, fisheries interactions, acoustic injury Chemical and pathogen pollution due to shipping or aquaculture practices. Introduction of nonnative species

Climate change is likely to have its most pronounced effects on species whose populations are already in tenuous positions (Isaac 2009). For species that rely primarily on sea ice for major parts of their life history, we expect that the loss of sea-ice would negatively impact those species' ability to thrive. Consequently, we expect the future population viability of at least some ESA-listed species to be affected with global warming.

Changes in ocean surface temperature may impact species migrations, range, prey abundance, and overall habitat quality. For ESA-listed species that undertake long migrations, if either prey availability or habitat suitability is disrupted by changing ocean temperature regimes, the timing of migration can change. For example, cetaceans with restricted distributions linked to cooler water temperatures may be particularly exposed to range restriction (Learmonth et al. 2006; Isaac 2009). Macleod (2009) estimated that, based on expected shifts in water temperature, 88 percent of cetaceans will be affected by climate change, 47 percent will be negatively affected, and 21 percent will be put at risk of extinction. Of greatest concern are cetaceans with ranges limited to non-tropical waters, and preferences for shelf habitats (Macleod 2009).

4.2 Status of Listed Species Likely to be Adversely Affected by the Action

This opinion examines the status of each species that is likely to be adversely affected by the proposed action. The status is determined by the level of extinction risk that the listed species face, based on parameters considered in documents such as recovery plans, status reviews, and listing decisions. This informs the description of the species' likelihood of both survival and recovery. The species status section also helps to inform the description of the species' current "reproduction, numbers, or distribution" as described in 50 CFR § 402.02. The opinion also examines the condition of critical habitat throughout the designated area, and discusses the current function of the essential PBFs that help to form that conservation value.

For each species, we present a summary of information on the population structure and distribution to provide a foundation for the exposure analyses that appear later in this opinion. Then we summarize information on the threats to the species and the species' status given those threats to provide points of reference for the jeopardy determinations we make later in this opinion. That is, we rely on a species' status and trend to determine whether an action's effects are likely to increase the species' probability of becoming extinct.

More detailed background information on the status of these species can be found in an number of published documents including stock assessment reports on Alaska marine mammals by Muto et al. (2020), and recovery plans for fin whales (NMFS 2010a), humpback whales (NMFS 1991), North Pacific right whales (NMFS 2013c), Steller sea lions (NMFS 2008). Cameron et al. (2010) and Kelly et al. (2010b) provided status reviews of bearded and ringed seals. Richardson et al. (1995), Tyack (2000), and Tyack (2009) provided detailed analyses of the functional aspects of cetacean communication and their responses to anthropogenic noise.

4.2.1 Bowhead whale

Bowhead whales may occur along the marine transit route and adjacent to NPR-A. The bowhead whale was listed as endangered under the Endangered Species Conservation Act (ESCA) on December 2, 1970 (35 FR 18319), and continued to be listed as endangered following passage of the ESA. Bowhead whales in Alaskan waters comprise the Western Arctic stock. Critical habitat has not been designated for the bowhead whale. The most recent abundance estimate for the Western Arctic bowhead whale population is about 16,820 (Muto et al. 2020).

Western Arctic bowhead whales are distributed in seasonally ice-covered waters of the Arctic and near-Arctic, generally north of 60°N and south of 75°N in the western Arctic Basin (Braham 1984; Moore and Reeves 1993). During winter and spring, bowhead whales are closely associated with pack ice or in polynyas (large, semi-stable open areas of water within the ice), and move north as the sea ice breaks up and recedes during the spring. During summer, most of the population is in relatively ice-free waters in the southeastern Beaufort Sea; however, some whales move back and forth between the Alaskan and Canadian Beaufort Sea during the summer feeding season (Quakenbush et al. 2010).

The majority of the Western Arctic stock migrates annually from wintering areas (December to March) in the northern Bering Sea, through the Chukchi Sea in the spring (April through May), to the eastern Beaufort Sea where they spend much of the summer feeding (June through early to mid-October) before returning again to the Bering Sea in the fall (September through December) to overwinter (Figure 9) (Muto et al. 2020).

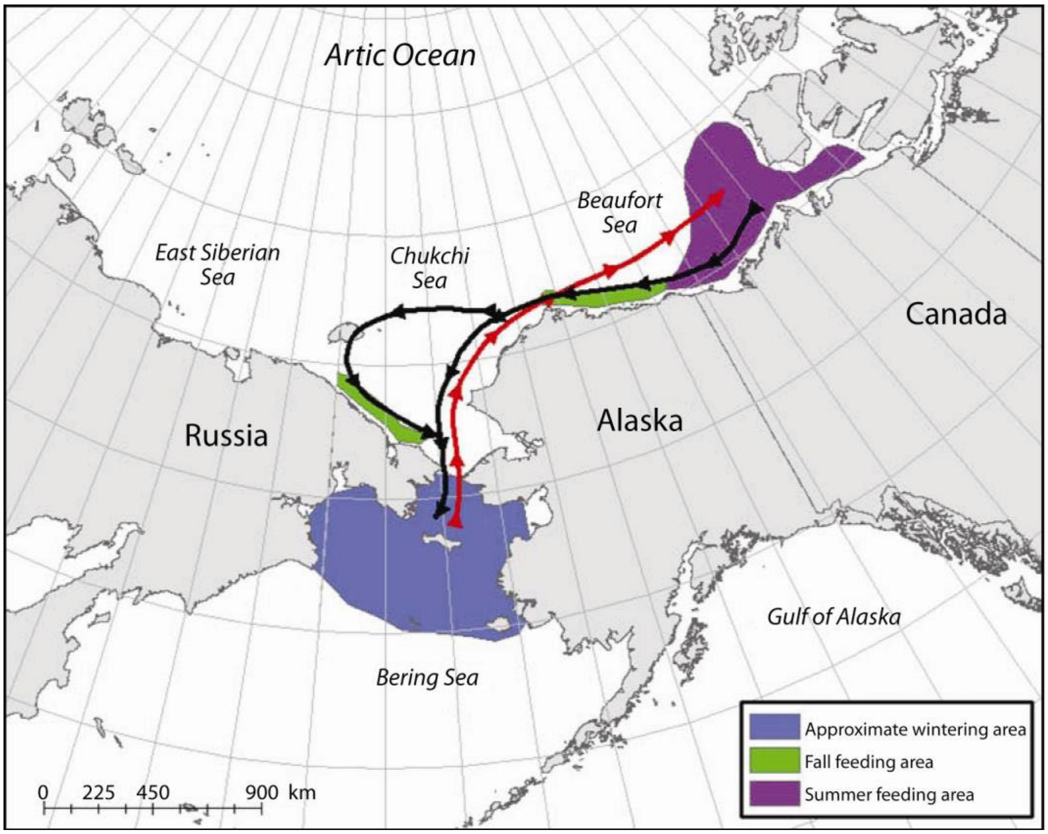

Figure 9. Generalized migration route, feeding areas, and wintering area for Western arctic bowhead whale (Moore and Laidre 2006).

The vast majority of the bowhead population migrates to the Bering Sea during the fall and does not return eastwards through the Beaufort Sea again until the spring. During the eastward (spring) migration, the whales are distributed far offshore. While a few whales may occur in the central Beaufort Sea area throughout the summer, most of the population spends the summer in the eastern Beaufort Sea before passing through again during the latter part of summer and fall as bowheads migrate west to over winter in the Bering Sea. Bowhead whales are most likely to be encountered during the fall migration when they travel closer to shore (than during the spring migration) in water ranging from 15 to 200 m deep (50 to 656 ft; Miller et al. 2002; Clarke et al. 2012). The fall migration trajectory varies annually and is influenced by ice presence (Moore and Reeves 1993); during years with less ice, the whales tend to migrate closer to shore, along the barrier islands. Bowhead whale sightings during the fall migration are also lower in heavy ice years. Treacy et al. (2006) found that the main migration corridor for bowhead whales during the fall migration was 73.4 km (46 mi) offshore in years of heavy ice conditions, 49.3 km (31 mi) offshore during moderate ice conditions, and 31.2 km (19 mi) offshore during light ice conditions.

The Aerial Surveys of Arctic Marine Mammals (ASAMM) project is a continuation of the Bowhead Whale Aerial Survey Project and Chukchi Offshore Monitoring in Drilling Area marine mammal aerial survey project. Through these projects, aerial surveys have been conducted in the Alaska Beaufort Sea in late summer and autumn since 1979 (Ljungblad et al. 1986; Ljungblad et al. 1987; Monnett and Treacy 2005; Treacy et al. 2006; Clarke et al. 2012; Clarke et al. 2013a; Clarke et al. 2013b). Figure 2 displays bowhead whale sightings from 2017 in the Chukchi and Beaufort seas. The ASAMM database and annual reports are available from the NMFS Marine Mammal Laboratory web page: http://www.afsc.noaa.gov/NMML/cetacean/.

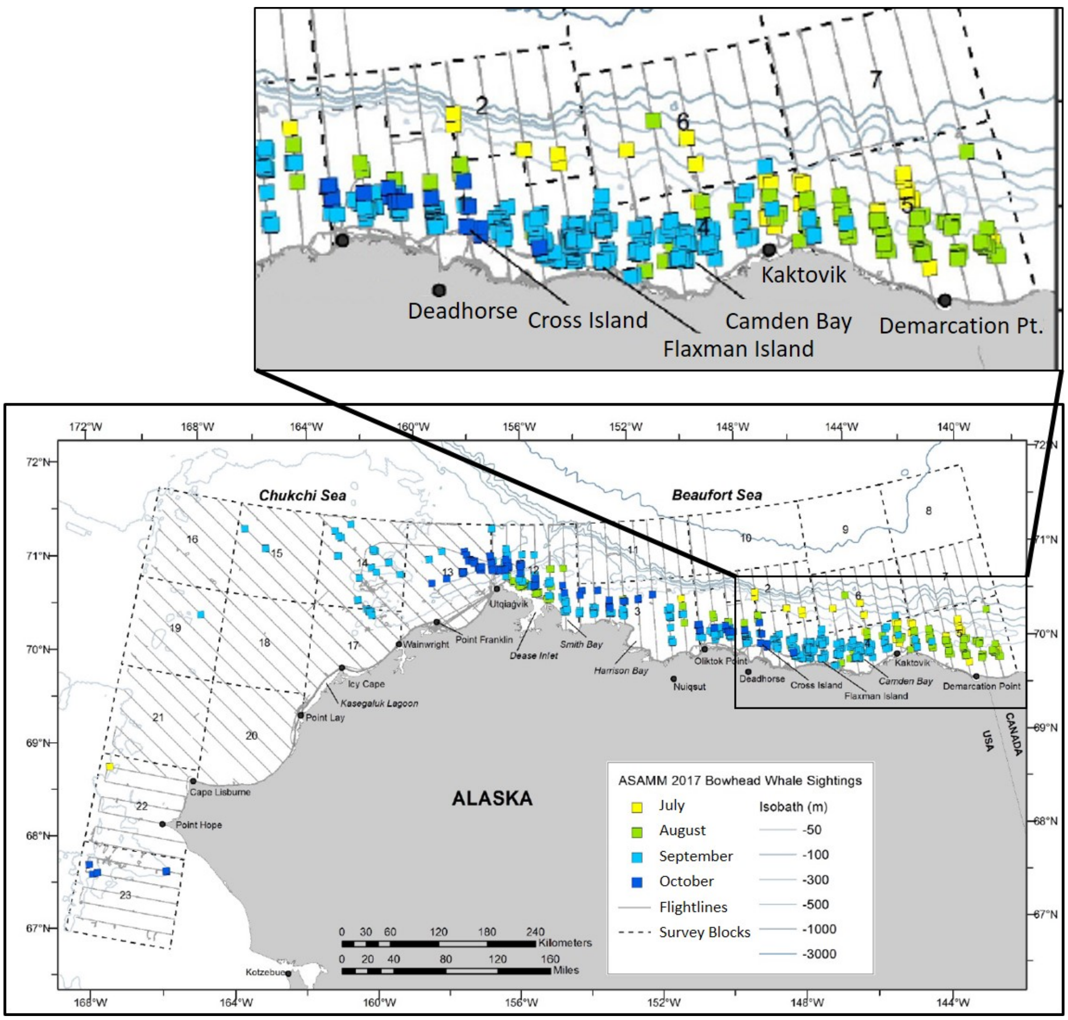

Figure 10. ASAMM 2017 bowhead sightings plotted by month, with transect, search, and circling effort (Clarke et al. 2018).

NMFS categorizes bowhead whales in the low-frequency cetacean (i.e., baleen whale) functional hearing group, with an estimated hearing range of 7 Hz to 35 kHz (NMFS 2018b). Inferring from their vocalizations, bowhead whales should be most sensitive to frequencies between 20 Hz and 5 kHz, with maximum sensitivity between 100 Hz and 500 Hz (Erbe 2002).

Additional information on bowhead whale biology and habitat is available at:

https://www.fisheries.noaa.gov/species/bowhead-whale

https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-species-stock

4.2.2 Blue Whale

Blue whales may occur along the marine transit route. The blue whale was listed as an endangered species under the ESCA on December 2, 1970 (35 FR 18319) after being depleted by whaling, and continued to be listed as endangered following passage of the ESA. A recovery plan was published in 1998 (NMFS 1998), but critical habitat has not been designated. Although blue whales have been divided into stocks for management purposes under the MMPA, distinct population segments have not been adopted under the ESA. The North Pacific population, comprised of the Central North Pacific and Eastern North Pacific stocks, occurs in Alaska.

The global population of blue whales is uncertain, but based on the above information, the global total for the species is plausibly in the range 10,000-25,000, corresponding to about 3-11% of the 1911 population size (IUCN 2017). The Central North Pacific stock is estimated at 133 individuals, and insufficient data exist to assess population trends (Carretta et al. 2020). The most recent MMPA stock assessment report estimated the abundance of the Eastern North Pacific stock at 1,496 individuals; the report further determined that the population trend is uncertain and there is little evidence to support that it is increasing (Carretta et al. 2020). Another recent report estimated that the Eastern North Pacific stock is at 97% of its carrying capacity at about 2,200 animals and that density dependent factors are a key reason for the observed lack of increase in population size (Stafford et al. 2001; Stafford 2003; McDonald et al. 2006a; Monnahan et al. 2015).

Acoustical data suggests two populations of North Pacific blue whales found in the eastern and western north Pacific (Stafford et al. 2001; Stafford 2003; McDonald et al. 2006a; Monnahan et al. 2015). The northeastern call predominates in the Gulf of Alaska, the U.S. West Coast, and the eastern tropical Pacific, while the northwestern call predominates from the south of the Aleutian Islands to the Kamchatka Peninsula in Russia, overlapping in the Gulf of Alaska (Muto et al. 2020). Individuals from these populations may be present in the action area along the marine transit route.

Blue whales from the Eastern Pacific stock spend winters off Mexico, Central America, and as far as 8°S, and feed during summer off the U.S. West Coast and, to a lesser extent, in the Gulf of Alaska (Carretta et al. 2020). The Central North Pacific stock spend winters in lower latitudes in the western and central Pacific, including Hawaii, and feed in summer southwest of Kamchatka, south of the Aleutians, and in the Gulf of Alaska (Carretta et al. 2020).

Although the populations of blue whales were severely depleted by whaling, no evidence is available to suggest that this exploitation resulted in a major change in their distribution during modern times, except perhaps in the eastern North Atlantic and the western North Pacific

(NMFS 1998). It is assumed that blue whale distribution is governed largely by food requirements (krill) and that populations are seasonally migratory. Poleward movements in spring allow the whales to take advantage of high zooplankton production in summer. Movement toward the subtropics in the fall allows blue whales to reduce their energy expenditure while fasting, avoid ice entrapment in some areas, and engage in reproductive activities in warmer waters of lower latitudes (NMFS 1998).

Blue whales are in the low frequency (LF) cetacean functional hearing group (Southall et al. 2017).

Additional information on blue whale biology and habitat is available at:

https://www.fisheries.noaa.gov/species/blue-whale

https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-species-stock

4.2.3 Fin Whale

Fin whales may occur along the marine transit route. NMFS listed the entire species of fin whale rangewide as endangered in 1970 (35 FR 18319) following large scale declines due to commercial whaling. Congress replaced the ESCA with the ESA in 1973, and fin whales continued to be listed throughout their range as endangered. A recovery plan was prepared in 2010 (NMFS 2010a). Critical habitat has not been designated for this species. Under the MMPA, NMFS manages three fin whale stocks in the North Pacific: (1) the Hawaii stock; (2) the California/Oregon/Washington stock, and (3) the Alaska stock (Carretta et al. 2017). Distinct population segments under the ESA have not been designated.

Prior to exploitation by commercial whalers, fin whales are thought to have numbered greater than 464,000 worldwide, and are now thought to number approximately 119,000 worldwide (Braham 1991). Although reliable and recent estimates of fin whale abundance are available for large portions of the North Atlantic Ocean, this is not the case for most of the North Pacific Ocean or for the Southern Hemisphere (NMFS 2010a). For the Hawaii stock, the best abundance estimate is 154 whales, and no data are available on the population trend for this stock (Carretta et al. 2020). The best estimate for the Northeast Pacific stock is 3168 whales, but the true magnitude of that increase is uncertain (Muto et al. 2019). The California/Oregon/Washington stock is estimated at 9,029 whales with evidence for an increasing trend (Carretta et al. 2020).

Fin whales are distributed widely in every ocean except the Arctic Ocean (though occasional sightings have been reported in recent years). In the North Pacific Ocean, fin whales occur in summer foraging areas in the Chukchi Sea, the Sea of Okhotsk, around the Aleutian Islands, and the Gulf of Alaska (Figure 11); in the eastern Pacific, they occur south to California; in the western Pacific, they occur south to Japan. Coastal and pelagic catch data from the first half of the twentieth century indicate that fin whales were not uncommon near Unalaska Bay and around Unalaska Island (Nishiwaki 1966; Reeves et al. 1985); however, fin whales have been documented infrequently around Unalaska Island since whaling ended (Stewart et al. 1987; Zerbini et al. 2006).

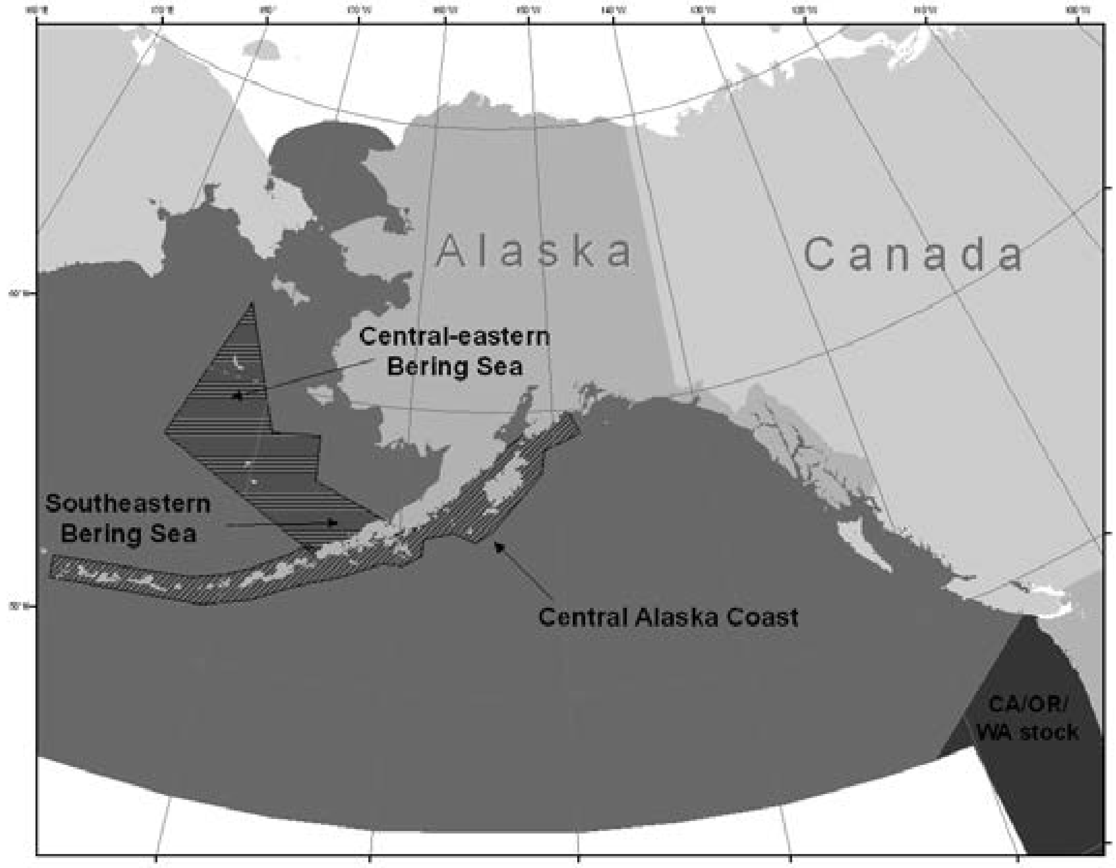

Figure 11. Approximate distribution of fin whales in the eastern North Pacific Ocean (shaded area) (Muto et al. 2020). Striped areas indicate where vessel surveys occurred in 1999-2000 (Moore et al. 2002) and 2001-2003 (Zerbini et al. 2006).

In the North Pacific, fin whales' preferred prey is euphausiids (mainly *Euphausia pacifica*, *Thysanoessa longipes*, *T. spinifera*, and *T. inermis*) and large copepods (mainly *Calanus cristatus*), followed by schooling fish such as herring, walleye pollock, and capelin (Nemoto 1970).

Fin whales produce a variety of low-frequency sounds in the 10 Hz to 0.2 kHz range (Watkins 1981; Watkins et al. 1987; Edds 1988; Thompson et al. 1992). While there is no direct data on hearing in low-frequency cetaceans, the applied frequency range is anticipated to be between 7 Hz and 35 kHz (NMFS 2016d). Synthetic audiograms produced by applying models to X-ray computed tomography scans of a fin whale calf skull indicate the range of best hearing for fin whale calves from approximately 20 Hz to 10 kHz, with maximum sensitivities between 1 to 2 kHz (Cranford and Krysl 2015).

More information on fin whale biology and habitat is available at:

https://www.fisheries.noaa.gov/species/fin-whale

https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-species-stock

4.2.4 Western North Pacific DPS and Mexico DPS Humpback Whales

Western North Pacific (WNP) DPS and Mexico DPS humpback whales may occur along the marine transit route. The humpback whale was listed as endangered under the ESCA on December 2, 1970 (35 FR 18319). Congress replaced the ESCA with the ESA in 1973, and humpback whales continued to be listed as endangered. In 2016, NMFS conducted a global status review and changed the status of humpback whales under the ESA. Three DPSs are present in Alaska waters: the WNP DPS (which includes a small proportion of humpback whales found in the Aleutian Islands, Bering Sea, and Gulf of Alaska) is listed as endangered; the Mexico DPS (which includes a small proportion of humpback whales found in the Aleutian Islands, Bering Sea, Gulf of Alaska, and Southeast Alaska) is listed as threatened; and the Hawaii DPS (which includes most humpback whales found in the Aleutian Islands, Bering Sea, Gulf of Alaska, and Southeast Alaska) is not listed (81 FR 62260; September 8, 2016). Critical habitat has not been designated for the Western North Pacific or Mexico DPSs.

Whales from these three DPSs overlap on feeding grounds off Alaska. All waters off the coast of Alaska may contain ESA-listed humpbacks. Humpback whales may be present in the action area along the marine transit route.

The WNP DPS is comprised of approximately 1,107 (CV=0.3) animals (Muto et al. 2019). The population trend for the WNP DPS is unknown. Humpback whales in the WNP DPS remain rare in some parts of their former range, such as the coastal waters of Korea, and have shown little signs of recovery in those locations.

The Mexico DPS is comprised of approximately 2,374 (CV=0.03) animals (Calambokidis et al. 2017) with an unknown population trend, though unlikely to be in decline (81 FR 62260, 62305; September 8, 2016).

Humpback whales have been observed throughout much of the shelf waters (waters over the continental shelves) of the Bering Sea, but densities of humpbacks appear relatively low in the northern shelf area, with relatively few sightings north of St. Lawrence Island (Moore et al. 2002; Friday et al. 2013). Humpback whales are consistently concentrated in coastal waters north of Unimak Pass (Friday et al. 2013). In the Aleutian Islands, there are high densities of humpback whales in the eastern Aleutians, but the densities decline in the western Aleutian Islands (Zerbini et al. 2006).

Humpback whales have also been observed during the summer in the Chukchi and Beaufort seas (Allen and Angliss 2015). In August 2007, a mother-calf pair was sighted from a barge approximately 87 km (54.1 mi) east of Barrow in the Beaufort Sea (Hashagen et al. 2009). Additionally, Ireland et al. (2008) reported three humpback sightings in 2007 and one in 2008 during surveys of the eastern Chukchi Sea.

During vessel-based surveys in the Chukchi Sea, Hartin et al. (2013) reported four humpback whales in 2007, two in 2008, and one in 2010. Five humpback sightings (11 individuals) occurred during the CSESP vessel-based surveys in 2009 and 2010 (Aerts et al. 2012), and a single humpback was observed several kilometers west of Barrow during the 2012 Chukchi Sea Environmental Studies Program vessel-based survey (Aerts et al. 2013).

The Aerial Surveys of Arctic Marine Mammals (ASAMM) reported four humpback whale sightings near the coast between Icy Cape and Pt. Barrow in July and August of 2012, as well as

24 individual humpback whales on September 11, 2012, south and east of Pt. Hope (Clarke et al. 2013a). Prior to 2012 only a single humpback had been sighted during the Chukchi Offshore Monitoring in Drilling Area Survey (Clarke et al. 2011).

Humpback whales have been seen and heard with some regularity in recent years (2009-2012) in the southern Chukchi Sea, often feeding and in very close association with feeding gray whales. Sightings have occurred mostly in September, but effort in the southern Chukchi has not been consistent and it is possible that humpback whales are present earlier than September (Hashagen et al. 2009; Clarke et al. 2011; Crance et al. 2011). Additional sightings of four humpback whales occurred in 2009 south of Point Hope, while transiting to Nome (Brueggeman 2010).

Humpback whales tend to feed on summer grounds and not on winter grounds. However, some opportunistic winter feeding has been observed at low latitudes (Perry et al. 1999). Humpback whales engulf large volumes of water and then filter small crustaceans and fish through their fringed baleen plates. Humpback whales are relatively generalized in their feeding compared to some other baleen whales. In the Northern Hemisphere, known prey includes: euphausiids (krill); copepods; juvenile salmonids; Arctic cod; walleye pollock; pteropods; and cephalopods (Johnson and Wolman 1984; Perry et al. 1999). Foraging is confined primarily to higher latitudes (Stimpert et al. 2007).

Humpback whales produce a variety of vocalizations ranging from 20 Hz to 10 kHz (Winn et al. 1970; Tyack and Whitehead 1983; Payne and Payne 1985; Silber 1986; Thompson et al. 1986; Richardson et al. 1995; Au 2000; Frazer and Mercado 2000; Erbe 2002; Au et al. 2006; Vu et al. 2012). NMFS categorizes humpback whales in the low-frequency cetacean functional hearing group, with an applied frequency range between 7 Hz and 35 kHz (NMFS 2016d).

Additional information on humpback whale biology and habitat is available at:

https://www.fisheries.noaa.gov/species/humpback-whale

https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-species-stock

4.2.5 North Pacific Right Whale

North Pacific right whales may occur along the marine transit route. The Northern right whale was listed as an endangered species under the ESCA on December 2, 1970 (35 FR 18319), and continued to be listed as endangered following passage of the ESA. NMFS later divided the listing into two separate endangered species: North Pacific right whales and North Atlantic right whales (73 FR 12024; March 6, 2008). Only the North Pacific right whale occurs in Alaska. Critical habitat has been designated for the North Pacific right whale (Figure 6) (73 FR 19000; April 8, 2008).

The North Pacific right whale is comprised of two populations, the eastern and the western. The eastern population of North Pacific right whale occurs in the Bering Sea and Gulf of Alaska, but may range as far south as Baja California, Mexico in the eastern Pacific, and Hawaii in the central Pacific (Allen and Angliss 2014). This population was severely depleted by legal and illegal commercial whaling up until 1999 (Brownell et al. 2001; Wade et al. 2011a).

The eastern North Pacific right whale is arguably the most endangered stock of large whale in the world, with approximately 31 individuals (Muto et al. 2020). The western population is also small and at risk of extinction; however, no reliable published estimate of abundance exists. Survey data suggest the western population is much larger than the eastern population, numbering several hundred or more animals (Brownell et al. 2001). No estimate of trend in abundance is currently available (Muto et al. 2020).

The North Pacific right whale is distributed from Baja California to the Bering Sea with the highest concentrations in the Bering Sea, Gulf of Alaska, Okhotsk Sea, Kuril Islands, and Kamchatka area. They are primarily found in coastal or shelf waters but sometimes travel into deeper waters. In the spring through the fall their distribution is dictated by the distribution of their prey. In the winter, pregnant females move to shallow waters in low latitudes to calve; the winter habitat of the rest of the population is unknown.

Whaling data indicate that North Pacific right whales once ranged across the entire North Pacific north of 35°N and occasionally as far south as 20°N (Scarff 1986; Scarff 2001). Prior to near extirpation due to commercial whaling, right whale concentrations were found in the Gulf of Alaska, eastern Aleutian Islands, south-central Bering Sea, Sea of Okhotsk, and Sea of Japan (Braham and Rice 1984). Since 1962, most sightings of North Pacific right whales have been in the Bering Sea and adjacent areas of the Aleutian Islands, with additional sightings as far south as central Baja California, as far east as Yakutat, Alaska, and Vancouver Island in the eastern North Pacific, as far south as Hawaii in the central North Pacific, and as far north as the subarctic waters of the Bering Sea and Sea of Okhotsk (Muto et al. 2020). Most recent North Pacific right whale sightings have been in the southeastern Bering Sea, with a few in the Gulf of Alaska, near Kodiak (Shelden et al. 2005; Wade et al. 2011a; Wade et al. 2011b).

It was thought this population migrated from high-latitude feeding grounds in summer to more temperate waters during the winter, possibly well offshore (Scarff 1986; Clapham et al. 2004). However, passive acoustic monitoring from 2011 to 2014 suggests that some North Pacific right whales may occur in the northern Bering Sea during winter months (Muto et al. 2020). An individual was visually identified north of St. Lawrence Island (northern Bering Sea) in November 2012 (Muto et al. 2020).

In August 2017, two right whales were detected in Bristol Bay, about 55 miles east of their designated critical habitat. Aerial and vessel surveys for right whales have occurred in a portion of the southeastern Bering Sea where right whales have been observed most summers since 1996 (Rone et al. 2012). Acoustic recorders in the southeastern Bering Sea have detected North Pacific right whales from May through January, with peak call detections in September and a sharp drop-off in detections by mid-November (Mellinger et al. 2004b; Munger et al. 2008; Stafford and Mellinger 2009; Stafford et al. 2010). The probability of acoustically detecting right whales in the Bering Sea is strongly influenced by the abundance of the copepod *Calanus marshallae*, a primary prey species for right whales on the Bering Sea shelf (Baumgartner et al. 2013).

Since 1980, eastern North Pacific right whales have been observed singly or in small groups, sometimes in association with dense zooplankton layers, south of Kodiak, in on-shelf and mid-slope waters in the Gulf of Alaska, near Unimak Pass in the Aleutian Islands, and on the mid-shelf of the Bering Sea, suggesting that this is important habitat for this population (Shelden et al. 2005; Zerbini et al. 2010; Wade et al. 2011a).

Right whales have been consistently detected in the southeastern Bering Sea within and near their designated critical habitat during spring and summer feeding seasons (Goddard and Rugh. 1998; Moore 2000; Moore et al. 2002; Zerbini et al. 2009; Rone et al. 2010; Rone et al. 2012).

Of the 184 right whale sightings reported north of the Aleutian Islands from 1973 to 2006, 182 occurred within the area designated as critical habitat in the Bering Sea. Sightings have since occurred in the Bering Sea and Gulf of Alaska, as well as acoustic detection of North Pacific right whale calling. Aerial surveys in 2008 documented 13 North Pacific right whales (NMFS 2017). In 2017, 17 right whales were found in the southeastern Bering Sea (Muto et al. 2019). Lone animals have been observed off Kodiak Island during NOAA surveys in 2004 through 2006. A single right whale was reported near Kodiak in 2010. A single right whale was also spotted in 2011 near Kodiak. In 2017, a potentially new individual was observed near Kodiak (Muto et al. 2019). During the 2018 International Whaling Commission POWER cruise, two North Pacific right whale sightings occurred in their designated critical habitat (IWC 2019).

Analysis of the data from bottom-mounted acoustic recorders deployed in October 2000, January 2006, May 2006, and April 2007 indicates that right whales remain in the southeastern Bering Sea from May through December with peak call detection in September (Munger et al. 2008; Stafford and Mellinger 2009). Additional recorders deployed from 2007 to 2013 indicate the presence of right whales in the southeastern Bering Sea almost year-round, with a peak in August and a sharp decline in detections in early January (Crance et al. 2017; Wright et al. 2019).

A study of right whale ear anatomy indicates a total possible hearing rage of 10 Hz to 22 kHz (Parks et al. 2007). NMFS categorizes right whales in the low-frequency cetacean functional hearing group, with an applied frequency range between 7 Hz and 35 kHz (NMFS 2016d).

More information on biology and habitat of the North Pacific right whale is available at:

https://www.fisheries.noaa.gov/species/north-pacific-right-whale

http://www.adfg.alaska.gov/index.cfm?adfg=rightwhale.main

https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-species-stock

4.2.5.1 North Pacific Right Whale Critical Habitat

Critical habitat for the North Pacific right whale was designated on April 8, 2008 (Figure 12, 73 FR 19000). The PBFs deemed necessary for the conservation of North Pacific right whales include the presence of specific copepods (*Calanus marshallae*, *Neocalanus cristatus*, and *N. plumchris*), and euphausiids (*Thysanoessa Raschii*) that act as primary prey items for the species, and physical and oceanographic forcing that promote high productivity and aggregation of large copepod patches. Two areas in Alaska were included in the designation, one in the Bering Sea and one in the Gulf of Alaska (Figure 12), comprising a total of approximately 95,200 square kilometers (36,750 square miles) of marine habitat. From 1973 (when the species was listed under the ESA) to 2006 (when critical habitat was first designated for the northern right whale, before the same areas were designated specifically for the North Pacific right whale), 182 of 184 sightings of the North Pacific right whale north of the Aleutians occurred within the area in the Bering Sea designated as critical habitat, and 5 of 14 sightings in the Gulf of Alaska occurred within the Gulf of Alaska critical habitat (Figure 12). During the 2018 International Whaling Commission POWER cruise, two North Pacific right whale sightings occurred in their designated critical habitat (IWC 2019).

The marine transit route is adjacent to the Bering Sea critical habitat area (see Figure 3).

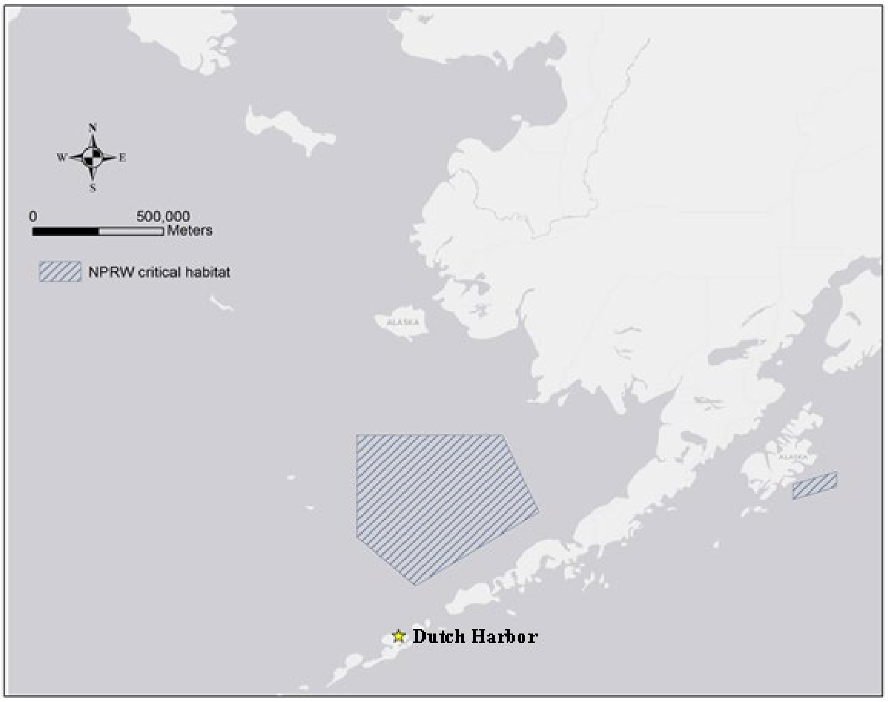

Figure 12. North Pacific right whale critical habitat in the Bering Sea and Gulf of Alaska

4.2.6 Sperm Whale

Sperm whales may occur along the marine transit route. The sperm whale was listed as an endangered species under the ESCA on December 2, 1970 (35 FR 18319) following widespread depletions due to commercial whaling, and continued to be listed as endangered following passage of the ESA. A recovery plan was prepared in 2010 (NMFS 2010b). Critical habitat has not been designated for the sperm whale.

The sperm whale is one of the most widely distributed marine mammals (Muto et al. 2020, Figure 10). Currently, the population structure of sperm whales has not been adequately defined (NMFS 2010b). For management purposes under the MMPA, three stocks of sperm whale are currently recognized in U.S. waters of the Pacific Ocean: (1) Alaska (also termed North Pacific stock), (2) California/Washington/Oregon, and (3) Hawaii (Muto et al. 2020). The North Pacific stock is the only stock occurring in Alaska waters (Muto et al. 2020).

Whitehead (2002) estimated the global abundance of sperm whale at 1,110,000 animals prior to commercial whaling. Rice (1989) estimated the North Pacific stock at 1,260,000 animals prior to exploitation (which is larger than Whitehead’s estimate for the global population), and estimated that by the 1970s, the North Pacific stock had been reduced to 930,000 whales. Although the number of sperm whales occurring in Alaska waters is unknown, 102,112 sperm whales are estimated to occur in the western North Pacific region (Kato and Miyashita 1998). There is no current reliable estimate of the global abundance of sperm whale, or of the North Pacific stock in Alaska (Muto et al. 2020). Therefore, a population trend for sperm whales in the North Pacific stock is also not available (Muto et al. 2020).

Sperm whales inhabit all oceans worldwide and can be observed along the pack ice edge in both hemispheres. They are most commonly found in deep ocean waters (typically deeper than 900 feet) between latitudes 60º N and 60º S. In Alaska, sperm whales commonly occur in the Gulf of Alaska, Bering Sea, around the Aleutian Islands, and some parts of Southeast Alaska during the summer months (Muto et al. 2020). Sperm whales occur year around in the Gulf of Alaska, but appear to be more common during the summer months than winter months (Mellinger et al. 2004a). Sperm whales are thought to migrate to higher latitude foraging grounds in the summer and lower latitudes in the winter (Muto et al. 2020). The northernmost observed range for sperm whales in the North Pacific extends from Cape Navarin, Russia (latitude 62º N) to the Pribilof Islands, Alaska (Omura 1955; Allen and Angliss 2014).

Sperm whales feed primarily on medium-sized to large-sized squids, and also eat other prey items including cephalopods (such as octopi) and large demersal mesopelagic sharks, skates, and fishes (Rice 1989; Allen and Angliss 2014).

Sperm whales produce a variety of vocalizations ranging from 0.1 to 20 kHz (Weilgart and Whitehead 1993; Goold and Jones 1995; Møhl et al. 2003; Weir and Goold 2007). Our understanding of sperm whale hearing stems largely from the sounds they produce. Sperm whales are odontocetes (tooth whales) and are considered mid-frequency cetaceans with an applied frequency range of 150 Hz to 160 kHz (NMFS 2016d). The only direct measurement of hearing was from a young stranded individual from which auditory evoked potentials were recorded and indicated a hearing range of 2.5 to 60 kHz (Carder and Ridgway 1990).

More information on sperm whale biology and habitat is available at:

https://www.fisheries.noaa.gov/species/sperm-whale

https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-species-stock

4.2.7 Arctic Ringed Seal

Arctic ringed seals may occur along the marine transit route and adjacent to NPR-A. Under the MMPA, NMFS recognizes one stock of Arctic ringed seals, the Alaska stock, whose range includes the Beaufort and Chukchi seas as well as the northern Bering Sea, with few seals ranging as far south as the Aleutian Islands. The Arctic ringed seal was listed as threatened under the ESA on December 28, 2012, primarily due to expected impacts on the population from declines in sea ice and snow cover stemming from climate change within the foreseeable future (77 FR 76706).

Though a precise population estimate for the entire Alaska stock is not available, research programs have recently developed new survey methods and partial, but useful, abundance estimates. In spring of 2012 and 2013, U.S. and Russian researchers conducted image-based aerial abundance and distribution surveys of the entire Bering Sea and Sea of Okhotsk (Moreland et al. 2013). Boveng et al. (2017) reported abundance estimates of 186,000 and 119,000 ringed seals in the U.S. Portion of the Bering Sea in 2012 and 2013, respectively. The authors indicated that their estimates should be viewed with caution.

The Arctic subspecies of ringed seal has a circumpolar distribution and is found in all seasonally ice-covered waters throughout the Arctic basin and adjacent waters. They remain with the ice most of the year and use it as a haul-out platform for resting, pupping and nursing in late winter to early spring, and molting in late spring to early summer. During summer, ringed seals range hundreds to thousands of kilometers to forage along ice edges or in highly productive open-water areas (Harwood and Stirling 1992; Freitas et al. 2008; Kelly et al. 2010b; Harwood et al. 2015). Harwood and Stirling (1992) reported that in late summer and early fall, aggregations of ringed seals occur in open-water in some parts of their study area in the southeastern Canadian Beaufort Sea where primary productivity was thought to be high. Harwood et al. (2015) also found that in the fall, several satellite-tagged ringed seals showed localized movements offshore east of Point Barrow in an area where bowhead whales are known to concentrate in the fall to feed on zooplankton. With the onset of freeze-up in the fall, ringed seal movements become increasingly restricted. Seals that have summered in the Beaufort Sea are thought to move west and south with the advancing ice pack, with many seals dispersing throughout the Chukchi and Bering seas while some remain in the Beaufort Sea (Frost and Lowry 1984; Crawford et al. 2012; Harwood et al. 2012).

In Alaskan waters, during winter and early spring when sea ice is at its maximal extent, ringed seals are abundant in the northern Bering Sea, Norton and Kotzebue Sounds, and throughout the Chukchi and Beaufort seas (Frost 1985; Kelly 1988b). Passive acoustic monitoring (PAM) of ringed seals from a high frequency recording package deployed at a depth of 787 ft. (240 m) in the Chukchi Sea (65 nm) 120 km north-northwest of Barrow, Alaska, detected ringed seals in the area between mid- December and late May over the four year study (Jones et al. 2014). With the onset of the fall freeze, ringed seal movements become increasingly restricted, and seals will either move west and south with the advancing ice pack with many seals dispersing throughout the Chukchi and Bering seas, or remain in the Beaufort Sea (Frost and Lowry 1984; Crawford et al. 2012; Harwood et al. 2012). Kelly et al. (2010a) tracked home ranges for ringed seals in the subnivean period (using shorefast ice); the size of the home ranges varied from less than 1 km^2 up to 27.9 km^2 (median is 0.62 km^2 for adult males and 0.65 km^2 for adult females). Most (94 percent) of the home ranges were less than 3 km^2 during the subnivean period (Kelly et al. 2010a). Near large polynyas, ringed seals maintain ranges up to 7,000 km^2 during winter and 2,100 km^2 during spring (Born et al. 2004). Some adult ringed seals return to the same small home ranges they occupied during the previous winter (Kelly et al. 2010a). The size of winter home ranges can, however, vary by up to a factor of 10 depending on the amount of fast ice; seal movements were more restricted during winters with extensive fast ice, and were much less restricted where fast ice did not form at high levels (Harwood et al. 2015).

Ringed seal pups are born and nursed in the spring (March through May), normally in subnivean birth lairs, with the peak of pupping occurring in early April (Frost and Lowry 1981). Subnivean lairs provide thermal protection from cold temperatures, including wind chill effects, and some protection from predators (Smith and Stirling 1975; Smith 1976). These lairs are especially important for protecting pups. Arctic ringed seals appear to favor ground-fast ice as whelping habitat. Ringed seal whelping has also been observed on both nearshore and offshore drifting pack ice (e.g., Lentfer 1972). The pups spend time learning diving skills, using multiple breathing holes, and nursing and resting in lairs (Smith and Lydersen 1991; Lydersen and Hammill 1993).

Ringed seals feed year-round, but forage most intensively during the open-water period and early freeze-up, when they spend 90 percent or more of their time in the water (Kelly et al. 2010a). Many studies of the diet of Arctic ringed seal have been conducted and although there is considerable variation in the diet regionally, several patterns emerge. Most ringed seal prey is small (in the 5-10 cm (2-4 in) length range for fishes and the 2-6 cm (0.8-2.4 in) length range for crustaceans), and preferred prey tends to be schooling species that form dense aggregations. Quakenbush et al. (2011b) found fish were consumed more frequently in the 2000s than in the 1960s and 1970s, and Arctic cod, saffron cod, sculpin, rainbow smelt, and walleye pollock were identified as the dominant fishes, while mysids, amphipods, and shrimp were the dominant invertebrate species in ringed seal diets.

Ringed seals produce underwater vocalizations which range from approximately 0.1 to 1.0 kHz (Jones et al. 2014) in association with territorial and mating behaviors. Underwater audiograms for ringed seals indicate that their hearing is most sensitive at 12.8 kHz in water (where they have a hearing threshold of about 49 dB re 1 μPa). In air, the peak of their sensitivity is at about 4.5 kHz (hearing threshold of 12 dB re 20 μPa) (Sills et al. 2015). NMFS defines the functional hearing range for phocids (seals) as 50 Hz to 86 kHz (NMFS 2016d).

Sills et al. (2015) suggested that because ringed seal hearing is sensitive for a greater frequency range than their vocalizations, their hearing is likely not only used for detection of the vocalizations of conspecifics (Sills et al. 2015), but may also be important in locating breathing holes and the ice edge, detection of predators, locating prey, and orienteering (Elsner et al. 1989; Wartzok et al. 1992; Miksis-Olds and Madden 2014). Sills et al. (2015) further reported that ringed seal hearing appears to be resistant to masking across a range of frequencies, as indicated by their enhanced ability to detect signals from background noise.

Additional information on ringed seals can be found at:

https://www.fisheries.noaa.gov/species/ringed-seal

4.2.8 Bearded Seal (Beringa DPS)

Bearded seals may occur along the marine transit route and adjacent to NPR-A. There are two recognized subspecies of the bearded seal: *E. b. barbatus,* often described as inhabiting the Atlantic sector (Laptev, Kara, and Barents seas, North Atlantic Ocean, and Hudson Bay; Rice 1998); and *E. b. nauticus*, which inhabits the Pacific sector (remaining portions of the Arctic Ocean and the Bering and Okhotsk seas; Ognev 1935; Scheffer 1958; Manning 1974; Heptner et al. 1976). Based on evidence for discreteness and ecological uniqueness, NMFS concluded that the *E. b. nauticus* subspecies consists of two DPSs: the Okhotsk DPS in the Sea of Okhotsk, and the Beringia DPS encompassing the remainder of the range of this subspecies (75 FR 77496; December 10, 2010). Only the Beringia DPS is found in U.S. waters (and the action area), and this portion is recognized by NMFS as a single Alaska stock.

The Beringia DPS was listed as threatened under the ESA on December 28, 2012 (77 FR 76740) due to the projected loss of sea ice and alteration of prey availability from climate change in the foreseeable future.

A precise population estimate for the entire Alaska stock is not available, but research programs have recently developed new survey methods and partial, but useful, abundance estimates. In spring of 2012 and 2013, U.S. and Russian researchers conducted aerial abundance and distribution surveys over the entire Bering Sea and Sea of Okhotsk (Moreland et al. 2013). For the U.S. portion of the Bering Sea, Boveng et al. (2017) reported model-averaged abundance estimates of 170,000 and 125,000 bearded seals in 2012 and 2013, respectively.

Bearded seals have a circumpolar distribution that does not extend farther north than 85° N (Folkens et al. 2002; Muto et al. 2020). The Beringia DPS of the bearded seal includes all bearded seals from breeding populations in the Arctic Ocean and adjacent seas in the Pacific Ocean between 145°E longitude (Novosibirskiye Archipelago) in the East Siberian Sea and 130°W longitude in the Canadian Beaufort Sea, except west of 157°W longitude in the Bering Sea and west of the Kamchatka Peninsula (where the Okhotsk DPS is found). The bearded seal's effective range is generally restricted to areas where seasonal sea ice occurs over relatively shallow waters. Cameron et al. (2010) defined the core distribution of bearded seals as those areas of known extent that are in waters less than 500 m (1,640 ft) deep.

Bearded seals are closely associated with sea ice, particularly during the critical life history periods related to reproduction and molting, and can be found in a broad range of ice types. They generally prefer moving ice that produces natural openings and areas of open-water (Heptner et al. 1976; Fedoseev 1984; Nelson et al. 1984). They usually avoid areas of continuous, thick, shorefast ice and are rarely seen in the vicinity of unbroken, heavy, drifting ice or large areas of multi-year ice (Fedoseev 1965; Burns and Harbo 1972; Burns 1981; Smith 1981; Fedoseev 1984; Nelson et al. 1984). Within the U.S. range of the Beringia DPS, the extent of favorable ice conditions for bearded seals is most restricted in the Beaufort Sea, where there is a relatively narrow shelf with suitable water depths. There is more suitable ice floating over suitable water depths in the Chukchi and Bering seas (Burns 1981). During winter, the central and northern parts of the Bering Sea shelf where heavier pack ice occurs have the highest densities of adult bearded seals (Heptner et al. 1976; Burns and Frost 1979; Burns 1981; Nelson et al. 1984; Cameron et al. 2018), possibly reflecting the favorable ice conditions there. Cameron et al. (2018) found that bearded seals tended to prefer areas of between 70 and 90 percent ice coverage, and were typically more abundant in offshore pack ice 37 to 185 km (20 to 100 nautical miles [nm]) from shore than within 37 km (20 nm) of shore. It is thought that in the fall and winter most bearded seals move south with the advancing ice edge through Bering Strait into the Bering Sea where they spend the winter, and in the spring and early summer, as the sea ice melts, many of these seals move north through the Bering Strait into the Chukchi and Beaufort seas (Burns 1967; Burns and Frost 1979; Burns 1981; Cameron and Boveng 2007; Cameron and Boveng 2009; Cameron et al. 2018). However, some unknown proportion of the population occurs in the Chukchi and Beaufort seas over winter (MacIntyre et al. 2013; MacIntyre et al. 2015). Some seals, mostly juveniles, have been observed hauled out on sandy islands near Barrow (Cameron et al. 2010).

Beringia DPS bearded seals are widely distributed throughout the northern Bering, Chukchi, and Beaufort seas and are most abundant north of the ice edge zone (MacIntyre et al. 2013). Bearded seals with pups have been observed in the Beaufort, Chukchi, and Bering seas in areas of drifting pack ice along the ice edge, but also in the heavy winter pack ice where there are leads (Burns and Frost 1979; Cameron et al. 2010). Telemetry data from Boveng and Cameron (2013) showed that large numbers of bearded seals move south in fall/winter as sea ice forms and move north as the seasonal sea ice melts in the spring. The highest densities of bearded seals are found in the central and northern Bering Sea shelf during winter (Fay 1974; Heptner et al. 1976; Burns and Frost 1979; Braham et al. 1981; Burns 1981; Nelson et al. 1984). In late winter and early spring bearded seals are widely (not uniformly) ranging from the Chukchi Sea south to the ice front in the Bering Sea usually on drifting pack ice (Muto et al. 2020). Bearded seal calls were recorded throughout the year in the Beaufort Sea (MacIntyre et al. 2013) and northeastern Chukchi Sea (Jones et al. 2014), and the timing of the peak calling periods in both of these studies (increasing through spring with peak rates in April) suggest that bearded seals are breeding in these areas.

During the open-water period the Beaufort Sea likely supports fewer bearded seals than the Chukchi Sea because of the more extensive foraging habitat (i.e., on the continental shelf) available to bearded seals there.

Individual male bearded seals use distinct vocalizations during the breeding season which are believed to advertise mate quality, signal competing claims on reproductive rights, or to identify territory. Studies in the fjords of the Svalbard Archipelago and shore leads in the Chukchi Sea of Alaska have suggested site fidelity of males within and between years supporting earlier claims that males defend aquatic territories (Cleator et al. 1989; Cleator and Stirling 1990; Van Parijs et al. 2003; Van Parijs et al. 2004; Van Parijs and Clark 2006; Risch et al. 2007). Males exhibiting territoriality maintain a ≤ 12 km^2 core area, unlike wandering males that call across several larger core areas (Van Parijs et al. 2003; Van Parijs et al. 2004; Van Parijs and Clark 2006; Risch et al. 2007), and scars on the males suggest fighting may be involved in defending territories as well.

Bearded seal diets vary with age, location, season, and changes in prey availability (Kelly 1988a). They are mostly benthic feeders (Burns 1981), consuming a variety of invertebrates (e.g., crabs, shrimp, clams, worms, and snails; Quakenbush et al. 2011a), fish (including arctic and saffron cod, flounders, and sculpins), and octopuses (Burns 1981; Kelly 1988a; Reeves et al. 1992; Hjelset et al. 1999; Cameron et al. 2010). Unlike walrus that “root” in the soft sediment for benthic organisms, bearded seals “scan” the surface of the seafloor with their highly sensitive whiskers, burrowing only in the pursuit of prey (Marshall et al. 2006; Marshall et al. 2008). Bearded seals also feed on ice-associated organisms when practicable, allowing the seals to live in areas with water depths considerably deeper than 200 m if necessary.

Male bearded seals produce a variety of underwater vocalizations ranging from approximately 0.2 to 4.3 kHz (Jones et al. 2014) which can travel up to 30 kilometers (Cleator et al. 1989; Van Parijs et al. 2001; Van Parijs et al. 2003; Van Parijs et al. 2004; Van Parijs and Clark 2006) and are used to find mates (Cameron et al. 2010). Mating calls peak during and after pup rearing (Wollebaeck 1927; Freuchen 1935; Dubrovskii 1937; Chapskii 1938), and evidence suggests these calls originate only from males (Burns 1967; Poulter 1968; Ray et al. 1969; Burns 1981; Stirling 1983; Cleator et al. 1989; Cleator and Stirling 1990; Van Parijs et al. 2001; Van Parijs et al. 2003; Van Parijs et al. 2004; Davies et al. 2006; Van Parijs and Clark 2006; Risch et al. 2007).

Although no audiograms have been published for bearded seals (Halliday et al. 2017), it is likely that their hearing is similar to other phocids (Terhune 1999). NMFS classifies bearded seals in the phocid pinniped (“true” seal) functional hearing group, with an applied frequency range between 0.050 and 86 kHz (NMFS 2016d).

Additional information on Beringia DPS bearded seals can be found at:

https://www.fisheries.noaa.gov/species/bearded-seal

4.2.9 Steller Sea Lion

Western DPS Steller sea lions may occur along the marine transit route. The Steller sea lion was listed as a threatened species under the ESA on November 26, 1990 (55 FR 49204). In 1997, NMFS reclassified Steller sea lions into two distinct population segments (DPS) based on genetic studies and other information (62 FR 24345); at that time the eastern DPS was listed as threatened and the western DPS was listed as endangered. On November 4, 2013, the eastern

DPS was removed from the endangered species list (78 FR 66140). Critical habitat has been designated for Steller sea lions (Figure 7) (50 CFR 226.202).

Numbers of Steller sea lions declined dramatically throughout much of the species' range, beginning in the mid- to late 1970s (Braham et al. 1980; Merrick et al. 1987). For two decades prior to the decline, the estimated total population was 250,000 to 300,000 animals (Kenyon and Rice 1961; Loughlin et al. 1984). The population estimate declined by 50-60 percent to about 116,000 animals by 1989 (NMFS 1992), and by an additional 15 percent by 1994, with the entire decline occurring in the range of the western DPS.

The most recent comprehensive aerial photographic and land-based surveys of western Steller sea lions in Alaska estimated a total Alaska population (both pups and non-pups) of 59,624 (Muto et al. 2020). Although Steller sea lion abundance continues to decline in the western Aleutians, numbers are thought to be increasing in the eastern part of the western DPS range.

Steller sea lions range throughout the North Pacific Ocean from Japan, east to Alaska, and south to central California (Loughlin et al. 1984). They range north to the Bering Strait, with significant numbers at haul-outs on St. Lawrence Island in the spring and fall (Kenyon and Rice 1961). Breeding range extends along the northern edge of the North Pacific Ocean from the Kuril Islands, Japan, through the Aleutian Islands and Southeast Alaska, and south to California (Loughlin et al. 1984).

Land sites used by Steller sea lions are referred to as rookeries and haulouts. Rookeries are used by adult sea lions for pupping, nursing, and mating during the reproductive season (generally from late May to early July). Haulouts are used by all age classes of both genders but are generally not where sea lions reproduce. Sea lions move onshore and offshore for feeding excursions. At the end of the reproductive season, some females may move with their pups to other haulout sites, and males may migrate to distant foraging locations (Spalding 1964; Pitcher and Calkins 1981). Sea lions may make semi-permanent or permanent one-way movements from one site to another (Chumbley et al. 1997; Burkanov and Loughlin 2005). Round trip migrations of greater than 6,500 km by individual Steller sea lions have been documented (Jemison et al. 2013).

Most adult Steller sea lions occupy rookeries during the pupping and breeding season, which extends from late May to early July (Pitcher and Calkins 1981; Gisiner 1985), and exhibit high site fidelity. During the breeding season some juveniles and non-breeding adults occur at or near the rookeries, but most are on haulouts (Rice 1998; Call and Loughlin 2005).

The foraging strategy of Steller sea lions is strongly influenced by seasonality of sea lion reproductive activities on rookeries and the ephemeral nature of many prey species. Steller sea lions are generalist predators that eat a variety of fishes and cephalopods (Pitcher and Calkins 1981; Calkins and Goodwin 1988; NMFS 2008), and occasionally other marine mammals and birds (Pitcher and Fay 1982; NMFS 2008). During summer Steller sea lions feed mostly over the continental shelf and shelf edge. Females attending pups forage within 20 nm of breeding rookeries (Merrick and Loughlin 1997), which is the basis for designated critical habitat around rookeries and major haulout sites.

The ability to detect sound and communicate underwater is important for a variety of Steller sea lion life functions, including reproduction and predator avoidance. NMFS categorizes Steller sea lions in the otariid pinniped functional hearing group, with an applied frequency range between

60 Hz and 39 kHz in water (NMFS 2016d).

More information on Steller sea lion biology and habitat (including critical habitat) is available at:

https://www.fisheries.noaa.gov/species/steller-sea-lion

https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-species-stock

4.2.9.1 Steller Sea Lion Critical Habitat

NMFS designated critical habitat for Steller sea lions on August 27, 1993 (58 FR 45269). In Alaska, designated critical habitat includes the following areas as described at 50 CFR §226.202.

1. Terrestrial zones that extend 3,000 feet (0.9 km) landward from each major haulout and major rookery.
2. Air zones that extend 3,000 feet (0.9 km) above the terrestrial zone of each major haulout and major rookery in Alaska.
3. Aquatic zones that extend 3,000 feet (0.9 km) seaward of each major haulout and major rookery in Alaska that is east of 144° W longitude.
4. Aquatic zones that extend 20 nm (37 km) seaward of each major haulout and major rookery in Alaska that is west of 144° W longitude.
5. Three special aquatic foraging areas: the Shelikof Strait area, the Bogoslof area, and the Seguam Pass area, as specified at 50 CFR §226.202(c).

The marine transit route overlaps with a very small portion of designated Steller sea lion critical habitat. The nearest major rookeries and haulouts to the action area are located on Akutan Island, Old Man Rocks, and Cape Sedanka approximately 15-18 nm away from the action area. Barging activities will also traverse through the Bogoslof critical habitat foraging area (Figure 13). Mitigation measures to reduce impact on Steller sea lion critical habitat are discussed above and include that vessel operators will not approach within 3 nm (5.5 km) of any major Steller sea lion rookeries or haulouts listed in regulation (50 CFR 224.103(d)(1)(iii) & 50 CFR 226.202).

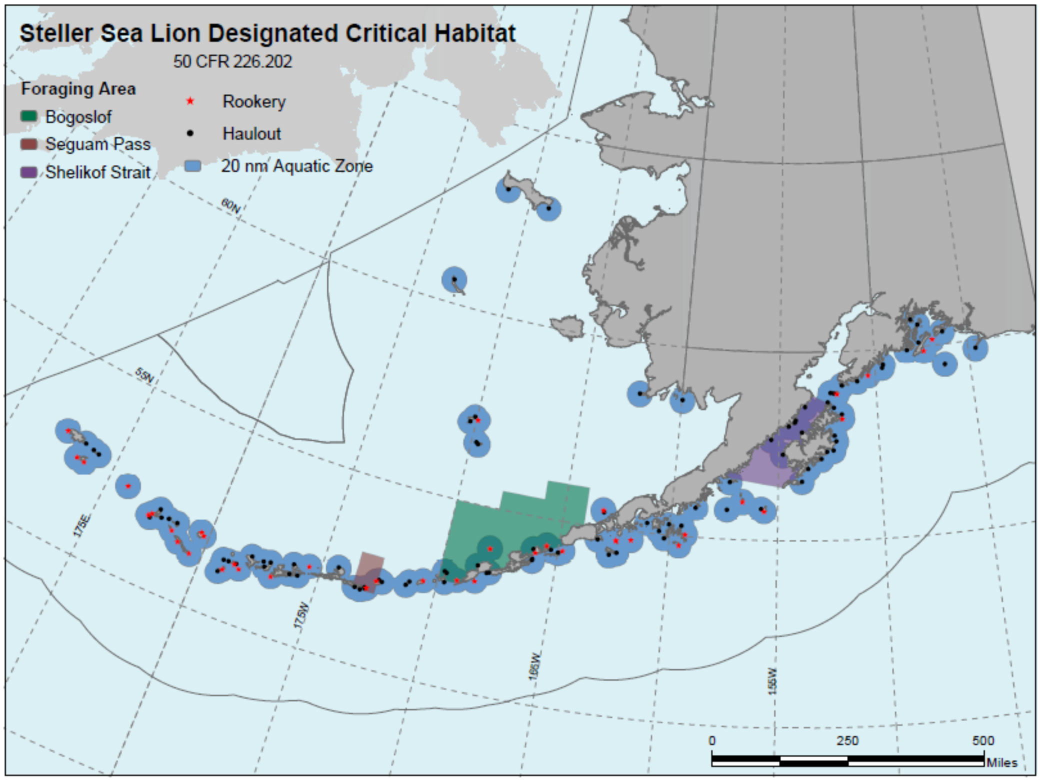

Figure 13. Designated critical habitat for the Steller sea lion (50 CFR 226.202)

5 ENVIRONMENTAL BASELINE

The "environmental baseline" refers to the condition of the listed species or its designated critical habitat in the action area, without the consequences to the listed species or designated critical habitat caused by the proposed action. The environmental baseline includes the past and present impacts of all Federal, state, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action areas that have already undergone formal or early section 7 consultation, and the impact of state or private actions which are contemporaneous with the consultation process. The consequences to listed species or designated critical habitat from ongoing agency activities or existing agency facilities that are not within the agency's discretion to modify are part of the environmental baseline (50 CFR § 402.02). This section discusses the environmental baseline, focusing on existing anthropogenic and natural activities within the action area and their influences on listed species and their critical habitat that may be adversely affected by the proposed action.

5.1 Climate Change

All areas of the action area are being affected by climate change. Although the species living in the Arctic successfully adapted to changes in the climate in the past, the current rate of change is accelerated (Simmonds and Eliott. 2009). As described in Section 4.1, effects to Arctic ecosystems are very pronounced, wide-spread, and well documented. While a changing climate may create opportunities for range expansion for some species, the life cycles and physiological requirements of many specialized polar species are closely linked to the annual cycles of sea ice and photoperiod and they may be less adaptable (Doney et al. 2009; Wassmann et al. 2011). Because the rate of change is occurring so quickly, the changes may exceed species' ability to adapt. Additionally, the loss of sea ice as a barrier increases the potential for further anthropogenic impacts as vessel traffic for transportation and tourism increases, resource extraction activities expand, and pathogens or disease have a path into newly ice-free regions.

As discussed in Section 4.2, the Arctic is warming at two or more times the global average. One consequence of the warming is a reduction in the length of the snow season (Figure 14). The depth and duration of snow cover are projected to continue to decline substantially throughout the range of the Arctic ringed seal, reducing the areas with suitable snow depths for their lairs by an estimated 70 percent by the end of this century (Hezel et al. 2012). It has been observed that the mean thickness of snow accumulating on sea ice has declined from approximately 35 to 22 cm in the western Arctic and 33 to 15 cm in the Beaufort and Chukchi Seas since the mid-1900s (Webster et al. 2014). A decrease in the availability of suitable sea ice conditions may not only lead to high mortality of ringed seal pups but may also produce behavioral changes in seal populations (Loeng et al. 2005). The persistence of this species will likely be challenged as decreases in ice and, especially, snow cover lead to increased juvenile mortality from premature weaning, hypothermia, and predation (Kelly et al. 2010b).

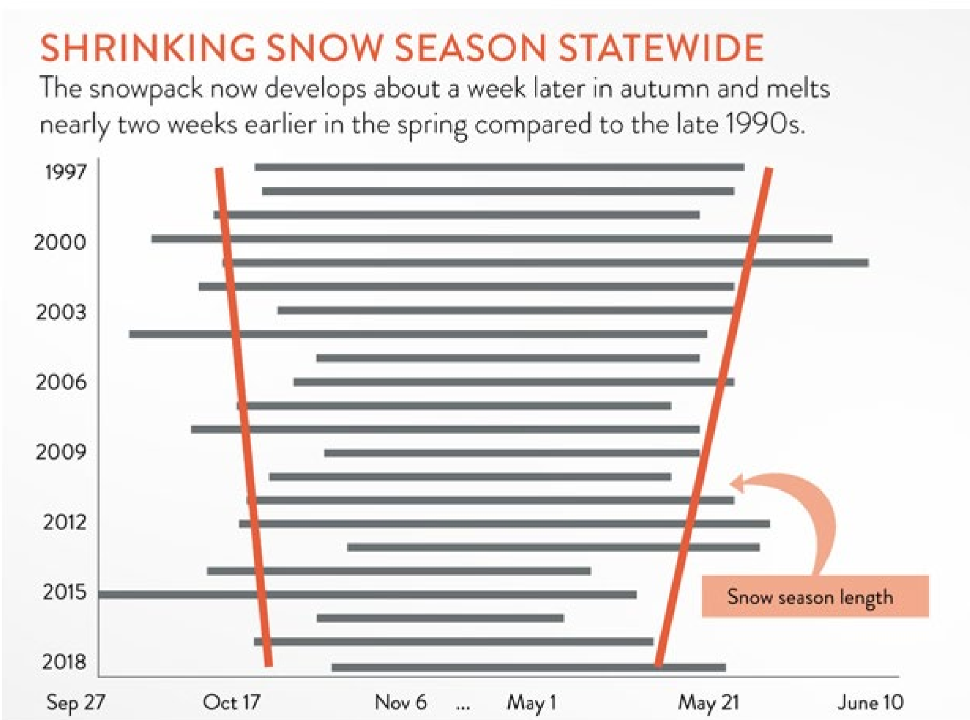

Figure 14. Length of the snow season (gray bars) in Alaska each year from 1997-2018. Orange slanting bars show the trends of the date when the state becomes 50 percent snow covered in fall and when half the winter snow has melted in spring. Image by Rick Thoman, Alaska Center for Climate and Policy.

Bearded seals are primarily found in areas where seasonal sea ice occurs over relatively shallow waters where they are able to forage on the bottom (Fedoseev 2000). The loss of sea ice from shallow feeding areas may make foraging more energetically costly. Decreases in ice suitable for molting and pup maturation, will likely compromise their reproductive and survival rates (Cameron et al. 2010). With a progressively earlier spring breakup, the molt may be interrupted due to a lack of access to a stable ice surface and can result in compromised body condition and disease (Burek et al. 2008; Ferguson et al. 2017).

Although no scientific studies have directly addressed the impacts of ocean acidification on ringed or bearded seals, ocean acidification may affect their prey through cascading changes in the food web, starting with phytoplankton and zooplankton. These changes may lead to decreased availability or loss of prey species over time (Kelly et al. 2010b).

Vessel traffic, and more importantly for seals, ice breaker traffic will be increasing in the Arctic (U.S. Committee on the Marine Transportation System 2019; NMFS 2020). Although seals are maneuverable enough to avoid vessels in open water, icebreakers could be lethal to nursing pups through collisions or crushing by displaced ice (Wilson et al. 2017; Wilson et al. 2020). In a study of Caspian seals (*Pusa capsica)* from 2006-2013, Wilson et al. (2017) documented the response of seals to ice breakers that made regular transits across the Caspian Sea. The ice breaking route had high densities of breeding seals in most years. A whole range of impacts to mothers and their pups was documented including being struck by the ice breaker, moving away from the ice breaker as it approached, to having mothers and pups separated. Vessel passage may destroy birth sites, water access holes, and pup shelters replacing those features with brash ice or open water. Often pups were marooned on fragments of intact ice or wetted in brash ice. Fragmented brash ice may cause disorientation, stress, and increased energetic demands (Wilson et al. 2017). With the Northern Sea Route and Northwest Passage being available more often and an increase in icebreakers, we would expect that ice dependent seals could be affected.

With an earlier retreat of sea ice in the spring and warmer ocean temperatures (Section 4.2.1.2), there have been changes in the distribution of whales. Aerial surveys to study the distribution, relative abundance, and behavior of marine mammals have been conducted in the eastern Chukchi Sea, primarily during July through October, 1982–1991 and 2008–2016, for the Aerial Surveys of Arctic Marine Mammals (ASAMM) project and its precursors (Brower et al. 2018). Although historical records from commercial whaling and scientific research document humpback, fin, and minke whales from June through October in the western Chukchi Sea and near the Chukotka coast, few records of these subarctic species exist in the eastern Chukchi Sea (Clarke et al. 2013a) and these species were entirely absent from this area in the 1982–1991 surveys (Brower et al. 2018). In contrast, there were 159 sightings of 250 individuals of these species in 2008–2016 in the eastern Chukchi Sea (Brower et al. 2018).

In addition to these observations, passive acoustic monitors (PAM) have been recording the presence of subarctic species in various parts of the Chukchi Sea (Delarue et al. 2013; Hannay et al. 2013; Crance et al. 2015; Tsujii et al. 2016). These species generally arrive in the southern Chukchi Sea after the sea ice melts (late July) and leave before it extends over the area in October or early November (Hannay et al. 2013; Tsujii et al. 2016). PAM also recorded the farthest northeast record of fin whale calls in the Alaskan Arctic (Crance et al. 2015). We would expect as sea ice continues to decline, presence of these subarctic species in more northerly latitudes will increase.

As mentioned earlier, shipping in the Arctic is expected to increase as sea ice decreases. Both major shipping routes, the Northern Sea Route along the northern Russian coast and the Northwest Passage through the Canadian Archipelago, pass through Bering Strait. The entire population of bowhead whales passes through Bering Strait each spring and fall between wintering and summering areas (Quakenbush et al. 2012). There are about 33 km (20 mi) between the west side of the Diomedes Islands and the Chukotka coast. Ships traveling along the coast between October and December could encounter a high proportion of the bowhead population (Quakenbush et al. 2012). Ship strikes are the greatest source of mortality for North Atlantic right whales (*Eubalaena glacialis*) and bowhead and North Pacific right whales may be as vulnerable to ship strikes as North Atlantic right whales due to their swimming speed and feeding behavior (Reeves et al. 2012). Two percent of subsistence-harvested bowheads bear scars from vessel encounters (George et al. 2017). In addition, with the expansion of habitat by the subarctic species to the north, interactions with ship traffic in the Bering Strait is an area of concern for all species (Reeves et al. 2012).

Some Arctic species may benefit from some aspects of climate change. Conceptual models suggested that overall reductions in sea ice cover should increase the Western Arctic stock of bowhead whale prey availability (Moore and Laidre 2006). This theory may be substantiated by the steady increase in the Western Arctic bowhead population during the nearly 20 years of sea ice reductions (Walsh 2008). George et al. (2006), showed that harvested bowheads had better body condition during years of light ice cover. Similarly, George et al. (2015) found an overall improvement in bowhead whale body condition and a positive correlation between body condition and summer sea ice loss over the last 2.5 decades in the Pacific Arctic. George et al. (2015) speculated that sea ice loss has positive effects on secondary trophic production within the Western Arctic bowhead whale's summer feeding region. Moore and Huntington (2008) anticipated that bowhead whales will alter migration routes and occupy new feeding areas in response to climate related environmental change.

5.1.1.1 Biotoxins

As temperatures in the Arctic waters warm and sea ice diminishes, marine mammal health may be compromised through nutritional and physiological stress, toxins from harmful algal blooms, and exposure to new pathogens. As mentioned in Section 4.2.1.2, an unprecedented harmful algal bloom extended from the Aleutian Islands to southern California as a result of "the blob," causing mass strandings of marine mammals (Cavole et al. 2016). Fey et al. (2015) found that across all animal taxa biotoxicity from harmful algal blooms was one of the events most often associated with mass mortality events. Two of the most common biotoxins along the West Coast of the Pacific are the neurotoxins domoic acid and saxitoxin (Lefebvre et al. 2016). Although these toxins can cause death, they can also cause sublethal effects including reproductive failure and chronic neurological disease (Broadwater et al. 2018).

Domoic acid was first recognized as a threat to marine mammal health in 1998 when hundreds of California sea lions (*Zalophus californianus*) died along beaches in central California or exhibited signs of neuroexcitotoxicity including seizures, head weaving, and ataxia (Scholin et al. 2000). Along the west coast of the United States and Canada, a coastwide bloom of the toxigenic diatom *Pseudo-nitzschia* in spring 2015 resulted in the largest recorded outbreak of domoic acid. Record-breaking concentrations of the marine neurotoxin caused unprecedented widespread closures of commercial and recreational shellfish and finfish fisheries and contributed to the stranding of numerous marine mammals along the U.S. west coast (McCabe et al. 2016).

Lefebvre et al. (2016) examined 13 species of marine mammals from Alaska including humpback whales, bowhead whales, beluga whales, harbor porpoises, northern fur seals, Steller sea lions, harbor seals, ringed seals, bearded seals, spotted seals, ribbon seals, Pacific walruses, and northern sea otters (Figure 15). Domoic acid was detected in all 13 species examined and had the greatest prevalence in bowhead whales (68%) and harbor seals (67%). Saxitoxin was detected in 10 of the 13 species, with the highest prevalence in humpback whales (50%) and bowhead whales (32%) and 5% of the animals tested had both toxins present (Lefebvre et al. 2016). It is not known if exposure to multiple toxins result in additive or synergistic effects or perhaps suppress immunity to make animals more vulnerable to secondary stressors (Broadwater et al. 2018). With declining sea ice, warmer water temperatures, and changes in ocean circulation patterns, NOAA anticipates that harmful algal blooms in the Arctic will likely worsen in the future[10].

Figure 15. Algal toxins detected in 13 species of marine mammals from southeast Alaska to the Arctic from 2004 to 2013 (Lefebvre et al. 2016).

5.1.1.2 Disease

In addition to influencing animal nutrition and physiological stress, environmental shifts caused by climate change may foster exposure to new pathogens in Arctic marine mammals. Through altered animal behavior and absence of physical barriers, loss of sea ice may create new pathways for animal movement and introduction of infectious diseases into the Arctic. The health impacts of this new normal in the Arctic are unknown, but new open water routes through

[10] NOAA Arctic Program. Arctic Report Card: Update for 2018, Available at https://arctic.noaa.gov/Report-Card/Report-Card-2018/ArtMID/7878/ArticleID/789/Harmful-Algal-Blooms-in-the-Arctic, accessed November 10, 2020.

the Arctic suggest that opportunities for Phocine distemper virus (PDV) and other pathogens to cross between North Atlantic and North Pacific marine mammal populations may become more common (VanWormer et al. 2019). PDV is a pathogen responsible for extensive mortality in European harbor seals (*Phoca vitulina vitulina*) in the North Atlantic. Prior to 2000, serologic surveys of Pacific harbor seals (*Phoca vitulina richardsii*), Steller sea lions, and northern sea otters off Alaska showed little evidence of exposure to distemper viruses, and PDV had not been identified as a cause of illness or death. PDV was not confirmed in the North Pacific Ocean until it was detected in northern sea otters sampled in 2004 (VanWormer et al. 2019). In addition to PDV, *Brucella*, and Phocid herpesvirus-1 have been found in Alaskan marine mammals (Zarnke et al. 2006). Herpesviruses were implicated in fatal and nonfatal infections of harbor seals in the North Pacific (Zarnke et al. 2006).

Ringed and bearded seals have co-evolved with numerous parasites and diseases, and these relationships are presumed to be stable. However, beginning in mid-July 2011, elevated numbers of sick or dead seals, primarily ringed seals, with skin lesions were discovered in the Arctic and Bering Strait regions. By December 2011, there were more than 100 cases of affected pinnipeds, including ringed seals, bearded seals, spotted seals, and walruses, in northern and western Alaska. Due to the unusual number of marine mammals discovered with similar symptoms across a wide geographic area, NMFS and USFWS declared a Northern Pinniped Unusual Mortality Event (UME) on December 20, 2011. Disease surveillance efforts in 2012 through 2014 detected few new cases similar to those observed in 2011. To date, no specific cause for the disease and deaths has been identified.

Likewise, in 2019, a UME was declared for bearded, ringed, and spotted seals in the Bering and Chukchi seas because of elevated mortality documented starting in June 2018 and continuing through the summer of 2019[11]. Since June 1, 2018, NMFS has confirmed 311 strandings[12] (Table 12). The cause of the UME has not been determined but many of the seals had low fat thickness. All age classes were affected. The seals that were sampled did not have the hair loss or skin lesions that were prominent in the prior UME. Subsistence hunters noted that some of the seals had less fat than normal. The lowest sea ice maximums occurred in 2017 and 2018 and the retreat of sea ice was very rapid. It is unknown if these extreme sea ice conditions played a role in the health of the seals.

Table 6. Stranded seals in the Bering and Chukchi seas from 2018-2020.

Year	Bearded	Ringed	Spotted	Unidentified	Total
2018 (June 1-Dec 31)	35	29	20	28	112
2019	49	36	23	57	165
2020 (as of October 23)	10	9	6	9	34
Total	**94**	**74**	**49**	**94**	**311**

Source: https://www.fisheries.noaa.gov/alaska/marine-life-distress/2018-2020-ice-seal-unusual-mortality-event-alaska

[11] Barbara Mahoney, 2019, unpublished document. Ice Seal UME Update in the Alaska Region Marine Mammal Stranding Network Fall/Winter 2019 newsletter.
[12]NOAA Fisheries. 2018-2020 Ice seal unusual mortality event in Alaska webpage. Available at: https://www.fisheries.noaa.gov/alaska/marine-life-distress/2018-2020-ice-seal-unusual-mortality-event-alaska, accessed November 10, 2020.

5.2 Fisheries

Commercial, subsistence, and recreational fisheries along the marine transit route portion of the action area may harm or kill listed marine species through direct bycatch, gear interactions (entrapments and entanglements), vessel strikes, contaminant spills, habitat modification, competition for prey, and behavioral disturbance or harassment.

Globally, 6.4 million tons of fishing gear is lost in the oceans every year (Wilcox et al. 2015). Entrapment and entanglement in fishing gear is a frequently documented source of human-caused mortality in cetaceans (see Dietrich et al. 2007). Fisheries interactions have an impact on many marine mammal species. More than 97 percent of whale entanglements are caused by derelict fishing gear (Baulch and Perry 2014). Materials entangled tightly around a body part may cut into tissues, enable infection, and severely compromise an individual's health (Derraik 2002). Mortality from entanglement may be underreported, as many marine mammals that die from entanglement tend to sink rather than strand ashore. Entanglement may also make marine mammals more vulnerable to additional dangers, such as predation and ship strikes, by restricting agility and swimming speed.

Entanglement can include many different gear interaction scenarios, but the following have occurred with listed species covered in this opinion:

- Cetaceans and Steller sea lions may ingest fishing gear, likely mistaking it for prey, which can lead to fitness consequences and mortality. Ingestion of gear and/or hooks can cause serious injury depending on whether the gear works its way into the gastrointestinal tract, whether the gear penetrates the gastrointestinal tract lining, is lodged in the esophagus, and the location of the hooking (e.g., embedded in the animal's stomach or other internal body parts) (Andersen et al. 2008; Helker et al. 2019). Necropsies of stranded whales have found that ingestion of net pieces, ropes, and other fishing debris has resulted in gastric impaction and ultimately death (Jacobsen et al. 2010).
- Gear loosely wrapped around the marine mammal's body that moves or shifts freely with the marine mammal's movement and does not indent the skin can result in disfigurement.
- Gear that encircles any body part and has sufficient tension to either indent the skin or to not shift with marine mammal's movement can cause lacerations, partial or complete fin amputation, organ damage, or muscle damage and interfere with mobility, feeding, and breathing. Lines from weighed gear (e.g., crab pots) that becomes entangled with whales can cause drowning or exhaustion. In June 2011, a dead bowhead whale was found in Kotzebue Sound, entangled in crab pot gear similar to that used in the Bering Sea (Suydam et al. 2011). In another instance, a dead female bowhead whale was found near St. Lawrence Island in the Bering Strait, entangled in fishing gear. The gear was identified as originating in the 2012/2013 winter commercial king crab fishery from the northern Bering Sea, near St. Matthew Island (Suydam et al. 2016; Muto et al. 2018).
- Chronic tissue damage from line under pressure can compromise a whale's physiology. Fecal samples from entangled whales had extremely high levels of cortisols (Rolland et al. 2005), an immune system hormone. Extended periods of pituitary release of cortisols can exhaust the immune system, making a whale susceptible to disease and infection.

From 2013 to 2017, the minimum estimated mean annual mortality and serious injury rate in U.S. commercial fisheries for western DPS Steller sea lions is 36 Steller sea lions. Mortality and serious injury can occur in several fishing gear types, including trawl, gillnet, longline, and troll fisheries (Muto et al. 2020), which fish in the MTR of this proposed action. The minimum estimated mean annual mortality and serious injury rate for bearded seals in U.S. commercial fisheries between 2013 and 2017 is 1.6 from three federally-managed US commercial fisheries in the Bering Sea and Aleutian Islands (Bering Sea/Aleutian Islands (BSAI) pollock trawl, BSAI flatfish trawl, and BSAI Pacific trawl fisheries) (Muto et al. 2020). During the same timeframe, the minimum estimated mean annual mortality and serious injury rate for ringed seals by the U.S. commercial fisheries was 2.4 for BSAI flatfish trawl (Muto et al. 2020). Entanglement and entrapment in trawl fishery gear was the leading cause of serious injury and mortality for all phocids analyzed in Helker et al. (2019).

Additionally, commercial fisheries may indirectly affect whales and seals by reducing the amount of available prey or affecting prey species composition. In Alaska, commercial fisheries target known prey species of ESA-listed whales, sea lions, and seals, such as pollock and cod, and bottom-trawl fisheries may disturb habitat for bottom-dwelling prey species of ESA-listed species. Steller sea lions and whale species, including both DPSs of humpback whales, fin whales, and sperm whales considered in this biological opinion, may compete with fisheries for prey species such as pollock and cod (Nemoto 1970; Kawamura 1980; Hain et al. 1982; Baker 1985; Geraci et al. 1989). As it is unknown how much of the whale diets consists of species exploited by commercial fisheries along the marine transit route, we cannot assess the degree to which competition for prey with fisheries affects these large whale species, but we have no indication that this is a serious concern.

Due to their highly migratory nature, many species considered in this opinion have the potential to interact with fisheries both in and outside of the action area. Assessing the impact of fisheries on such species is difficult due to the large number of fisheries that may interact with the animals and the inherent complexity of evaluating ecosystem-scale effects. The NMFS Bycatch Report estimates bycatch of marine mammals (and other taxa) from observer data and self-reported logbook data (NMFS 2016e). Additionally, under the MMPA, NMFS maintains an annual List of Fisheries that categorizes U.S. commercial fisheries according to the level of interactions that result in incidental mortality or serious injury of marine mammals. Detailed information on U.S. commercial fisheries in Alaska waters, including observer programs and coverage and observed incidental takes of marine mammals, is presented in Appendices 3-6 of the Alaska Stock Assessment Reports (Muto et al. 2019).

The North Pacific Fishery Management Council (NPFMC) adopted an Arctic Fishery Management Plan (FMP) that closed all Federal waters of the Chukchi and Beaufort seas to commercial fishing for any species of finfish, mollusks, crustaceans, and all other forms of marine animal and plant life, with limited exceptions. The Arctic FMP does not regulate subsistence or recreational fishing or State of Alaska-managed fisheries in the Arctic.

Because no commercial fisheries occur in the Chukchi and Beaufort seas, any observed serious injury or mortality to listed species in the Arctic that can be associated with commercial fisheries is currently attributable to interactions with fisheries in other areas, including in the Bering Sea/Aleutian Islands (BSAI) management area and Gulf of Alaska (GOA). For example, George et al. (2017) analyzed scarring data for bowhead whales harvested between 1990 and 2012 to estimate the frequency of line entanglement. Approximately 12 percent of the harvested whales examined for signs of entanglement (59/486) had scar patterns that were identified with high confidence as entanglement injuries (29 whales with possible entanglement scars were excluded). Most of the entanglement scars occurred on the peduncle, and entanglement scars were rare on smaller subadult and juvenile whales (body length <10 m). The authors suspected the entanglement scars were largely the result of interactions with derelict fishing/crab gear in the Bering Sea. The estimate of 12 percent entanglement does not include bowheads that may have died as a result of entanglement.

Groundfish fisheries (including pollock, cod, flatfish, sablefish, rockfish, and other species) of the BSAI and GOA are managed by the NPFMC under separate but complementary FMPs. By regulation, up to 2 million metric tons of groundfish may be harvested annually from the BSAI, and up to 800,000 metric tons of groundfish may be harvested annually from the GOA (50 CFR 679.20(a)). In 2018, 2 million metric tons of groundfish were authorized for harvest in the BSAI, and approximately 427,000 metric tons of groundfish were authorized for harvest in the GOA. Nearly 80 percent of the halibut apportioned to Alaska under the Pacific Halibut Treaty is allocated to fisheries in the Gulf of Alaska (including Southeast Alaska). The remainder is allocated and harvested in the BSAI.

NMFS manages 10 crab stocks in the BSAI under an FMP, and the State of Alaska manages the remaining crab stocks. Pot gear is the primary gear type used in the directed crab fisheries. In 2016, more than 29,000 metric tons of crab were harvested in the Federal crab fisheries in the BSAI (Garber-Yonts and Lee 2017).

There are no Federal Fishery Observer Program records of bowhead whale mortality incidental to U.S. commercial fisheries in Alaska. However, in early July 2010 a dead bowhead whale was found floating in Kotzebue Sound entangled in crab pot gear similar to that used by commercial crabbers in the Bering Sea (Suydam et al. 2011); and during the 2011 spring aerial photographic survey of bowhead whales near Point Barrow, an entangled bowhead whale was photographed that was not considered to be seriously injured (Mocklin et al. 2012). Citta et al. (2015) found that the distribution of satellite-tagged bowhead whales in the Bering Sea overlapped spatially and temporally with areas where commercial pot fisheries occurred and noted the potential risk of entanglement in lost gear. The total estimated annual mortality and serious injury rate in U.S. commercial fisheries in 2012 through 2016 is 0.2 bowhead whales (Muto et al. 2019); however, the actual rate is currently unknown. As mentioned above, George et al. (2017) found evidence of past entanglements (entanglement scars). This is thought to be an underestimate, as animals killed as a result of entanglement are no longer part of this sampled population.

Humpback whales can be killed or injured during interactions with commercial fishing gear, although the evidence available suggests that the frequency of these interactions may not have significant adverse consequence for humpback whale populations. From 2012 to 2016, mortality and serious injury of humpback whales occurred once in the Bering Sea/Aleutian Islands pollock trawl fishery (1 in 2012). The estimated average annual mortality and serious injury rate from observed U.S. commercial fisheries is 0.8 Western North Pacific DPS humpback whales from 2012 to 2016 (Muto et al. 2019). In 2015, there was one entangled Western North Pacific DPS humpback entangled in BSAI commercial pot gear, which is in the action area of this project in the marine transit route.

5.3 Oil & Gas

Offshore petroleum exploration activities have been conducted in the action area both within State of Alaska waters and the Outer Continental Shelf (OCS) of the Beaufort and Chukchi seas, and nearby in Canada's eastern Beaufort Sea off the Mackenzie River Delta, in Canada's Arctic Islands, in the Russian Arctic, and around Sakhalin Island in the Sea of Okhotsk (NMFS 2016a). In the central Beaufort Sea in Alaska, oil and gas exploration, development, and production activities include seismic surveys; exploratory, delineation, and production drilling operations; construction of artificial islands, causeways, ice roads, shore-based facilities, and pipelines; and vessel and aircraft operations. Stressors associated with these activities that are of primary concern for marine mammals include noise, physical disturbance, and pollution, particularly in the event of a large oil spill.

Oil and gas exploration activities have occurred on the North Slope since the early 1900s, and oil production started at Prudhoe Bay in 1977. Oil production has occurred for over 40 years in the region, and presently spans from the Alpine field, which is approximately 96 km (60 mi) west of Prudhoe Bay, to the Point Thomson project, which is approximately 96 km east of Prudhoe Bay. Additionally, onshore gas production from the Barrow gas field began over 60 years ago. Associated industrial development has included the creation of industry-supported community airfields at Deadhorse and Kuparuk, and an interconnected industrial infrastructure that includes roadways, pipelines, production and processing facilities, gravel mines, and docks.

Endicott Satellite Drilling Island, built in 1987, was constructed to support the first continuous production of oil from an offshore field in the Arctic. Subsequently, the Northstar offshore island was constructed in 1999 and 2000 to support oil production. Northstar, as well as the Nikaitchuq and Oooguruk developments, currently operates in nearshore areas of the Beaufort Sea, and is expected to continue operating in the future. Other oil and gas related activities that have occurred in the Beaufort Sea and Chukchi Sea OCS to date include exploratory drilling, exploration seismic surveys, geohazard surveys, geotechnical sampling programs, and baseline biological studies and surveys. There are also several exploration and development projects occurring on the North Slope including Greater Moose's Tooth 1 and 2, Smith Bay, Nuna, and Nanushuk.

In addition, the Alaska Gasoline Development Corporation is developing a liquid natural gas pipeline that would extend from Prudhoe Bay, generally following the existing Trans Alaska Pipeline System through interior Alaska, to end at the Liquefaction Facilities in Nikiski in Southcentral Alaska. Construction infrastructure would include shipping traffic through the Bering, Chukchi, and Beaufort seas.

Since 1975, 84 exploration wells, 14 continental offshore stratigraphic test wells (i.e., COST), and six development wells have been drilled on the Arctic OCS (BOEM 2012). Historical data on offshore oil spills for the Alaska Arctic OCS region consists of all small spills (i.e., less than 1,000 barrels [31,500 gallons]) and cannot be used to create a distribution for statistical analysis (NMFS 2013a). Instead, agencies use a fault tree model[13] to represent expected spill frequency and severity of spills in the Arctic. Table 6 shows the assumptions the Bureau of Ocean Energy Management (BOEM) presented regarding the size and frequency of spills in the Beaufort and Chukchi Seas Planning Area in its final programmatic EIS for the Outer Continental Shelf oil

[13] Fault tree analysis is a method for estimating spill rates resulting from the interactions of other events. Fault trees

and gas leasing program for 2012 to 2017 (BOEM 2012).

Table 7. Oil spill assumptions for the Beaufort and Chukchi Seas Planning Areas, 2012 to 2017

Spill Type	Assumed Spill Volume (barrels)	Assumed Number of Spill Events	Maximum Volume of Assumed Spill Events (barrels)
Small	≥ 1 to < 50	50 to 90	9,310
	≥ 50 to < 1,000	10 to 35	34,965
Large	≥ 1,000	-	-
Pipeline	1,700	1 to 2	3,400
Platform	5,100	1	5,100
		TOTAL	**52,775**

Table adapted from BOEM (2012)

Offshore oil and gas development in Alaska poses a number of threats to listed marine species, including increased ocean noise, risk of hydrocarbon spills, production of waste liquids, habitat alteration, increased vessel traffic, and risk of ship strike. NMFS reviewed the potential effects of oil and gas development in a Final Environmental Impact Statement for the effects of oil and gas activities in the Arctic Ocean (NMFS 2013a) and has conducted numerous Section 7 consultations on oil and gas activities in the Chukchi and Beaufort Seas (available at https://www.fisheries.noaa.gov/alaska/consultations/section-7-biological-opinions-issued-alaska-region). Increased oil and gas development in the U.S. Arctic has led to an increased risk of various forms of pollution to whale and seal habitat, including oil spills, other pollutants, and nontoxic waste (Allen and Angliss 2015). Spills can occur from produced fluids, diesel, sales oil, bulk storage tanks, and more (Table 8).

Table 8. Relative rate of occurrence for spills from main sources (BLM 2019).

Source	Spill Size				
	Very Small	Small	Medium	Large	Very Large
Produced fluids	H	H	M	L	VL
Saltwater	H	H	M	L	VL
Diesel	H	M	L	VL	0
Sales oil	M	M	M	L	VL
Bulk storage tanks and containers on pads	L	L	L	VL	0
Tank vehicles	H	M	L	VL	0
Vehicle and equipment operation and maintenance	VH	VH	M	VL	0
Other routine operations	VH	VH	H	L	VL
Drilling blowout	VL	VL	VL	VL	VL
Production uncontrolled release	VL	VL	VL	VL	VL

Source	Spill Size				
	Very Small	**Small**	**Medium**	**Large**	**Very Large**

Notes:

VL = Very low rate of occurrence	Very small:	<0.24 barrels (10 gallon)
VH = Very high rate of occurrence	Small:	0.24-2.37 barrels (10-99.5 gallons)
L = Low rate of occurrence	Medium:	2.38-23.8 barrels (100-999.5 gallons)
M = Medium rate of occurrence	Large:	23.8-2,380 barrels (1,000-100,000 gallons)
H = High rate of occurrence	Very large:	>2,380 barrels (>100,000 gallons)
0 = Would not occur		

Many of the consultations have authorized the take (by harassment) of bowhead whales and bearded and ringed seals from sounds produced during geophysical (including seismic) surveys and drilling operations conducted by leaseholders during open water (i.e., summer) months. Geophysical seismic survey activity has been described as one of the loudest man-made underwater noise sources, with the potential to harass or harm marine mammals (Richardson et al. 1995). Controlled-source, deep-penetration reflection seismology, similar to sonar and echolocation, is the primary tool used for onshore and offshore oil exploration (Smith et al. 2017). Seismic surveys are conducted by towing long arrays of sensors affixed to wires at approximately 10 knots behind large vessels following a survey grid. High power air cannons are fired below the water surface, and the sound waves propagate through the water and miles into the seafloor. When those soundwaves encounter strong impedance contrasts (e.g., between water and the ocean floor, or between different densities of substrates), a reflection signal is detected by the sensors. Those signals can be interpreted to determine the stratigraphy of the substrate and identify oil and gas deposits.

Seismic surveying has acoustic impacts on the marine environment. The noise generated from seismic surveys has been linked to behavioral disturbance of wildlife, masking of cetacean communication, and potential auditory injury to marine mammals in the marine environment (Smith et al. 2017). Seismic surveys are often accompanied by test drilling. Test drilling involves fewer direct impacts than seismic exploration, but the potential risks of test drilling, such as oil spills, may have broader consequences (Smith et al. 2017). Oil and gas exploration, including seismic surveys, occur within the action area and across the ranges of many of the species considered in this Biological Opinion.

5.3.1 Pollution and Discharges (Excluding Spills)

Previous development and discharges in portions of the action area are the source of multiple pollutants that may be bioavailable (i.e., may be taken up and absorbed by animals) to ESA-listed species or their prey items (NMFS 2013a). Drill cuttings and fluids contain contaminants that have high potential for bioaccumulation, such as dibenzofuran and polycyclic aromatic hydrocarbons. Historically, drill cuttings and fluids have been discharged from oil and gas developments in the Beaufort Sea near the action area, and residues from historical discharges may be present in the affected environment (Brown et al. 2010). Polycyclic aromatic hydrocarbons are also emitted to the atmosphere by flaring waste gases at production platforms or gas treatment facilities. For example, approximately 162,000 million standard cubic feet of waste gas was flared at Northstar in 2004 (Neff 2010).

Marine mammals can ingest spilled compounds while feeding, inhale the volatile components, or be affected by direct contact. For example, whales can experience baleen fouling upon encountering petroleum products. Effects of oil ingestion on marine mammals can range from progressive organ damage to death, depending on the quantity and composition of the ingested oil (Geraci and St. Aubin 1990). Surface contact with oil spills can damage mucous membranes and eyes of seals, or disrupt thermoregulation in seal pups (Geraci and St. Aubin 1990).

The Clean Water Act of 1972 (CWA) has several sections or programs applicable to activities in offshore waters. Section 402 of the CWA authorizes the U.S. Environmental Protection Agency (EPA) to administer the National Pollutant Discharge Elimination System (NPDES) permit program to regulate point source discharges into waters of the United States. Section 403 of the CWA requires that EPA conduct an ocean discharge criteria evaluation for discharges of pollutants from point sources into the territorial seas, contiguous zones, and the oceans. The Ocean Discharge Criteria (40 CFR part 125, subpart M) sets forth specific determinations of unreasonable degradation that must be made before permits may be issued.

On November 28, 2012, EPA issued a NPDES general permit for discharges from oil and gas exploration facilities on the outer continental shelf and in contiguous state waters of the Beaufort Sea (Beaufort Sea Exploration General Permit (GP)). The general permit authorizes 13 types of discharges from exploration drilling operations and establishes effluent limitations and monitoring requirements for each waste stream.

On January 21, 2015, EPA issued a NPDES general permit for wastewater discharges associated with oil and gas geotechnical surveys and related activities in Federal waters of the Beaufort and Chukchi Seas (Geotechnical GP). This general permit authorizes twelve types of discharges from facilities engaged in oil and gas geotechnical surveys to evaluate the subsurface characteristics of the seafloor and related activities in federal waters of the Beaufort and Chukchi Seas.

Both the Beaufort Sea Exploration GP and the Geotechnical GP establish effluent limitations and monitoring requirements specific to each type of discharge and include seasonal prohibitions and area restrictions for specific waste streams. For example, both general permits prohibit the discharge of drilling fluids and drill cuttings to the Beaufort Sea from August 25 until fall bowhead whale hunting activities by the communities of Nuiqsut and Kaktovik have been completed. Additionally, both general permits require environmental monitoring programs to be conducted at each drill site or geotechnical site location, corresponding to before, during, and after drilling activities, to evaluate the impacts of discharges from exploration and geotechnical activities on the marine environment.

The principal regulatory mechanism for controlling pollutant discharges from vessels (grey water, black water, coolant, bilge water, ballast, deck wash, etc.) into waters of the Arctic OCS is also the CWA. Discharges are covered under the Vessel Incidental Discharge Act, which is in the new CWA Section 312(p)[14]. In addition, the U.S. Coast Guard has issued regulations that address pollution prevention with respect to discharges from vessels carrying oil, noxious liquid

[14] https://www.epa.gov/vessels-marinas-and-ports/vessel-incidental-discharge-act-vida

substances, garbage, municipal or commercial waste, and ballast water (33 CFR part 151). The State of Alaska regulates water quality standards within three miles of the shore.

5.3.2 Spills

BOEM and BSEE define small oil spills as <1,000 barrels (bbl). Large oil spills are defined as 1,000-150,000 bbl, and very large oil spills (VLOS) are defined as ≥ 150,000 bbl (BOEM 2017b).

5.3.2.1 Small Oil Spills

Offshore petroleum exploration activities have been conducted in State of Alaska waters adjacent of the Beaufort and Chukchi seas since the late 1960s. Based on a review of potential discharges and on the historical oil spill occurrence data for the Alaska OCS and adjacent State of Alaska waters, several small spills in the Beaufort Sea from refueling operations (primarily at West Dock) were reported to the National Response Center. Small oil spills have occurred with routine frequency and are considered likely to occur (BOEM 2017b).

In the past 30 years, only 43 wells have been drilled in the Beaufort and Chukchi seas lease program areas. From 1985 to 2013, eight crude oil spills of ≥ 550 bbl were documented along the Alaska North Slope, one of which was ≥ 1,000 bbl. During the same time period, total North Slope production was 12.80 billion bbl (Bbbl) of crude oil and condensate. From 1971 through 2011, the highest mean volume of North Slope spills was from pipelines. The mean spill size for pipelines was 145 bbl. The spill rate for crude oil spills ≥ 500 bbl from pipelines (1985 to 2013) was 0.23 pipeline spills per Bbbl of oil produced (BOEM 2016).

From 1995 to 2012, approximately 400 spills (100 to 300,000 gallons) occurred in Alaska's marine waters. Most were in nearshore and shallow coastal waters and were primarily diesel (BLM 2019). Only 1% of the spills were crude oil. If a pinniped came in direct contact with a small, refined oil spill it could experience inhalation and respiratory distress from hydrocarbon vapors, or ingestion directly or indirectly by consuming contaminated prey, and less likely skin and conjunctive tissue irritation (Engelhardt 1987). Oil may also foul pinniped pelage and be ingested during cleaning. Small refined offshore spills are also expected to dissipate rapidly. A small spill could impact pinnipeds through their ingestion of contaminated prey, but prey contamination likely would be localized and temporary.

With respect to the ringed and bearded seals, small spills could result in irritation of the eyes, mouth, lungs, and anal and urogenetical surfaces (St. Aubin 1990). The effects of an oil spill on ringed or bearded seals would depend largely on the size, season, and location of the spill. If a spill were to occur during the ice free, open water season, seals may be exposed to oil through direct contact, or perhaps through contaminated food items. However, St. Aubin (1990) notes that with their keen sense of olfaction and good sense of vision ringed and bearded seals may be able to detect and avoid oil spills in the open water season (St. Aubin 1990).

Immersion studies by Geraci and Smith (1976a) found ringed seals may develop mild liver injury, kidney lesions and eye injury from immersion in crude oil. The eye damage was often severe, suggesting permanent eye damage might occur with longer periods of exposure to crude oil, and the overall severity of the injuries was most likely associated with the exposure duration to crude oil. Geraci and Smith (1976a) concluded the direct effects of an oil blow-out or spill may result in transient eye damage to healthy seals in open water; however, ringed seals exposed to a slick of crude oil showed no impairment in locomotion or breathing.

A small spill could affect the zooplankton populations upon which whales feed, but the prey contamination is likely to be localized and small in comparison to the overall food resource available. Vessel activity associated with spill response would likely keep bowhead whales away from the spill area. Oil adheres poorly to the skin of mysticete whales, and cetaceans are believed to have the ability to detect and avoid oil spills (Geraci 1990; NMFS 2016a); however, an animal's need for food, shelter, or other biological requirements can override any avoidance behaviors to oil (Vos et al. 2003). Additionally, weathering should quickly break up or dissipate the oil or fuel through the local environment to harmless residual levels that eventually become undetectable.

5.3.2.2 Large Oil Spills and Very Large Oil Spills

Large and very large oil spills can affect marine mammals through inhalation, ingestion, and dermal exposure, as well as short-term reductions in prey availability, long-term injury to prey habitats, reduced reproduction, and cumulative effects (Helm et al. 2015). The effects are the same as described in the small spill section above, but are more severe and pronounced, as well as far more lethal, and the long-term effects are also more pronounced. Fur seals are the most vulnerable while other seals and sea lions are less sensitive to direct contamination (Helm et al. 2015).

The loss of well control (LOWC) occurrence frequencies, per well, are on the order of 10^{-3} to 10^{-6}. The occurrence frequencies depend upon the operation or activity, whether the LOWC was a blowout or well release, and whether there was oil spilled (BOEM 2018).

In general, historical data show that LOWC events escalating into blowouts and resulting in oil spills are infrequent and that those resulting in large oil spills are even rarer events (BOEM 2018). From 1964 to 2010 there were 283 well control incidents, 61 of which resulted in crude or condensate spills (BOEM 2012; BOEM 2018). From 1971 to 2010, fewer than 50 well control incidents occurred. Excluding the volume from the Deepwater Horizon (DWH) spill, the total spilled volume was less than 2,000 bbl of crude or condensate, with the largest of the 1971-2010 spills—other than the DWH event—being 350 bbl. The DWH event was the only VLOS (3.19 million barrels of oil spilled) to occur between 1971 and 2010 (BOEM 2012; BOEM 2018). During that same time period, more than 41,800 wells were drilled on the OCS and almost 16 Bbbl of oil were produced.

From 1971-2010, industry drilled 223 exploration wells in the Pacific OCS, 46 in the Atlantic OCS, 15,138 in the Gulf of Mexico OCS, and 84 in the Alaska OCS, for a total of 15,491 exploration wells. During this period, there were 77 well control incidents associated with exploration drilling. Of those 77 well control incidents, 14 (18 percent) resulted in oil spills ranging from 0.5 bbl to 200 bbl, for a total 354 bbl, excluding the estimated volume from the DWH spill. These statistics show that, while approximately 15,000 exploration wells were drilled, there were a total of 15 loss-of-well-control events that resulted in a spill of any size (i.e., small spills, large spills, or very large oil spills): 14 were small spills and one was a large spill (≥1,000 bbl) that resulted from a blowout. That one large/very large spill was the DWH (BOEM 2018).

The risk of an unlikely or rare event, such as a loss of well control incident, is determined using the best available historical data. The 2012-2017 Five-Year Program Final Programmatic EIS (BOEM 2012) provides a detailed discussion of the OCS well control incidents and risk factors that could contribute to a long duration LOWC event. Risk factors include geologic formation and hazards; water depth and hazards; geographic location (including water depth); well design and integrity; loss of well control prevention and intervention; scale and expansion; human error; containment capability; response capability; oil types and weathering/fate; and specific regional geographic considerations, including oceanography and meteorology (BOEM 2018).

Quantifying the frequency of VLOSs from a loss of well control event is challenging as relatively few large oil spills that can serve as benchmarks have occurred on the OCS (Scarlett et al. 2011). Based on an analysis of this historic data from both the 1971-2010 (the modern regulatory era) and the 1964-1971 time frames, the frequency of a loss of well control occurring and resulting in a VLOS of different volumes was determined (BOEM 2016). This analysis, which is set forth in the 2017-2022 Five-Year Program Final Programmatic EIS for the Liberty Development Project, was used to calculate the frequency (per well) of a spill exceeding 4,610,000 bbl (BOEM 2018) and is derived by using the equation from the 2017-2022 Five-Year Program Final PEIS (BOEM 2016).The hypothetical VLOS volume is based on Hilcorp's estimate of a worst case discharge volume which was independently verified by BOEM.

5.3.3 Contaminant Found in Listed Species

Metals and hydrocarbons introduced into the marine environment from offshore exploratory drilling activities are not likely to enter the Beaufort Sea food webs in ecologically significant amounts. However, there is a growing body of scientific literature on concentrations of metals and organochlorine chemicals (e.g., pesticides and polychlorinated biphenyls [PCBs]) in tissues of higher trophic level marine species, such as marine mammals, in cold-water environments.

Along the MTR, the most likely sources of pollution and contaminants would be ballast water discharge and accidental spills of oil, fuel, and other materials from traversing vessels. The Aleutian Islands had the greatest volume of reported oil and other hazardous substance spills in marine waters of the action area between 1995 and 2012. Leaks and spills have been reported from fuel tanks and tank farms in the Unalaska area of the MTR. Areas of Dutch Harbor are considered impaired due to oil sheens in sediments (ADEC 2010). The potential sources of this contamination include several previously contaminated sites nearby as well as many industrial sources that currently operate within the harbor area. OASIS Environmental Inc. (2006) provides more information on contaminants at Dutch Harbor.

There is particular concern about mercury in Arctic marine mammal food webs (MacDonald 2005). Mercury concentrations in marine waters in much of the Arctic are higher than concentrations in temperate and tropical waters due in large part to deposition of metallic and inorganic mercury from long-range transport and deposition from the atmosphere (Outridge et al. 2008). However, there is no evidence that significant amounts of mercury are coming from oil operations around Prudhoe Bay (Snyder-Conn et al. 1997) or from offshore drilling operations (Neff 2010).

Heavy metals can enter marine mammals through uptake from the atmosphere through the lungs, absorption through the skin, across the placenta before birth, via milk during lactation, ingestion of sea water and ingestion of food (Vos et al. 2003). The major route of heavy metal contamination for marine mammals seems to be via feeding. Additionally, being a top predator in the food web can influence heavy metal levels, such as mercury, especially in marine mammals relying on fish (Vos et al. 2003).

Some environmental contaminants, such as chlorinated pesticides, are lipophilic and can be found in the blubber of marine mammals (Becker et al. 1995). Tissues collected from whales landed at Barrow in 1992 (Becker et al. 1995) indicated that bowhead whales had very low levels of mercury, PCBs, and chlorinated hydrocarbons, but they had elevated concentrations of cadmium in their liver and kidneys. Bratton et al. (1993) measured organic arsenic in the liver tissue of one bowhead whale and found that about 98 percent of the total arsenic was arsenobetaine. Arsenobetaine is a common substance in marine biological systems and is relatively non-toxic.

Bratton et al. (1993) looked at eight metals (arsenic, cadmium, copper, iron, mercury, lead, selenium, and zinc) in the kidneys, liver, muscle, blubber, and visceral fat from bowhead whales harvested from 1983 to 1990. They observed considerable variation in tissue metal concentration among the whales tested. Metal concentrations evaluated did not appear to increase over time. The metal levels observed in all tissues of the bowhead are similar to levels reported in the literature in other baleen whales. The bowhead whale has little metal contamination as compared to other arctic marine mammals, except for cadmium. Mossner and Ballschmiter (1997) reported that total levels of polychlorinated biphenyls and chlorinated pesticides in bowhead blubber from the North Pacific and Arctic Oceans were many times lower than those in beluga whales or northern fur seals. However, while total levels were low, the combined level of three isomers of the hexachlorocyclohexanes (chlorinated pesticides) was higher in the blubber tested from bowhead whales than from three marine mammal species sampled in the North Atlantic (pilot whale, common dolphin, and harbor seal). These results were believed to be due to the lower trophic level of the bowhead as compared to the other marine mammals tested.

Contaminants research on ringed seals is extensive throughout the Arctic environment where ringed seals are an important part of the diet for coastal human communities. Pollutants such as organochlorine compounds and heavy metals have been found in all of the subspecies of ringed seal with the exception of the Okhotsk ringed seal. The variety, sources, and transport mechanisms of contaminants vary across ringed seal ecosystems (Kelly et al. 2010b).

Heavy metals such as mercury, cadmium, lead, selenium, arsenic, and nickel accumulate in ringed seal vital organs, including liver and kidneys, as well as in the central nervous system (Kelly et al 2010). Gaden et al. (2009) suggested that during ice-free periods the seals eat more Arctic cod (and mercury). They also found that mercury levels increased with age for both sexes (Dehn et al. 2005; Gaden et al. 2009). Becker et al. (1995) reported ringed seals had higher levels of arsenic in Norton Sound (inlet in the Bering Sea) than ringed seals taken by residents of Point Hope, Point Lay, and Barrow (now Utqiaġvik). Arsenic levels in ringed seals from Norton Sound were quite high for marine mammals, which might reflect localized natural arsenic sources.

Research on contaminants in bearded seals is limited compared to the information for ringed seals. However, pollutants such as organochlorine compounds and heavy metals have been found in most bearded seal populations. Climate change has the potential to increase the transport of pollutants from lower latitudes to the Arctic (Tynan and Demaster 1997).

Lee et al. (1996) compared persistent organochlorine pesticides and PCBs in Steller sea lions in the Gulf of Alaska to Steller sea lions in the Russian waters of the Bering Sea. PCBs were the predominant organochlorine in Steller sea lion blubber, followed by DDT. The level of PCBs in male Steller sea lions were higher than those in ringed seals in Arctic waters. Steller sea lions in the Bering Sea had significantly lower DDTs and PCBs than those from the Gulf of Alaska (Lee et al. 1996). Ferdinando (2019) assessed heavy metals in marine mammals including Steller sea lions. In the southwest Alaska area consisting of the Aleutian Islands, mercury was the highest concentration of heavy metal found in Steller sea lions, followed by lead, nickel, and copper and were concentrated in the fur, tendon, and muscle tissues (Ferdinando 2019).

5.4 Vessels

The general seasonal pattern of vessel traffic in the Arctic is correlated with seasonal ice conditions, which results in the bulk of the traffic being concentrated within the months of July through October, and unaided navigation being limited to an even narrower time frame. However, this pattern appears to be rapidly changing, as ice-diminished conditions become more extensive during the summer months.

The number of unique vessels tracked via AIS in U.S. waters north of the Pribilof Islands increased from 120 in 2008 to 250 in 2012, and is expected to continue to increase (Azzara et al. 2015). This includes only the northern Bering Sea, the Bering Strait, Chukchi Sea and Beaufort Sea to the Canadian border. The increase in vessel traffic on the outer continental shelf of the Chukchi Sea and the near-shore waters off Prudhoe Bay from oil and gas exploration activity is particularly pronounced (ICCT 2015). The number of vessels identified in this region in 2012 includes a spike in vessel traffic associated with the offshore exploratory drilling program that was conducted by Shell on the outer continental shelf (OCS) of the Chukchi Sea that year. A comparison of the geographic distribution of vessel track lines between 2011 and 2012 provides some insight into the changes in vessel traffic patterns that may occur as a result of such activities (Figure 1). Overall, in 2012 there was a shift toward more offshore traffic, and there were also noticeable localized changes in vessel traffic concentration near Prudhoe Bay and in the vicinity of the drilling project in the Chukchi Sea (Azzara et al. 2015).

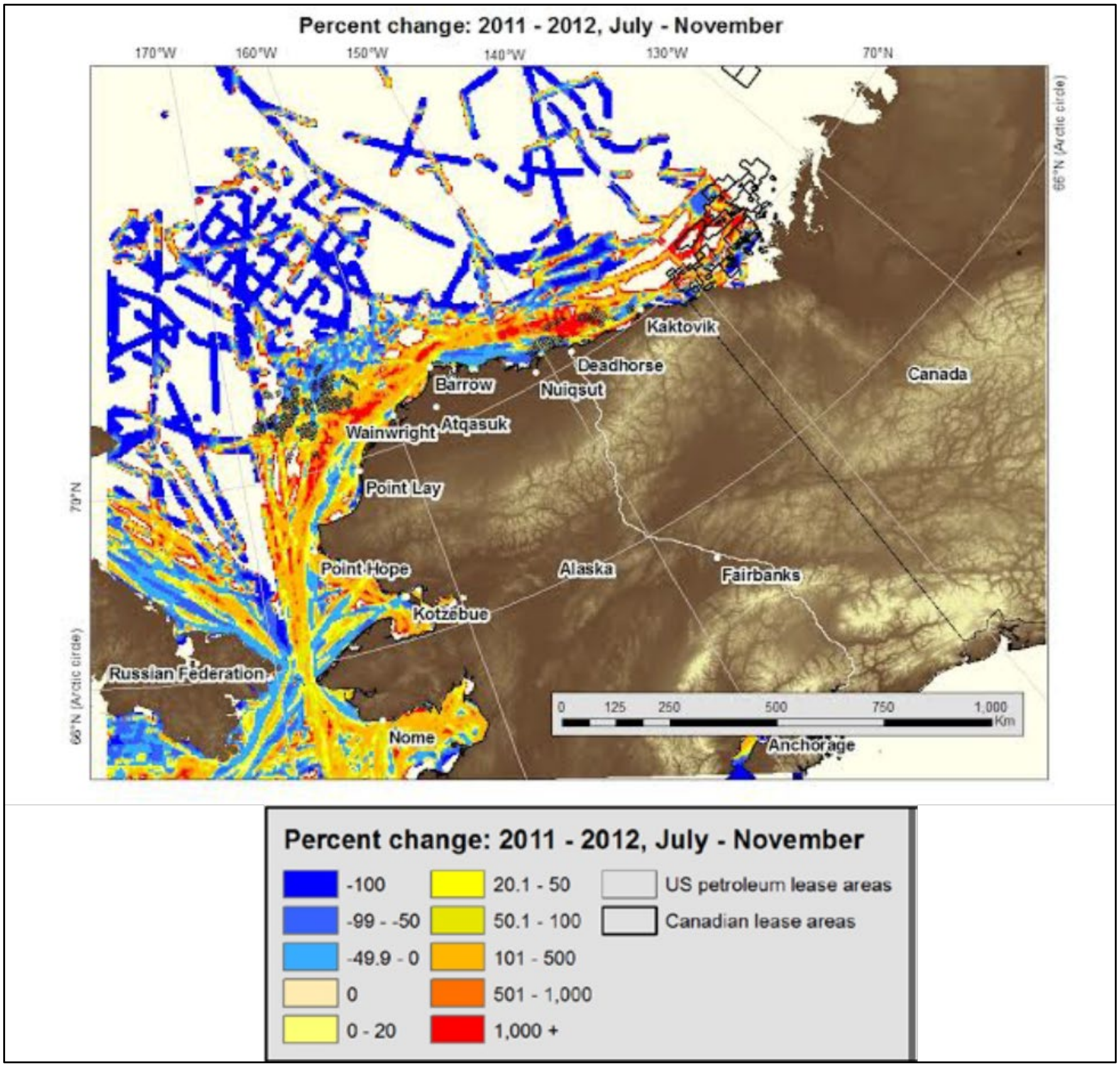

Figure 16. Percent difference in vessel activity between 2011 and 2012 using 5-km grid cells. (Azzara et al. 2015)

Marine vessel traffic may pose a threat to pinnipeds and cetaceans in the action area, specifically along the MTR, because of ship strikes and vessel noise. In 2018-2019, there were more than 62,000 vessel arrivals to, and departures from, Dutch Harbor, Alaska[15] (Figure 17). The U.S. Committee on the Marine Transportation System (CMTS) reported that about 255 vessels transited through the US Arctic and surrounding region from 2015-2017, as determined by automatic identification system (AIS) data. Vessel route densities off the North Slope of Alaska are about one to 10 routes over 2018-2019 (Figure 18). About 10 commercial vessels with AIS tracking traveled from Dutch Harbor along the MTR to the North Slope, with some making stops in coastal towns. Smaller fishing vessels may or may not have AIS, and skiffs do not.

[15] www.marinetraffic.com, accessed November 16, 2020

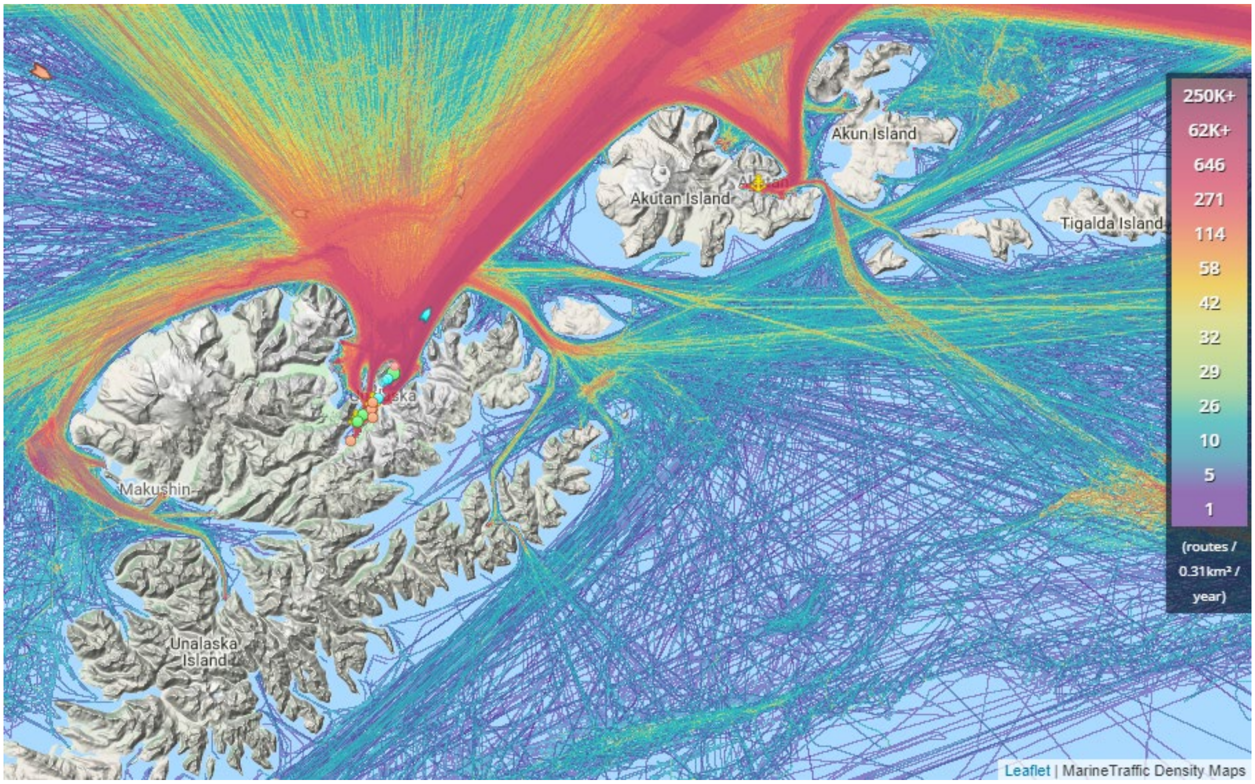

Figure 17. 2018-2019 Marine traffic in and out of Dutch Harbor, Alaska.
Source: www.marinetraffic.com

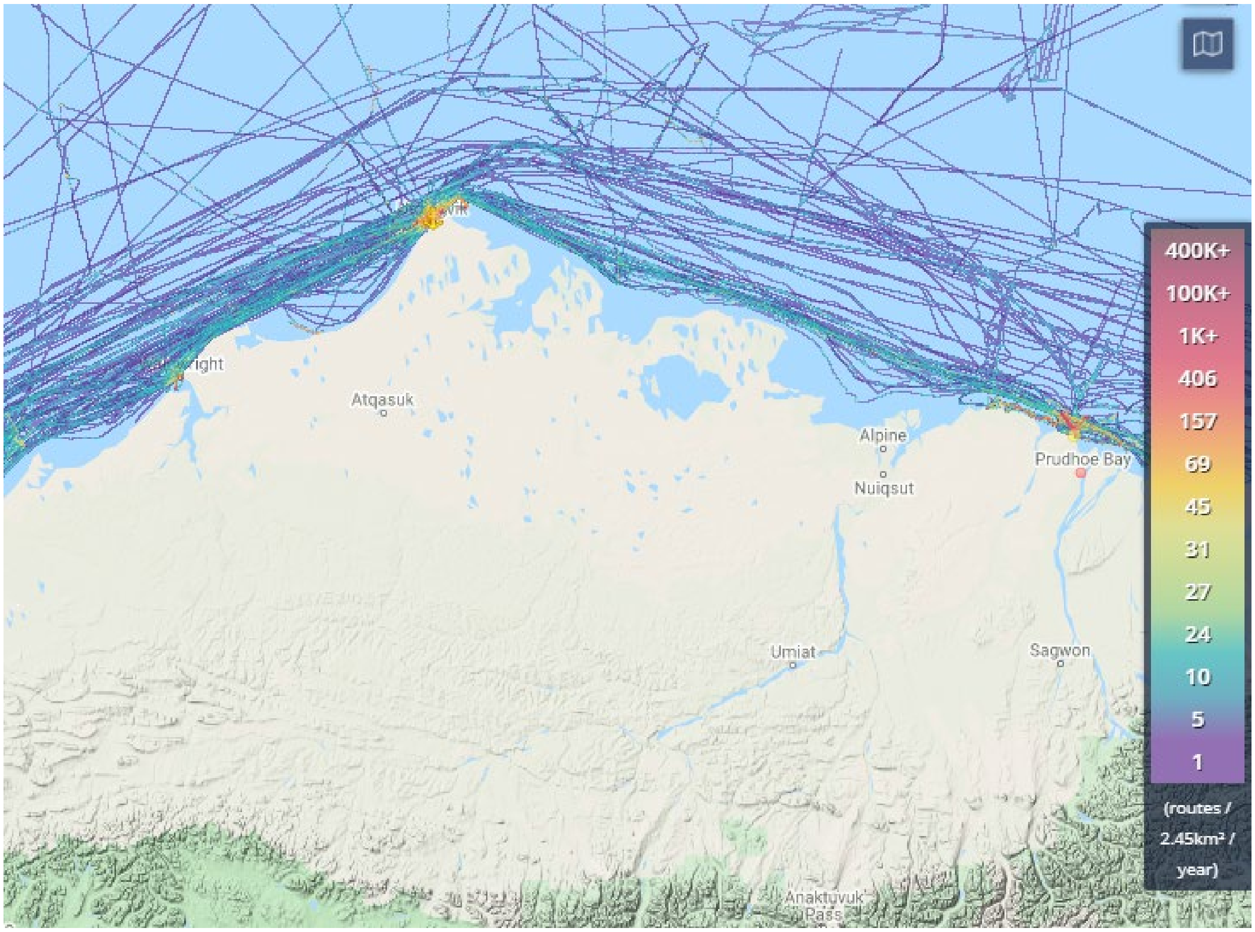

Figure 18. 2018-2019 Vessel traffic near the NPR-A.
Source: www.marinetraffic.com

Vessel traffic in the Chukchi and Beaufort seas is currently limited to late spring, summer, and early autumn. However, surface air temperatures in the Arctic Region are increasing at double the rate of the global average (Adams and Silber 2017). Continued expansion of the duration and extent of seasonal ice-free waters in the Chukchi and Beaufort seas is anticipated over the coming decades, likely resulting in increased vessel traffic and increased duration of the navigation season. As seasonal ice-free waters expand, the international commercial transport of goods and people in the area is projected to increase 100-500 percent in some Arctic areas by 2025 (Adams and Silber 2017). The U.S. Committee on the Marine Transportation System (CMTS) reported that the number of vessels operating in the Chukchi and Beaufort seas has increased 128% from 2008 to 2018. The vessels include those used for research, natural resource exploration and extraction, commercial shipping, government/law enforcement/search and rescue, and tourism. Of the 255 vessels that transited through the US Arctic and surrounding region from 2015-2017, over 50% were tug, towing, and cargo vessels. Thirty-two flag states transited the region, although US flagged vessels were the most prevalent. The length of the navigation season has been growing by as much as 7-10 days annually, which, extrapolated over the next decade, could result in 2.5 months of additional navigation season over what was currently seen in 2019 (U.S. Committee on the Marine Transportation System 2019). In the projections developed by the CMTS for the most plausible scenario, 72 vessels are expected to be active annually by 2030 in natural resource exploration and development, which is also the activity ranked as the largest contributor to projected traffic growth. More than 50% of this growth is anticipated to be from non-US natural resource extraction (Russian exports of LNG and mineral extraction in Canada). By 2030 in the most plausible scenario, 28 vessels are anticipated to be active for rerouted shipping through the Arctic and 17 vessels in the expansion of the Arctic fleet (icebreakers, and ice-hardened cruise ships). However, these estimates do not include the small vessel transits used for commercial fishing, subsistence harvest, or lightering goods from large barges to shore using smaller vessels.

5.4.1 Vessel Noise

Vessel noise can create auditory interference, or masking, in which the noise can interfere with an animal's ability to understand, recognize, or even detect sounds of interest. This can lead to behavioral changes in marine mammals, such as increasing their communication sound levels or causing them to avoid noisy areas. Commercial shipping traffic is a major source of low frequency (5 to 500 Hz) human generated sound in the oceans (Simmonds and Hutchinson 1996; NRC 2003). The types of vessels operating in the Beaufort Sea typically include barges, skiffs with outboard motors, icebreakers, scientific research vessels, and vessels associated with oil and gas exploration, development, and production. The primary underwater noise associated with vessel operations is the continuous noise produced from propellers and other on-board equipment. Cavitation noise is expected to dominate vessel acoustic output when tugs are pushing or towing a barges or other vessels. Other noise sources include onboard diesel generators and the main engine, but both are subordinate to propeller harmonics (Gray and Greeley 1980). Shipping sounds are often at source levels of 150 to 190 dB re 1 μPa at 1 m (BOEM 2011) with frequencies of 20 to 300 Hz (Greene and Moore 1995). Sound produced by smaller boats is typically at a higher frequency, around 300 Hz (Greene and Moore 1995). In shallow water, vessels more than 10 km (6.2 mi) away from a receiver generally contribute only to background-sound levels (Greene and Moore 1995). Noise from icebreakers comes from the ice physically breaking, the propeller cavitation of the vessel, and the "bubbler systems" that blow compressed air under the hull which moves ice out of the way of the ship. Broadband source levels for icebreaking operations are typically between 177 and 198 dB re 1 μPa at 1m (Greene and Moore 1995; Austin et al. 2015); however, they can be extremely variable mainly due to the varying thickness of ice that is being broken and the resulting horsepower required to break the ice.

5.4.2 Vessel Strikes

Current shipping activities in the Arctic pose varying levels of threats to marine mammals depending on the type and intensity of the shipping activity and its degree of spatial and temporal overlap with their habitats. The presence and movements of ships in the vicinity of seals can affect their normal behavior (Jansen et al. 2010) and may cause them to abandon their preferred breeding habitats in areas with high traffic (Smiley and Milne 1979; Mansfield 1983). To date, no bearded or ringed seal carcasses have been found with propeller marks. However, Sternfeld (2004) documented a single spotted seal stranding in Bristol Bay, Alaska, that may have resulted from a propeller strike.

Vessel strikes of whales occur throughout Alaska, but are less common in the action area than in the Gulf of Alaska and Southeast Alaska. Free-ranging marine mammals often engage in avoidance behavior when surface vessels move toward them. It is not clear whether these responses are caused by the physical presence of a surface vessel, the underwater noise generated by the vessel, or an interaction between the two (Goodwin and Cotton 2004; Lusseau 2006). These studies suggest that the behavioral responses of marine mammals to surface vessels are similar to their behavioral responses to predators. There has been one reported vessel strike of a bowhead whale from Utqiaġvik in 2015 (NMFS unpublished data); evidence from subsistence-harvested bowhead whales indicate about 2 percent of animals have experienced vessel collisions (George et al. 2017). Increased vessel traffic resulting from a reduction in sea ice in the Arctic may lead to more vessel strike incidents in the future.

5.5 Ocean Noise

In addition to vessel noise described above, ESA-listed species in the action area are exposed to several other sources of natural and anthropogenic noise. Natural sources of underwater noise include sea ice, wind, waves, precipitation, and biological noise from marine mammals, fishes, and crustaceans. Other anthropogenic sources of underwater noise of concern to listed species in the action area include in-water construction activities such as drilling, dredging, and pile driving; oil, gas, and mineral exploration and extraction; Navy sonar and other military activities; geophysical seismic surveys; and ocean research activities. Levels of anthropogenic (human-caused) sound can vary dramatically depending on the season, type of activity, and local conditions. The combination of anthropogenic and natural noises contributes to the total noise at any one place and time. Noise impacts to listed marine mammal species from many of these activities are mitigated through ESA Section 7 consultations.

Noise is of particular concern to marine mammals because many species use sound as a primary sense for navigating, finding prey, avoiding predators, and communicating with other individuals. As described in greater detail later in this opinion, noise may cause marine mammals to leave a habitat, impair their ability to communicate, reduce their survival rate, or cause stress. Noise can cause behavioral disturbances, can mask other sounds including their own vocalizations, may result in injury, and, in some cases, may result in behaviors that ultimately lead to death. The severity of these impacts can vary greatly between minor impacts that have no real cost to the animal, to more severe impacts that may have lasting consequences.

Because responses to anthropogenic noise vary among species and individuals within species, it is difficult to determine long-term effects. Habitat abandonment due to anthropogenic noise exposure has been found in terrestrial species (Francis and Barber 2013). The presence and movements of ships in the vicinity of seals can affect their normal behavior (Jansen et al. 2010) and may cause them to abandon their preferred breeding habitats in areas with high traffic (Sullivan 1980; Allen 1984; Henry and Hammill 2001; Edrén et al. 2010; London et al. 2012). Clark et al. (2009) identified increasing levels of anthropogenic noise as a habitat concern for whales because of its potential effect on their ability to communicate (i.e., masking). Some research (Parks 2003; McDonald et al. 2006b; Parks 2009) suggests marine mammals compensate for masking by changing the frequency, source level, redundancy, and timing of their calls. However, the long-term implications of these adjustments, if any, are currently unknown.

Because noise is a primary source of disturbance to marine mammals, and the category of disturbance most focused on in Incidental Harassment Authorizations and Letters of Authorization, this opinion considers it as a separate category of the Environmental Baseline.

5.5.1 Ambient Noise

Ambient sound, as it is considered here, refers to naturally produced sound in the absence of measurable anthropogenic sound. Ambient sound is different from "background sound" which can include anthropogenic sounds that are typical for a particular location.

The presence of ice can contribute significantly to ambient sound levels and affects sound propagation. While sea ice can produce substantial amounts of ambient sounds, it also can function to dampen or heighten ambient sound. Smooth annual ice can enhance sound propagation compared to open water conditions (Richardson et al. 1995). However, with increased cracking, ridging, and other forms of sub-surface deformation, transmission losses generally become higher compared to open water (Richardson et al. 1995; Blackwell and Greene 2001). Urick (1996) discussed variability of ambient noise in water, including under Arctic ice. He stated that "the ambient background depends upon the nature of ice, whether continuous, broken, moving or ground-fast, the temperature of air, and the speed of the wind." Temperature affects the mechanical properties of the ice, and temperature changes can result in cracking. The spectrum of cracking ice sounds typically displays a broad range from 100 Hz to 1 kHz, and the spectrum level has been observed to vary as much as 15 dB re 1 μPa at 1 m within 24 hours due to diurnal variability in air temperatures (BOEM 2011). Data are limited, but in at least one instance it has been shown that ice-deformation sounds produced frequencies of 4 to 200 Hz (Greene 1981).

During the open-water season in the Arctic, wind and waves are important sources of ambient sound with levels tending to increase with increased wind and sea state, all other factors being equal (Richardson et al. 1995). Wind, wave, and precipitation noise originating close to the point of measurement dominate frequencies from 500 to 50,000 Hz.

There are many marine mammals in the Arctic marine environment whose vocalizations contribute to ambient sound including bowhead whales, gray whales, beluga whales, walrus, ringed seals, bearded seals, and spotted seals. Ringed seal calls have a source level of 95 to 130 dB re 1 μPa at 1 m, with the dominant frequency under 5 kHz (Cummings et al. 1986; Thomson and Richardson 1995).

Sound levels recorded during the open-water season (July 6 through September 22) in Foggy Island Bay varied from approximately 88 to 103 dB re uPa broadband (Aerts et al. 2008). These sound levels may have been influenced by vessel activities occurring nearby (Aerts et al. 2008), and may therefore be better characterized as background sound rather than ambient sound. Broadband background sound levels recorded in the water under the ice at 9.4 km (5.8 mi) from Northstar Island were 77 dB 1 re μPa and 76 dB re μPa in 2001 and 2002, respectively (Blackwell et al. 2004a).

5.5.2 Oil and Gas Exploration, Drilling, and Production Noise

NMFS has conducted numerous ESA section 7 consultations related to oil and gas activities in the Beaufort Sea. Many of the consultations have authorized the take (by harassment) of bowhead whales and estimated take of ringed and bearded seals from sounds produced during geophysical (including seismic) surveys and other exploration and development activities. Below are some key consultations completed in the action area, but this is not an exhaustive list.

The ESA does not prohibit the taking of threatened species unless special regulations have been promulgated, pursuant to ESA Section 4(d), to promote the conservation of the species. ESA Section 4(d) rules have not been promulgated for Arctic ringed seals or Beringia DPS bearded seals; therefore, ESA section 9 take prohibitions do not apply to these two species. In our biological opinions, we estimate take of these threatened species, we determine whether the action may jeopardize the continued existence of these species, and we work with the action agency to minimize take. We do not, however, authorize take of threatened species for which take is not prohibited under the ESA.

For each consultation, the process to estimate take of listed species is very specific to that action, relying on assumptions specific to the proposed action, and the best available information at that time for species density, and the best available science at that time to understand the scope and intensity of a stressor (e.g., acoustics, sound source verification, transmission loss, etc.). The estimates of take are conservative and thus are, most likely, overestimates. We also make assumptions about the ability of an action agency to accurately recognize that take has occurred during the course of an action—that whales and pinnipeds are not always available to be observed, or they can be affected in ways that are not observable. It is possible that the actual take numbers reported by an action agency may underestimate the instances of take of listed species. We present these caveats to provide context for the authorized take estimates below.

In 2013, NMFS completed an incremental step consultation with BOEM and Bureau of Safety and Environmental Enforcement (BSEE) on the effects of the authorization of oil and gas leasing and exploration activities in the U.S. Beaufort and Chukchi seas over a 14-year period, from March 2013 to March 2027 (i.e., the Arctic Regional Biological Opinion (NMFS 2013b)). The incidental take statement issued with the biological opinion for the 14-year period allows for takes (by harassment) from sounds associated with high-resolution, deep penetration, and in-ice deep penetration seismic surveys of 87,878 bowhead whales, 896 fin whales, 1,400 humpback whales, and estimated take of 91,616 bearded seals, and 506,898 ringed seals. Take will be more accurately evaluated and authorized for project-specific consultations that fall under this over-arching consultation (i.e., stepwise consultations), and the cumulative take for all subsequent consultations will be tracked and tiered to these consultations.

In 2014, NMFS Alaska Region conducted three internal consultations with NMFS Permits Division on the issuance of IHAs to take marine mammals incidental to 3D ocean bottom sensor seismic and shallow geohazard surveys in Prudhoe Bay, Foggy Island Bay, and the Colville River Delta, in the Beaufort Sea, Alaska, during the 2014 open-water season (NMFS 2014a; NMFS 2014b; NMFS 2014c). These project-specific consultations were either directly or indirectly linked to the Arctic regional biological opinion. The incidental take statements issued with the three biological opinions allowed for take (by harassment) of 138 bowhead whales, and estimates take of 744 bearded seals and 427 ringed seals, as a result of exposure to impulsive sounds at received levels at or above 160 dB re 1 μParms.

NMFS completed an incremental step consultation with BOEM and BSEE in 2015 on the effects of oil and gas exploration activities for lease sale 193 in the Chukchi Sea, Alaska, over a nine-year period, from June 2015 to June 2024 (AKR-2015-9422) (NMFS 2015a) (Table 9).The incidental take statement issued with the biological opinion allows for takes (by harassment) from sounds associated with seismic, geohazard, and geotechnical surveys, and exploratory drilling of 8,434 bowhead whales, 133 fin whales, 133 humpback whales, while also estimating take of 1,045,985 ringed seals, and 832,013 bearded seals.

Subsequently in 2015, NMFS Alaska Region consulted with the NMFS Permits Division on the issuance of an IHA to take marine mammals incidental to Shell's exploration drilling activities in the Chukchi Sea, Alaska (AKR-2015-9449) (NMFS 2015b). The incidental take statement issued with the biological opinion allowed for takes (by harassment) of 1,038 bowhead whales, 14 fin whales, 14 humpback whales, while estimating take of 1,722 bearded seals, and 25,217 ringed seals as a result of exposure to continuous and impulsive sounds at received levels at or above 120 dB re 1 μParms and 160 dB re 1 μParms, respectively.

Table 9. 2015 consultations and exposure numbers in the Chukchi Sea and Beaufort Sea.

Consultation Number	Topic	Project proponent	Bowhead whales	Fin whales	Humpback whales	Ringed seals	Bearded seals
AKR-2015-9422	Lease sale 193	BLM	8,434	133	133	1,045,985	832,013
AKR-2015-9449	Drilling activities	Shell	1,038	14	14	1,722	25,217
AKR-2015-9448	Aviation activities	Shell				793	11
AKR-2015-9454	Shallow geohazard survey	Hilcorp	12			350	100
AKR-2015-9451	3-D seismic survey	SAE	9			443	22

In 2015, NMFS Alaska Region conducted an internal consultation with NMFS Permits Division on the issuance of an IHA to take marine mammals incidental to ice overflight and ice survey activities conducted by Shell Gulf of Mexico and Shell Offshore Inc., from May 2015 to April 2016 (AKR-2015-9448) (NMFS 2015c). The biological opinion estimated take (by harassment) of 793 ringed seals and 11 bearded seals as a result of exposure to visual and acoustic stimuli from aircraft. An IHA was issued for Hilcorp's proposed shallow geohazard survey in the Beaufort Sea[16] (AKR-2015-9454) that authorized harassment of 12 bowhead whales, 100 bearded seals, and 350 ringed seals (80 FR 27901). Lastly, NMFS Alaska Region developed a biological opinion[17] (AKR-2015-9451) in response to the issuance of an MMPA IHA authorizing take of 9 bowhead whales, 443 ringed seals, and 22 bearded seals for SAExploration's 3-D seismic survey (80 FR 20084).

There were no consultations for oil and gas activities completed with the NMFS Permits Division in 2016 and 2017.

[16] https://www.fisheries.noaa.gov/resource/document/biological-opinion-proposed-issuance-incidental-harassment-authorization-hilcorp
[17] https://www.fisheries.noaa.gov/resource/document/biological-opinion-issuance-incidental-harassment-authorization-saexploration-0

In 2018, NMFS Alaska Region completed a consultation with BOEM, BSEE, EPA, and USACE for oil and gas exploration activities for the Liberty Project taking place from December 2020 to November 2045 (NMFS 2018a). In 2019, the NMFS Alaska Region reinitiated consultation with BOEM, BSEE, EPA, and USACE for the Liberty Project and conducted a consultation with the NMFS Permits Division on the issuance of a letter of authorization (LOA) to take marine mammals incidental to oil and gas exploration activities for the Liberty Oil and Gas Development and Production Activities (NMFS 2019a). The biological opinion estimates take of ringed seals: 831 by Level B harassment due to noise and physical presence, 8 by Level A harassment due to noise, and 10 by mortality, and for bearded seals, 130 by Level B harassment due to noise and physical presence and 4 by Level A harassment The biological opinion also authorized the following take for bowhead whales: 120 by Level B harassment and 4 by Level A harassment.

In 2019, NMFS Alaska Region completed a programmatic consultation with the Bureau of Land Management for the implementation of the oil and gas lease sales for the Arctic National Wildlife Refuge coastal plain (NMFS 2019b). The consultation was based on the most likely scenario for oil exploration, development, production, and abandonment. An incidental take statement is not issued for programmatic consultations; however, consultations will be required for future oil and gas activities within the refuge boundaries that may affect listed species.

5.5.3 Seismic Activity Noise

Seismic surveys have been conducted in the Chukchi Sea and Beaufort Sea since the late 1960s and early 1970s, resulting in extensive coverage over the area. Seismic surveys vary, but a typical two-dimensional/three-dimensional (2D/3D) seismic survey with multiple guns emits sound at frequencies of about 10 Hz to 3 kHz (Austin et al. 2015). Seismic airgun sound waves are directed towards the ocean bottom, but can propagate horizontally for several kilometers (Greene and Richardson 1988; Greene and Moore 1995). Analysis of sound associated with seismic operations in the Beaufort Sea and central Arctic Ocean during ice-free conditions also documented propagation distances up to 1,300 km (808 mi) (Richardson 1998; Richardson 1999; Thode et al. 2010). Because the Chukchi Sea continental shelf has a highly uniform depth of 30 to 50 m (98 to 164 ft), it strongly supports sound propagation in the 50 to 500 Hz frequency band (Funk et al. 2008).

Several of the section 7 consultations discussed in the previous subsection include estimates of take (by harassment) of marine mammals from noise produced through seismic activity.

5.5.4 Aircraft Noise

The sound and visual presence of aircraft can result in behavioral changes in whales such as diving, altering course, vigorous swimming, and breaching (Patenaude et al. 2002). Oil and gas development projects often involve helicopters and fixed-winged aircraft, and aircraft are used for surveys of natural resources. Airborne sounds do not transfer well to water because much of the sound is attenuated at the surface or is reflected where angles of incidence are greater than 13°; however, loud aircraft noise can be heard underwater when aircraft are within or near the 13° overhead cone and surface conditions are calm (Richardson et al. 1995). Richardson et al. (1995) and Richardson and Malme (1993) observed that bowhead whales in the Beaufort Sea will dive or swim away when low-flying (500 m (1640 ft)) aircraft pass above them.

Ringed seals departed their lairs in response to a helicopter flying 5 km from the lair, and during helicopter landings and take-offs as far away as 3 km (Kelly et al. 1988). They are most adversely affected by noise disturbance in late March through June when they spend greater amounts of time out of the water and their movements are limited to small areas due to their dependent offspring (Kelly et al. 1988). One study indicated that the risk of scaring ringed seals into the water can be substantially reduced if small-type helicopters do not approach closer than 1500 m and small fixed-wing aircraft do not approach closer than 500 m (Born et al. 1999).

5.6 Direct Mortality

Within the proposed action area there are several potential sources of direct mortality of listed species, including subsistence harvest, stranding, and predation. Direct mortality associated with vessels strikes is addressed in Section 5.4.2.

5.6.1 Subsistence Harvest

The ESA and MMPA allow for the harvest of marine mammals by Alaska Natives for subsistence purposes and for the creation of traditional handicrafts. However, the Whaling Convention Act (16 USC §§ 916 *et seq*.) restricts the Alaska Native subsistence hunt of great whales, allowing only for the take of bowheads. Thus, subsistence hunters in Alaska are not authorized to take humpback whales. However, one humpback whale was illegally harvested in Kotlik in October, 2006, and another was illegally harvested in Toksook Bay in May, 2016 (Muto et al. 2019). Whaling by Alaska Natives in the Alaskan Arctic and sub-arctic has taken place for at least 2,000 years (Marquette and Bockstoce 1980; Stoker and Krupnik 1993). In addition to subsistence hunting, commercial whaling occurred during the late 19th and early 20th centuries. Pelagic commercial whaling for the Western Arctic stock of bowheads was conducted from 1849 to 1914 in the Bering, Chukchi, and Beaufort seas (Bockstoce et al. 2005). Woodby and Botkin (1993) estimated that the historical abundance of bowhead whales in this population was between 10,400 and 23,000 whales before commercial whaling began. Within the first two decades (1850 through 1870), over 60 percent of the estimated pre-whaling population was harvested, although whaling effort remained high into the 20th century (Braham 1984). It is estimated that the pelagic whaling industry harvested 18,684 whales from this stock (Woodby and Botkin 1993). Between 1848 and 1919, shore-based whaling operations (including landings as well as struck and lost estimates from U. S., Canada, and Russia) took an additional 1,527 animals. Estimates of mortality likely underestimate the actual harvest as a result of under-reporting of the Soviet catches (Yablokov 1994) and incomplete reporting of struck and lost animals. Commercial whaling also may have caused the extinction of some subpopulations and some temporary changes in distribution.

Subsistence harvest has been regulated by quotas set by the International Whaling Commission, implemented through the Whaling Convention Act, and allocated by the Alaska Eskimo Whaling Commission to Alaska Natives since 1977. Alaska Native subsistence hunters from 11 Alaska communities take approximately 0.1 to 0.5 percent of the population per annum (Philo et al. 1993; Suydam et al. 2011). Under this quota, the number of kills in any one year has ranged between 14 and 72. The maximum number of strikes per year is set by a quota which is determined by subsistence needs and bowhead whale abundance and trend estimates (Stoker and Krupnik 1993). Suydam and George (2012) summarized Alaska subsistence harvests of bowhead whales from 1974 to 2011 by village and reported that a total of 1,149 whales were landed by hunters from 12 villages, with Barrow (now Utqiaġvik) landing the most whales (n = 590) and Shaktoolik landing only one. The number of whales landed at each village varies greatly from year to year, as success is influenced by village size and ice and weather conditions (Table 10). The efficiency of the hunt (the percent of whales struck that are retrieved) has increased since the implementation of the bowhead whale quota in 1978. In 1978, the efficiency was about 50 percent. In 2018, 47 of 68 whales struck were landed, resulting in an efficiency of 69 percent, which was lower than the previous 10-year average of 78 percent (Suydam et al. 2019).

Table 10. Annual number of bowhead whales landed by Alaska natives

Year	Number of Landed Whales
2010	45
2011	38
2012	55
2013	46
2014	38
2015	38
2016	47
2017	43
2018	47

Sources: (Suydam et al. 2011; Suydam et al. 2012; Suydam et al. 2013; Suydam et al. 2014; Suydam et al. 2015; Suydam et al. 2016; Suydam et al. 2017, AEWC unpublished data, 2017; Suydam et al. 2019)

Canadian and Russian Natives also take whales from this stock. Hunters from the western Canadian Arctic community of Aklavik harvested one whale in 1991 and one in 1996. No catches for Western Arctic bowhead whales were reported by either Canadian or Russian hunters for 2006 and 2007 (IWC 2008; IWC 2009) or by Russia in 2009, 2011, 2012, or 2014 (IWC 2011; Ilyashenko 2013; Ilyashenko and Zharijov 2015), but two bowhead whales were taken in Russia in 2008 (IWC 2010), two in 2010 (IWC 2012), and one in 2013 (Ilyashenko and Zharijov 2014).

Annual subsistence take by Natives of Alaska, Russia, and Canada from 2010 through 2014 averaged 44 bowhead whales. During the 2013 through 2018 time period, the IWC and Alaska Eskimo Whaling Commission (AEWC) allowed Alaskan and Chukotkan whalers to land up to 336 bowhead whales total[18]. The IWC set a catch limit of 392 bowhead whales landed for the years 2019 through 2025 combined.

Ringed and bearded seals are important subsistence species for many northern coastal

[18] Alaska Eskimo Whaling Commission (AEWC) website. Bowhead harvest quota. Available at http://www.aewc-alaska.org/bowhead-quota.html, accessed March 30, 2018.

communities. Approximately 64 Alaska Native communities in western and northern Alaska, from Bristol Bay to the Beaufort Sea, regularly harvest ringed and bearded seals for subsistence purposes (Ice Seal Committee 2019). Estimates of subsistence harvest of ringed and bearded seals are available for several of these communities based on annual household surveys (Table 5), but more than 50 other communities that harvest these species for subsistence were not surveyed within this time period or have never been surveyed. From 2012-2017, only 4 percent (3 of 64) of the coastal communities that harvest ice seals have been surveyed in two or more consecutive years (Ice Seal Committee 2019). Household surveys are designed to estimate harvest for the specific community surveyed; extrapolation of harvest estimates beyond a specific community is not appropriate because of local differences in seal availability, cultural hunting practices, and environmental conditions (Ice Seal Committee 2019). From 2013 through 2017, the total annual ringed and bearded seal harvest estimates across surveyed communities ranged from 185 to 1,306 and 114 to 1,176, respectively (Table 11).

Table 11. Alaska ringed and bearded seal harvest estimates based on household surveys, 2013–2017

Community	Estimated Ringed Seal Harvest					Estimated Bearded Seal Harvest				
	2013	2014	2015	2016	2017	2013	2014	2015	2016	2017
Nuiqsut	-	58	-	-	-	-	26	-	-	-
Utqiaġvik	-	428	-	-	-	-	1,070	-	-	-
Point Hope	-	246	-	-	-	-	183	-	-	-
Kotzebue	-	69	-	-	-	-	228	-	-	-
Shishmaref	-	296	-	-	-	-	319	-	-	-
Hooper Bay	667	158	185	546	193	171	64	148	118	114
Tununak	-	-	-	117	-	-	-	-	19	-
Tuntutuliak	75	-	-	-	-	53	-	-	-	-
Quinhagak	160	51	-	26	-	49	16	-	38	-
Total	**902**	**1,306**	**185**	**689**	**193**	**273**	**1,176**	**148**	**175**	**114**

Source: adapted from Ice Seal Committee (2019). Villages with no landings were not included.

5.6.2 Stranding

In 2019, there were 11 stranded bowhead whales in the Arctic[19]. The number of strandings in 2019 was high compared to the 3 strandings per year average from 2000-2018 (Table 12). The cause of death is unknown for most of these reports as the level of decomposition was too advanced. We are unaware of other large whale strandings in the action area for species discussed in this opinion.

[19] https://www.fisheries.noaa.gov/resource/document/alaska-region-marine-mammal-annual-stranding-reports

Table 12. Number of stranded bowhead whales from 2015 to 2019, and the average from 2000 to 2018.

Year	Number Stranded Bowheads
2019	11
2018	7
2017	1
2016	6
2015	13
Average per year 2000-2018	**3**

The NMFS AKR Stranding Network received reports of many stranded ice seals in spring and summer 2019. In September, NMFS declared an Unusual Mortality Event (UME) for ringed, bearded, and spotted seals, dating back to June 1, 2018. From June 2018 through April 15, 2020, there were reports of 66 ringed, 84 bearded, and 85 unidentified seals (a number of which could have been ringed or bearded seals). The cause, or causes, of these deaths is currently being investigated by NMFS.

From December 2017 – May 2018, there were 28 ringed seal strandings in the Bering Sea, reported in the villages of Unalaska, Akutan, Nelson Lagoon, and St. Paul. Health evaluations were conducted for the seals, but it is still unclear if these incidences were outliers or indicators of the potential negative effects of climate change (Savage 2019). Reports of stranded Steller sea lions often indicate that the animal was entangled in fishing gear or marine debris; however, cause of death cannot always be determined, and not all stranded animals can be found (Muto et al. 2019).

5.6.3 Predation

Little is known about the natural mortality of bowhead whales (Philo et al. 1993). From 1964 through the early 1990s, at least 36 deaths were reported in Alaska, Norway, Yukon and Northwest Territories for which the cause could not be established (Philo et al. 1993). Bowhead whales have no known predators except humans and killer whales. The frequency of attacks by killer whales upon the Western Arctic stock of bowhead whales is assumed to be low (George et al. 1994). Of 195 whales examined from the Alaskan subsistence harvest between 1976 and 1992, 4.1 to 7.9 percent had scars indicating that they had survived attacks by killer whales (George et al. 1994). Of 378 complete records for killer whale scars collected from 1990 to 2012, 30 whales (8 percent) had scarring "rake marks" consistent with orca/killer whale injuries and another 10 had possible injuries (George et al. 2017). The mortality rate of bowhead whales due to killer whale predation remains unknown. Killer whales will also prey upon calves of many species of large whales (e.g., fin, sperm, and humpback whales) (Jefferson et al. 1991; Pitman et al. 2001), although the rate of mortality due to killer whale predation for these large whales is unknown.

Polar bears are the main predator of ringed and bearded seals (Cameron et al. 2010; Kelly et al. 2010b). Other predators of both species include walruses and killer whales (Burns and Eley 1976; Heptner et al. 1976; Fay et al. 1990; Derocher et al. 2004; Melnikov and Zagrebin 2005). In addition, Arctic foxes prey on ringed seal pups by burrowing into lairs; and gulls, ravens, and possibly snowy owls successfully prey on pups when they are not concealed in lairs (Smith 1976; Kelly et al. 1986; Lydersen et al. 1987; Lydersen and Smith 1989; Lydersen 1998). The threat currently posed to ringed and bearded seals by predation is considered moderate, but predation risk is expected to increase as snow and sea ice conditions change with a warming climate (Cameron et al. 2010; Kelly et al. 2010b).

Polar bear predation on ringed seal pups tripled when pups were prematurely exposed as a consequence of unseasonably warm conditions. Hammill and Smith (1991) further noted that polar bear predation on ringed seal pups increased four-fold when average snow depths in their study area decreased from 23 cm to 10 cm. Gulls, ravens, and possibly snowy owls prey on ringed seal pups when the latter are forced out of subnivean lairs prematurely because of low snow accumulation and/or early melts (Lydersen et al. 1987; Lydersen and Smith 1989; Lydersen and Ryg 1990; Lydersen 1998). Avian predation is facilitated not only by lack of sufficient snow cover but also by conditions favoring influxes of birds (Kelly et al. 2010b).

5.7 Other Arctic Projects

In the winters of 2014, 2017, and 2018, the U.S. Navy conducted submarine training, testing, and other research activities in the northern Beaufort Sea and Arctic Ocean from a temporary camp constructed on an ice flow toward the northern extent of the U.S. EEZ, about 185 to 370 km (115 to 230 mi) north of Prudhoe Bay. Equipment, materials, and personnel were transported to and from the ice camp via daily flights based out of the Deadhorse Airport (located in Prudhoe Bay). No takes were expected, nor authorized, for this activity. An IHA was subsequently issued to the U.S. Navy to incidentally harass (level B only) marine mammals during submarine training and testing activities associated with Ice Exercise 2020 north of Prudhoe Bay, Alaska from February 2020 through January 2021.

In 2016, NMFS Alaska Region conducted internal consultations with NMFS Permits Division on the issuance of three Incidental Harassment Authorizations (IHA) to take marine mammals incidental to dock construction and anchor retrieval in the Bering, Chukchi, and Beaufort seas during the 2016 open water season. The biological opinions estimated takes (by harassment) of 706 bearded seals and 7,887 ringed seals as a result of exposure to continuous or impulsive sounds at received levels at or above 120 dB or 160 dB re 1 μPa rms, respectively.

In 2016 and 2017, NMFS Alaska Region conducted internal consultations with NMFS Permits Division on the issuance of an IHA associated with the continuation of fiber optic cable laying. Quintillion was permitted to install 1,904 km (1,183 mi) of subsea fiber optic cable during the open-water season, including a main trunk line and six branch lines to onshore facilities in Nome, Kotzebue, Point Hope, Wainwright, Barrow, and Oliktok Point. The biological opinions estimated takes (by harassment) of 62 bearded seals and 855 ringed seals as a result of exposure to sounds of received levels at or above 120 dB re 1 μPa_{rms} from sea plows, anchor handling, and operation and maintenance activities (NMFS 2016b).

An IHA was issued to the Alaska Gasline Development Corporation to harass marine mammals during pile driving associated with the Alaska LNG project in Prudhoe Bay from July 2022 through June 2023. Estimates of Level A takes of ESA-listed animals associated with this project include 32 ringed seals and 5 spotted seals. Estimates of Level B takes of ESA-listed animals associated with this project include 110 bowhead whales, 1,765 ringed seals, and 300 bearded seals.

5.8 Scientific Research

Research is a necessary endeavor to assist in the recovery of threatened and endangered species; however, research activities can also disturb these animals. Research on marine mammals often requires boats, adding incrementally to the vessel traffic, noise, and pollution in the action area. Aerial surveys could also disturb whales, especially when circling at low-altitudes to obtain accurate group counts. Boat based surveys, such as photo-identification studies, often require the boat to closely approach whales or whale groups. Deployment and retrieval of passive acoustic monitoring devices requires a boat, which temporarily increases noise in the immediate area. However, once the instruments are deployed, passive acoustic monitoring is noninvasive. Species considered in this Biological Opinion are taken incidentally during research directed towards other species. This includes various hydroacoustic surveys for fish species, the Alaska longline survey, the Arctic ecosystem integrated survey, and other research (NMFS 2019c).

NMFS issues scientific research permits that are valid for five years for ESA-listed species. When permits expire, researchers often apply for a new permit to continue their research. Additionally, applications for new permits are issued on an on-going basis; therefore, the number of active research permits is subject to change in the period during which this Opinion is valid.

Species considered in this Opinion also occur in Canadian waters. Although we do not have specific information about any permitted research activities in Canadian waters, we assume they will be similar to those described below.

Cetaceans

Whales are exposed to research activities documenting their biology, behavior, habitat use, stock structure, social organization, communication, distribution, and movements throughout their ranges. Activities associated with these permits occur in the action area, in some cases at the same time as the proposed project activities.

Currently permitted research activities include:

- Counting/surveying, aerial and vessel-based
- Opportunistic collection of sloughed skin and remains
- Behavioral and monitoring observations
- Various types of photography and videography
- Skin and blubber biopsy sampling
- Fecal sampling
- Suction-cup, dart/barb, satellite, and dorsal fin/ridge tagging
- Acoustic, active playback/broadcast, and passive recording
- Acoustic sonar for prey mapping

Some of these research activities require close vessel approach. The permits also include incidental harassment takes to cover such activities as tagging, where the research vessel may come within 100 yards of other whales while in pursuit of a target whale. These activities may cause stress to individual whales and cause behavioral responses. In some cases, take could occur and is authorized by the research permits.

Pinnipeds

Steller sea lions, ringed seals, and bearded seals are exposed to research activities documenting their population status and trends, health, movements, habitat use, foraging ecology, response to recovery activities, distribution, and movements throughout their ranges.

Of the more than 30 active scientific research permits, some include behavioral observations, counting/surveying, photo-identification, and capture and restraint (by hand, net, cage, or board), for the purposes of performing the following procedures:

Collection of:

- Blood
- Clipped hair
- Urine and feces
- Nasal and oral swabs
- Vibrissae (pulled)
- Skin, blubber, or muscle biopsies
- Weight and body measurements
- Injection of sedative
- Administration of drugs (intramuscular, subcutaneous, or topical)
- Attachment of instruments to hair or flippers, including flipper tagging
- Ultrasound

These activities may cause stress to individual pinnipeds and cause behavioral responses. In some cases, take could occur and is authorized by the research permits.

6 EFFECTS OF THE ACTION

"Effects of the action" are all consequences to listed species or critical habitat that are caused by the proposed action, including the consequences of other activities that are caused by the proposed action. A consequence is caused by the proposed action if it would not occur but for the proposed action and it is reasonably certain to occur. Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action (50 CFR § 402.02).

This biological opinion relies on the best scientific and commercial information available. We try to note areas of uncertainty, or situations where data is not available. In analyzing the effects of the action, NMFS gives the benefit of the doubt to the listed species by minimizing the likelihood of false negative conclusions (concluding that adverse effects are not likely when such effects are, in fact, likely to occur).

We organize our effects analysis using a stressor identification – exposure – response – risk assessment framework for the proposed activities.

We conclude this section with an *Integration and Synthesis of Effects* that integrates information presented in the *Status of the Species* and *Environmental Baseline* sections of this opinion with the results of our exposure and response analyses to estimate the probable risks the proposed action poses to endangered and threatened species.

NMFS identified and addressed all potential stressors; and considered all consequences of the proposed action, individually and cumulatively, in developing the analysis and conclusions in this opinion regarding the effects of the proposed action on ESA-listed species and designated critical habitat.

6.1 Project Stressors

The proposed action is composed of several activities, each with associated stressors that can impact ESA-listed species. Different activities can cause similar stressors (e.g., disturbance, habitat degradation, etc.). Based on our review of the available data, the proposed action may cause the primary stressors identified below (organized by activity). Mitigation measures (Section 2.2) designed to lessen the impact of these stressors are also described in the following sections.

- Vibroseis seismic surveys
  - Vehicle traffic impacts on ringed seals and their lairs (and habitat alteration)
  - Visual disturbance from vehicles and personnel
  - Acoustic disturbance from the surveys
- Seawater treatment facility
  - Disturbance associated with building and operating a desalination plant, such as pile driving, dredging, screeding, and seawater withdrawal
  - Debris (trash) from human activity/presence posing entanglement/ingestion risk to species
  - Habitat alteration (from dredging and screeding)
- Module transfer island construction
  - Disturbance of seals due to construction activities
  - Habitat alteration due to construction
  - Debris (trash) from human activity/presence posing entanglement/ingestion risk to species
- Ice roads
  - Acoustic disturbance from activities associated with ice road, trail, and pad construction, use, and maintenance
  - Direct injury, mortality, or harassment from on-ice activities
  - Visual disturbance from vehicles and project activities
  - Habitat alteration from the ice road, trail, and pad construction
- Unauthorized discharge
  - Oil spills, diesel fuel spills from processing facilities, pipelines, transport, etc.
- Vessel effects
  - Vessels striking marine mammals, especially large whales
  - Visual disturbance from vessels
  - Acoustic disturbance from vessels
  - Introduction of aquatic nuisance species
  - Pollution (unauthorized oil spills or fuel leaks from transiting vessels)
- Exploratory well drilling
  - Acoustic disturbance from drilling activities
  - Increased human presence/activity associated with drilling (e.g., vehicles, personnel, aircraft)

    - Acoustic disturbance from aircraft (from surveys associated with drilling)
    - Pollution (debris, unauthorized spills)
- Aircraft transportation
    - Acoustic disturbance
    - Visual disturbance

Designated critical habitat is also found within the action area. The marine transit route (see Figure 3) crosses through a portion of Steller sea lion critical habitat and comes near North Pacific right whale critical habitat. Stressors associated with marine transportation (pollution, visual and acoustic disturbance) could affect the physical and biological features of those critical habitats; see 4.2.5.1 and 4.2.9.1 for further discussion.

6.2 Exposure and Response Analysis

As discussed in the *Approach to the Assessment* section of this opinion, exposure analyses are designed to identify the listed species or designated critical habitats that are likely to co-occur with these effects in space and time and the nature of that co-occurrence. In this step of our analysis, we try to identify the number, age (or life stage), and gender of the individuals that are likely to be exposed to an action's effects and the populations or subpopulations those individuals represent.

The proposed action contains several component activities that occur on or over land, or in water, which would in turn expose different ESA-listed species, depending on the setting of the activity. In Table 13 below, we summarize and identify the ESA-listed species that could be exposed during the activities covered under BLM's Integrated Activity Plan. Further details on the effects to the ESA-listed species potentially exposed during the proposed action can be found in the following sections.

Table 13. Overview of ESA-listed species potentially exposed to activities under the proposed action.

	Fin Whale	Blue Whale	Sperm Whale	Humpback Whale	North Pacific Right Whale	Bowhead Whale	Ringed Seal	Bearded Seal	Steller Sea Lion
3D Seismic Surveys (Vibroseis)						X	X	X	
Exploratory Well Drilling						X	X	X	
Seawater Treatment Plant						X	X	X	
Unauthorized Spills	X			X		X	X	X	
Module Island Construction						X	X	X	
Ice Road, Trail, and Pad Construction and Use							X		
Marine Transportation	X	X	X	X	X	X	X	X	X
Aircraft Transportation						X	X	X	
Screeding and Dredging						X	X	X	

6.2.2 Acoustic Disturbance Thresholds

Several of the activities for the proposed action would result in acoustic disturbance of marine mammals. Depending on the nature of the activity, the acoustic disturbance could be air-borne, or underwater. There are different thresholds for noise in water and in air; those thresholds are discussed later in this section.

The MMPA defines "harassment" as: "any act of pursuit, torment, or annoyance which (i) has the potential to injure a marine mammal or marine mammal stock in the wild [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 [Level B harassment]" (16 U.S.C. § 1362(18)(A)).

While the ESA does not define "harass," NMFS issued guidance interpreting the term "harass" under the ESA as to: "create the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering" (Wieting 2016). For the purposes of this consultation, any action that amounts to incidental harassment under the MMPA—whether Level A or Level B—constitutes an incidental "take" under the ESA and must be authorized via Incidental Take Statements resulting from subsequent section 7 consultations. This programmatic consultation does not authorize take.

Since 1997, NMFS has used generic sound exposure thresholds to determine whether an activity produces underwater sounds that might result in impacts to marine mammals (70 FR 1871, 1872; January 11, 2005). NMFS revised the comprehensive guidance on sound levels likely to cause injury to marine mammals through onset of permanent and temporary threshold shifts (PTS and TTS; Level A harassment) (83 FR 28824; June 21, 2018) (NMFS 2018b). NMFS is in the process of developing guidance for behavioral disruption (Level B harassment). However, until such guidance is available, NMFS uses the following conservative thresholds of underwater sound pressure levels[20], expressed in rms[21] from broadband sounds that cause behavioral disturbance, and referred to as Level B harassment under section 3(18)(A)(ii) of the MMPA (16 U.S.C § 1362(18)(A)(ii)):

- impulsive sound: 160 dB re 1 μPa_{rms}
- non-impulsive sound: 120 dB re 1μPa_{rms}

Under the PTS/TTS Technical Guidance, NMFS uses the following thresholds for underwater sounds that cause injury, referred to as Level A harassment under section 3(18)(A)(i) of the MMPA (16 U.S.C § 1362(18)(A)(i)). Different thresholds and auditory weighting functions are provided for different marine mammal hearing groups, which are defined in the Technical Guidance (NMFS 2018b). The generalized hearing range for each hearing group is in Table 14.

[20] Sound pressure is the sound force per unit micropascals (μPa), where 1 pascal (Pa) is the pressure resulting from a force of one newton exerted over an area of one square meter. Sound pressure level is expressed as the ratio of a measured sound pressure and a reference level. The commonly used reference pressure level in acoustics is 1 μPa, and the units for underwater sound pressure levels are decibels (dB) re 1 μPa.

[21] Root mean square (rms) is the square root of the arithmetic average of the squared instantaneous pressure values.

Table 14. Underwater marine mammal hearing groups (NMFS 2018b).

Hearing Group	Generalized Hearing Range[1]
Low-frequency (LF) cetaceans *(Baleen whales)*	7 Hz to 35 kHz
Mid-frequency (MF) cetaceans *(dolphins, toothed whales, beaked whales)*	150 Hz to 160 kHz
High-frequency (HF) cetaceans *(true porpoises)*	275 Hz to 160 kHz
Phocid pinnipeds (PW) *(true seals)*	50 Hz to 86 kHz
Otariid pinnipeds (OW) *(sea lions and fur seals)*	60 Hz to 39 kHz
[1]Respresents the generalized hearing range for the entire group as a composite (i.e., all species within the group), where individual species' hearing ranges are typically not as broad. Generalized hearing range chosen based on ~65 dB threshold from normalized composite audiogram, with the exception for lower limits for LF cetaceans (Southall et al. 2007) and PW pinniped (approximation).	

For the proposed action, the activities which could result in underwater acoustic disturbance include: vibroseis, ice road, trail, and pad construction, vessel traffic (marine transportation), dredging, module island construction, exploratory well drilling, and seawater treatment plant operation and construction.

The PTS onset acoustic thresholds are presented in Table 15, using dual metrics of cumulative sound exposure level (L_E) and peak sound level (PK) for impulsive sounds and L_E for non-impulsive sounds.

Level A harassment radii can be calculated using the optional user spreadsheet[22] associated with NMFS Technical Guidance, or through modeling.

[22] The Optional User Spreadsheet can be downloaded from the following website: http://www.nmfs.noaa.gov/pr/acoustics/guidelines.htm

Table 15. PTS Onset Acoustic Thresholds (NMFS 2018b).

Hearing Group	PTS Onset Acoustic Thresholds* (Received Level)	
	Impulsive	Non-impulsive
Low-Frequency (LF) Cetaceans	$L_{pk,flat}$: 219 dB $L_{E,LF,24h}$: 183 dB	$L_{E,LF,24h}$: 199 dB
Mid-Frequency (MF) Cetaceans	$L_{pk,flat}$: 230 dB $L_{E,MF,24h}$: 185 dB	$L_{E,MF,24h}$: 198 dB
High-Frequency (HF) Cetaceans	$L_{pk,flat}$: 202 dB $L_{E,HF,24h}$: 155 dB	$L_{E,HF,24h}$: 173 dB
Phocid Pinnipeds (PW) (Underwater)	$L_{pk,flat}$: 218 dB $L_{E,PW,24h}$: 185 dB	$L_{E,PW,24h}$: 201 dB
Otariid Pinnipeds (OW) (Underwater)	$L_{pk,flat}$: 232 dB $L_{E,OW,24h}$: 203 dB	$L_{E,OW,24h}$: 219 dB

* Dual metric acoustic thresholds for impulsive sounds: Use whichever results in the largest isopleth for calculating PTS onset. If a non-impulsive sound has the potential of exceeding the peak sound pressure level thresholds associated with impulsive sounds, these thresholds should also be considered.
Note: Peak sound pressure (L_{pk}) has a reference value of 1 µPa, and cumulative sound exposure level (L_E) has a reference value of 1µPa^{2}s. The subscript "flat" is being included to indicate peak sound pressure should be flat weighted or unweighted within the generalized hearing range. The subscript associated with cumulative sound exposure level thresholds indicates the designated marine mammal auditory weighting function (LF, MF, and HF cetaceans, and PW and OW pinnipeds) and that the recommended accumulation period is 24 hours. The cumulative sound exposure level thresholds could be exceeded in a multitude of ways (i.e., varying exposure levels and durations, duty cycle). When possible, it is valuable for action proponents to indicate the conditions under which these acoustic thresholds will be exceeded.

In addition, NMFS uses the following thresholds for in-air sound pressure levels from broadband sounds that cause Level B behavioral disturbance under section 3(18)(A)(ii) of the MMPA (16 U.S.C § 1362(18)(A)(ii)):

- 90 dB re 20µPa$_{rms}$ for harbor seals
- 100 dB re 20µPa$_{rms}$ for non-harbor seal pinnipeds

There is no established in-air acoustic threshold for Level A injury. For the proposed action, in-air acoustic disturbance could be caused by construction activities associated with the seawater treatment plant, module transfer island, ice road, trail, and pads, vehicle traffic, and aircraft transportation.

For this consultation, we present the thresholds at which we understand acoustic disturbance to occur for marine mammals to provide context for our exposure analysis.

6.2.3 Seismic Surveys

It is anticipated that all seismic surveys will be conducted by vibroseis seismic vehicles in the winter on land and over frozen bays and lagoons. The surveys require vibroseis seismic vehicles and smaller support vehicles (see Section 2.1.1.1)

Pinnipeds

All heavy equipment and vehicles will be restricted to grounded ice per the mitigation measures with the exception of snow machines to set and retrieve recorders. Snow machine ice paths will not be greater than 3 feet wide on ungrounded ice.

Some ringed seals could be disturbed by vehicular traffic and activities using the nearshore areas of the NPR-A during the ice-covered season. Impacts from vehicles (noise, disturbance) specific to ice road construction, maintenance and use are covered in Section 6.2.5; however, impacts could also occur from the use of lesser developed trails over ice. Three events of seals being directly impacted by vehicles have been recorded by industry on Alaska's North Slope since 1998. During one of these a ringed seal pup was killed when its lair was destroyed by a Caterpillar tractor clearing a road on ice over water 29 feet (9 m) deep with an ice thickness of 4.3 feet (1.3 m). Additionally, an adult female was injured when a lair was destroyed (MacLean 1998). The other two incidents (April 24, 2018, and April 28, 2018) reportedly did not result in harm to seals. In both cases, a seal pup climbed out of a hole in ice disturbed by ice road equipment; no adult was present (BOEM 2018).

Lethal take is unlikely to occur with the proposed action because all heavy equipment and vehicles will be restricted to grounded ice where ringed seal lairs do not normally occur and ringed seals are unlikely to be present. On the portions of ungrounded ice that will be subjected to seismic survey activity, only lighter equipment (snow machines) will be used for survey activities (e.g., placing and retrieving receiver devices used to monitor seismic signals.) This will reduce the mechanical footprint beneath which heavier equipment could cause a lair to collapse (BLM 2019). A snow machine's low level of downward pressure on snow is expected to greatly reduce potential impacts to any over-driven lairs. Additional factors that reduce the impacts of the potential crushing of a lair include the ability of an older pup or an adult to rapidly flush from a birthing lair, as well as project mitigation measures such as restricting ice use to grounded ice over less than 10 feet of water depth and delineation and marking of lairs when located (see Section 2.2.4.1 – subpart Additional Mitigation Measures). For these reasons, any potential impact of this vibroseis survey on ringed seal pups by lair crushing is very unlikely to occur, and we conclude that the adverse effects on ringed seals from this vibroseis survey through crushing of ringed seal pups or lairs are highly improbable.

Noise disturbance from vehicle traffic could disturb some seals, seals could be harassed, depending on the proximity of the vehicle, and seals may vacate an area or lair; vehicle noise is also addressed in Section 6.2.5. In addition, seismic survey activities are considered an acoustic stressor. Vibroseis source pressure waveforms are typically frequency sweeps below 100 Hz, though strong harmonics may exist to 1.5 kHz with signal durations of 5 to 20 seconds. They are categorized as continuous noise source (Richardson et al. 1995).

With applied mitigation measure 3 (Section 2.2.4, Additional Mitigation Measures), we expect that noise from vibroseis would occur at low levels where impacts would not rise to the level of take. More serious impacts, such as lair collapse caused by vehicles, could result in injury or death of individual seals. Adults may be able to escape into the water, but pups could be killed by crushing or premature exposure to the water or frigid air. The likelihood of such effects is greatly diminished by BLM's adoption of mitigation measures. Mitigation measure 3 c) requires that on-ice operations after May 1 will employ a full-time, trained, PSO on vehicles to ensure that all basking seals are avoided by vehicles by at least 500 ft. Mitigation measure 3 b) requires that all equipment with airborne noise levels above 100 dB re 20 micro Pascals are operating at distances from observed seals that allow for the attenuation of noise to levels below 100 dB.

Bearded seals are not anticipated to be in the area in the timeframe during which the vibroseis surveys will be conducted, and therefore are unlikely to be adversely impacted by these surveys. The vibroseis surveys will occur during late winter and early spring, when the Beaufort Sea coastline contains nearly continuous shorefast ice. Based on normal ice conditions, and even in recent years when sea ice coverage has decreased, lead systems (channels of water inside ice) are typically several kilometers away from where the contemplated activities will take place, making the area unsuitable habitat for bearded seals (BOEM 2017a). Bearded seals typically overwinter in the Bering Sea during the timing of the vibroseis surveys. Because of a lack of suitable winter habitat in the waters off of the NPR-A during the vibroseis surveys, impacts to bearded seals from harassment and harm associated with vibroseis surveys are extremely unlikely to occur. We conclude that the adverse effects associated with this vibroseis survey on bearded seals are improbable.

Cetaceans

There are no anticipated impacts to listed cetaceans as this activity is land-based, or would occur on grounded or shorefast ice. As stated above, lead systems where bowhead whales may be encountered are typically several kilometers away from where these activities would take place. We conclude that the adverse effects associated with this vibroseis survey on cetaceans are improbable.

6.2.4 Seawater Treatment Plant Construction

Up to two STPs could be built under the high development scenario. The STPs could be barged as a unit to a designed offshore site (e.g. proposed Olikok Point STP, Prudhoe Bay STP), or they could be constructed along the coast (e.g. Kuparuk STP). The coastal waters are either not part of the NPR-A and do not fall within the jurisdiction of the BLM, or there is an NSO stipulation for the areas under BLM jurisdiction. Lessees would need appropriate State permits to build in the coastal waters. Although there is an NSO exclusion for nearly all permanent development from the shore inland one mile, there is an exception for STPs which may be built terrestrially within the one-mile zone (BLM 2020c).

Sheet piles and pipe piles would be needed for an in-water placement. As with the MTI (Section 6.2.4), this work would be done on ground-fast ice to minimize sound transmission to the open water (BLM 2020c). Any work that might be done in the open water season would require an analysis of the anticipated sound sources (sound transmission in water), determination of the ensonified area, and appropriate mitigation measures to avoid or minimize effects to listed species (ringed and bearded seals, bowhead whales). If the STP is built on land, there would be in-air sounds created by construction, dredging for the intake and outfall structures, and screeding to maintain the area around the intake structure and barge landing area. If built terrestrially, it is not anticipated that any marine mammals would occur near enough to the construction to be harassed by in-air noise.

STP water intake structures are designed with grates to exclude marine mammals and mobile screens to exclude fish. In addition, the intake flow is designed to be less than 0.1 m/second (0.4 ft/second), which is less than the velocity (0.15 m/second (0.5 ft/second) that larval and juvenile fish can swim away from the intake and avoid entrainment (Missimer and Maliva 2018). Intake structures are typically in shallow water (depth ≤ 2.5 m) in areas of naturally low biological productivity (see Screeding and Dredging, Section 6.2.11), reducing the number of larval stages of benthic invertebrates that might be entrained. Krill are generally present in deeper offshore waters and are not expected to be near the STP intake in significant numbers. Due to the low densities of krill and larval invertebrates expected at the intake site and the low water velocity of the intake, entrainment or impingement of larval invertebrates or krill is not expected to occur at levels that would affect the prey available for marine mammals. Therefore, we conclude that the intake of seawater for the STP would have a negligible effect on listed marine mammals.

STPs also have an outflow pipe. Suspended solids must be removed from the seawater for its use as down-the-well floodwater for increasing oil recovery. Because seawater can have more suspended sediment during the open water season than in winter, there are two different modes of operation to treat seasonally different sediment loads. During the winter, strained seawater is typically treated to remove sediment using only sand filters and hypochlorite (to prevent biological growth on filters.) Coagulants and/or other clarifying agents are also included in the treatment during the open water season to enhance sediment removal. The use of coagulants and/or flocculants begins at breakup during late May or early June when turbidity and total suspended solids concentrations rise, and is used until freeze-up usually during October. Heat is added to the seawater year-round to decrease viscosity and enhance sediment removal. During filter backwashing, the material containing hypochlorite becomes mixed with the backwash water and is stored in a collection/treatment tank along with strainer backwash. Sodium metabisulfite is used to dechlorinate the backwash prior to being discharged. For these reasons, total residual chlorine from the hypochlorite and temperature are primary parameters of concern in the discharge during normal operations.

The outfall discharge requires an Alaska Pollutant Discharge Elimination System Permit and is regulated by the Alaska Department of Environmental Conservation. A federal National Pollutant Discharge Elimination Permit is also required. Regulatory agencies monitor and regulate the components of the discharge so that the quality of the receiving water body is not impaired. In addition, currents and wind quickly disperse and mix the outflow water. For these reasons, we conclude that any effects of the discharge water to listed marine mammals would be negligible.

Dredging and screeding would be needed for construction of a berth site, installation of the intake and outfall pipes, and for maintenance near the intake structure. These activities are discussed in Section 6.2.11.

The potential effects of vessels associated with the proposed action (e.g. delivering modules to the site, equipment, materials) are captured in Sections 6.2.7. Trash and debris that will be created from construction activities is discussed in Section 6.2.8)

6.2.5 Module Transfer Island Construction

As discussed in Section 2.1.1.8 island construction will include the cutting and removal of sea ice and the placement of gravel in the opening created by ice removal until the desired island size is achieved. Although modules or equipment would be stored on the island, it is not anticipated that a large facility would be built on it. Sheet piles for slope stability and pipe piles for moorings would likely be installed around at least portions of the island. In addition, screeding and dredging may be needed to prepare a landing area in the open water season. The effects from screeding and dredging are discussed in Section 6.2.11.

Ice trenching

Because ice trenching is scheduled to occur on ground-fast ice, transmission of sound to the open water is not expected. Ice trenching may expose ringed and bearded seals to in-air noise. The noise produced by the machines on the ice is anticipated to be similar to that related to ice road construction, which is discussed in Section 6.2.5

In addition to acoustic harassment, seals may be physically harassed, injured, or killed by the use of equipment associated with ice trenching and removal. Specifically, ice trenching activities could disturb ringed seals in their lairs. However, ice trenching is expected to occur in shallow water depths, on ground-fast ice. Ringed seals typically build their lairs on ice over deeper water, not on ground-fast ice, and bearded seals are not expected to be found on ground-fast ice (Section 6.2.5 (ice road construction)). Consequently, it is extremely unlikely that ringed seals or bearded seals will be affected by ice trenching.

Sheet and pipe pile driving

As described in the BA (BLM 2020b) sheet and pipe pile driving construction would only occur in winter on ground-fast ice only. Under these conditions we expect a negligible transmission of sound to open water. However, if sheet or pipe pile driving extends into the open water season for any reason, we would expect sound to harass listed marine mammals. Under those circumstances, a sound source verification study would be conducted to estimate the size of the zone ensonified, with appropriate mitigation measures implemented to avoid or minimize harassment to bowhead whales, and ringed and bearded seals.

The potential effects of vessels associated with delivering materials to the MTI or ferrying goods to shore are captured in Section 6.2.7. Trash and debris that will be created from construction activities is discussed in Section 6.2.8.

6.2.6 Ice Road, Trail, and Pad Construction, Use, and Maintenance

The construction, use, and maintenance of ice roads, trails, and pads would occur in winter and early spring (December to April) over grounded ice. Ice road, trail, and pad use and maintenance would continue into the spring, until the weather warms and the ice structures are no longer safe to use (e.g., May, June). Ice roads and trails would be 3.6 meters (12 feet) wide. BLM estimates that 50 miles (80.5 kilometers) of ice roads and trails would be constructed annually, with approximately 3,500 miles (5,633 kilometers) constructed over the duration of the proposed action (BLM 2020c). Ice roads and trails would be used for access to the MTI and barge landing sites, and to other sites for authorized purposes where access is needed.

Bowhead whales occur in the Beaufort Sea near the action area. Bowhead whales spend the winter months near the southern edge of the pack ice and move north as the sea ice recedes and breaks up. Since the ice road, trail, and pad activities will take place in the ice-covered months when bowhead whales are not likely to be present, we consider exposure (and therefore any effects) to be extremely unlikely.

The ice road and trail activities will take place over land and in waters on grounded ice (typically up to 12 meters deep (39 feet)). Bearded seals preferentially occupy areas of moving ice and open water in depths of up to 200 meters (656 feet) (Burns and Harbo 1972). Because bearded seals occur in deeper water and on different types of ice than where the action will take place, we consider exposure (and therefore any effects) to this species from ice road, trail, and pads activities to be extremely unlikely.

In winter, ringed seals use the nearshore environment, in waters 10 to 35 meters deep (Williams et al. 2006); in summer, they forage along the ice edge. Ringed seal densities are highest in areas with greater than 80 percent ice cover, in depths of 5 to 35 meters, with some ringed seals inhabiting shallower areas (less than 3 meters deep) (Frost et al. 2004).

Since the proposed action would take place in winter and through as late as June in the nearshore environment, we expect that ringed seals could be exposed to ice road, trail, and pad construction, use, and maintenance.

6.2.6.1 Acoustic Disturbance from Ice Road, Trail, and Pad Construction, Use, and Maintenance

Under its Integrated Activity Plan, BLM could authorize ice road, trail, and pad construction, use, and maintenance activities, which can expose ringed seals to sound that can result in acoustic disturbances.

For the proposed action, the principal noise producing activities would be from the ice augering, pumping sea water to flood the ice and build the road, snow plowing equipment, and the use of equipment to cut the ice. We would consider these noise sources to be continuous (i.e., non-impulsive), and thus for ringed seals, the onset acoustic threshold for behavioral disturbance would be 120 dB re $1\mu Pa_{rms}$ (NMFS 2018b).

The in-air sound pressure levels from broadband sound that cause Level B behavioral disturbance for non-harbor seal pinnipeds is 100 dB re $20\mu Pa_{rms}$. The sound source pressure levels at 100m for airborne noise for activities associated with ice road construction are: 64.7 dB re $20\mu Pa_{rms}$ for bulldozers, 67.9 dB re $20\mu Pa_{rms}$ for augers, and 72 dB re $20\mu Pa_{rms}$ for water pumps (Greene et al. 2008). Trucks on the ice road create in-air sound levels of 74.8 dB re $20\mu Pa_{rms}$ (at 100 m).

As a result of exposure to noise causing Level B behavioral disturbance, we expect that ringed seals could experience threshold shifts, auditory interference (masking), behavioral responses, and physical or physiological effects (e.g., stress response). The likelihood of these effects occurring is reduced by BLM's adoption of the mitigation measures (see Section 2.2). These measures, which include seasonal restrictions and exclusion zone distances, would minimize the degree of exposure of ringed seals to acoustic disturbance.

6.2.6.2 Direct Injury and Mortality

In addition to acoustic and physical harassment, ringed seals may be injured or killed by the use of on-ice equipment associated with ice roads, ice trails, and ice pads.

Since 1998, there have been three documented incidents of ringed seal takes from oil and gas activities on the North Slope, with one recorded mortality (see discussion in vibroseis section 6.2.2). The likelihood of direct injury and mortality can be minimized with BLM's adoption of the mitigation measures (see Section 2.2).

Ice road, trail, and pad construction would occur from approximately December 1 to mid-February; operations and maintenance would generally occur from mid-February through mid- to late May. Ringed seals begin to establish lairs in late March. Prior to establishing lairs, ringed seals are mobile and are expected to generally avoid the ice roads/trails and construction activities. Therefore, ice road, trail, and pad construction will be initiated no later than March 1 to reduce the potential for disturbance to ringed seal birth lairs or dens.[23]

After March 1, and continuing until decommissioning of ice roads/trails, the on-ice activities can occur anywhere on sea ice where water/ice depth is less than 10 feet (3 meters) at MLLW (i.e., where habitat is not suitable for ringed seal lairs). However, if the water and ice is greater than 10 feet (3 meters) in depth at MLLW, these activities will only occur within the boundaries of the driving lane or shoulder area of the ice road or trail.

6.2.6.3 Visual Disturbance due to Ice Road Vehicles and Project Activities

In addition to the stressors associated with acoustic disturbance from ice road, trail, and pad construction, use, and maintenance, ringed seals could be exposed to stressors caused by visual disturbance from vehicles and project activities.

Visual disturbance could occur during all vehicle and project activities. A ringed seal could react to project activities by being startled by vehicles. Disturbance from project activities or vehicles could temporarily increase stress levels or displace an animal from its habitat. Vehicle traffic would occur on the ice roads and trails regularly from the time the roads and trails are built until the time when it is unsafe to use them. Vehicles and personnel would also use ice pads (e.g., for parking). Project activities would include use of the construction equipment for making the ice roads, trails, and pads.

We expect some visual disturbance to occur while ringed seals remain on the ice, for example, while they are molting from late spring to early summer. Ringed seals also use the ice as a haul-out platform at other times during the year (e.g., for resting), and could experience visual disturbance then as well.

To minimize the risk of takes of ringed seals from on-ice activities, BLM should adopt the mitigation measures outlined in section 2.2.2.1. Mitigation measures ensuring that winter activities on the sea ice would begin as early as practical, and prior to March 1 of each year before female ringed seals have established their birth lairs, would limit the amount of visual disturbance. For activities after March 1, the implementation of mitigation measures like the use

[23] Ice trails may be constructed after March 1st in order to address human safety concerns. In that scenario, ice trails must be constructed in daylight hours with good visibility, following avoidance measures outlined in Section 2.2.2.1, BMPs Implemented after March 1st.

of dedicated observers and notification and avoidance protocols would further reduce the impacts to ringed seals from visual disturbance.

Research from Northstar reported that ringed seals exposed to disturbance due to vehicle or human presence maintained breathing holes and lairs for up to 163 days despite the presence of vehicular use of ice roads (Williams et al. 2006). These structures were established within a few meters of the Northstar Development in the landfast ice before and during construction activities.

Given that there was no significant difference in the presence of seals before and after the development of the Northstar Island and given the implementation of the above mitigation measures by BLM for their activities, we expect that only a small number of adult ringed seals and pups are likely to be affected or displaced by visual disturbance due to ice road, ice trail, and ice pad construction and maintenance in association with the proposed action.

6.2.6.4 Habitat Alteration from Ice Road, Trail, and Pad Construction

The proposed action will include the construction, use, and maintenance of ice roads, trails, and pads on the North Slope. The proposed action will alter habitat for ESA-listed ringed seals, amounting to approximately 80.5 km (50 miles) of ice roads and trails annually, amounting to 5,633 km (3,500 miles) of ice roads and trails over the duration of the action. Ringed seals could be affected by the habitat alterations from these activities.

Ringed seals are regularly documented in the coastal portions of the action area. However, the amount of habitat that would be affected by the construction of the ice roads, trails, and pads is extremely small compared to the amount of similar habitat available on the North Slope and the Beaufort and Chukchi seas. Furthermore, not all of the coastal areas within the action area overlap with optimal ringed seal habitat, as much of the coastal area is too shallow and gradually-sloped to be optimal ringed seal feeding habitat. The overall impact of habitat alteration is expected to be extremely minor.

6.2.7 Unauthorized Discharge

Various types of discharges are authorized under applicable laws, and some of those discharges may affect listed species. The effects of any such activities that require ESA section 7 consultation would be assessed in those consultations and are not evaluated in this opinion. This section will thus focus on the probability of an unauthorized discharge of oil and gas associated with the proposed IAP, and the potential impacts associated with exposure of ESA-listed marine mammals under NMFS's authority to small, medium, large, and very large oil spill (VLOS) events during exploration and production activities pursuant to the IAP.

No oil and gas exploration or production activities will occur as part of this proposed action in the Bering Sea. A portion of the Bering Sea is included in the action area due to transit of marine vessels associated with exploration. However, the effects to listed species from oil spills in the Bering Sea due to this transiting activity are extremely unlikely due to the small number of vessels and low risk of spills during offshore travel in established navigation routes. The transit route is well offshore and we expect that any accidental spills will be relatively minor and quickly dispersed, therefore oil spills in the Bering Sea will not be discussed further in this analysis. This analysis will focus on the risk of spills in the NPR-A and adjacent nearshore areas of the Beaufort and Chukchi seas. Blue whales, sperm whales, North Pacific right whales and Steller sea lions are expected to be present primarily in the Bering Sea, south of the NPR-A and adjacent nearshore areas, and thus, unlikely to be exposed. The analysis focuses on species most likely to be in that area in the NPR-A and the adjacent nearshore areas of the Beaufort and Chukchi seas (bowhead, humpback, and fin whales, and ringed and bearded seals.

There is no designated critical habitat for ESA-listed marine mammals under NMFS's jurisdiction in the Beaufort and Chukchi seas. We do not anticipate toxic components of oil spills in the Beaufort and Chukchi seas extending south into the Bering Sea where critical habitat is designated. For this reason, we will not be discussing critical habitat any further in the oil spill risk and effects sections.

6.2.7.1 Spill Risk and Effects

Oil and gas spills are an anticipated stressor resulting from the proposed action. Unlike other potential stressors in this opinion, harm and harassment to ESA-listed marine mammals due to oil and gas spills is not authorized and associated take of listed species will not be included in incidental take statements resulting from future site-specific consultations. However, the potential effects from this stressor will be analyzed to determine if the anticipated impacts are likely to jeopardize ESA-listed species.

Oil spills as a result of activities conducted as part of the proposed IAP could occur from pipelines, storage tanks, exploration and production activities and facilities, drilling rigs (well-control incidents), airstrips, roads, vessels, and bridges. Hydrocarbon spills may include crude oil and refined hydrocarbons such as fuel/diesel, motor oil, and hydraulic fluid. Examples of material spilled at North Slope production sites in recent years include drilling mud, corrosion inhibitor, sewage, methanol, motor oil, diesel fuel, hydraulic fluid, lube oil, propylene glycol, and crude oil (BLM 2020c). The primary characteristics of these spills that will determine effects on ESA-listed species under NMFS's jurisdiction are size/volume and location, particularly whether the spill occurs in or near the marine environment, or in an inland location.

Additionally, oil and gas spill response activities have the potential to harm and harass ESA-listed species, however, most spill response activities and tactics have been previously consulted on by NMFS and are covered in the 2015 Programmatic Biological Opinion of the Alaska Federal/State Preparedness Plan for Response to Oil & Hazardous Substance Discharges/Releases (Unified Plan). Spill response tactics were evaluated in this consultation and the incidental take statement in the 2015 Unified Plan opinion applies to actions funded, authorized, or conducted by the USCG or EPA in Alaska. Therefore, response activities will not be discussed further in this opinion. The USCG generally has oversight of spill responses that impact the marine environment, and the EPA generally has oversight for inland or upland spills.

Risk of Spills

The Biological Assessment for the NPR-A IAP (BLM 2020c) provides an estimate of the anticipated number of oil spills resulting from the proposed action. BLM confirmed in follow-up emails that up to 70 years of production is anticipated, for a total plan length of 85 years. ABR, Inc. analyzed data from the Alaska Department of Environmental Conservation spills database for spills of all substances that occurred as a result of oil and gas operations (development and support) in the North Slope region between January 1, 2000, and December 31, 2018. Based on the ADEC data, including the amount of oil and gas produced during that 19 year time span, the proposed action, and the anticipated amount of crude oil that will be produced under the proposed IAP, BLM estimates that 342 small crude oil spills, 1,487 refined oil spills, 7 medium crude oil spills, 4 medium refined oil spills, 1 large crude oil spill, and 0 large refined oil spills will occur (Table 16). BLM defines small spills as 0-2,100 gallons (0-50 bbl), medium spills as 2,101-36,036 gallons (50-858 bbl), and large spills as greater than 36,036 gallons (BLM 2020c).

Table 16. Number of oil spills projected to occur in the NPR-A over the 85-year IAP based on ABR, Inc., analysis of ADEC spills database (spills of all substances that occurred as a result of oil and gas operations [development and support] in the North Slope Region between Jan. 1, 2000 and Dec. 31, 2018) *(BLM 2020c)*.

Spill size	Small	Medium	Large
	(0–2,100 gallons)	(2,101–36,036 gallons)	(>36,036 gallons)
Substance			
Crude oil	342	7	1
Refined oil	1,487	4	0

Based on NMFS's analysis of 1) BLM's oil spill risk assessment (BLM 2020c), 2) the ADEC spills database, 3) BOEM oil spill statistics, and 4) NOAA's Assessment of Marine Oil Spill Risk and Environmental Vulnerability for the State of Alaska (NOAA 2014), NMFS found no significant differences from the BLM projections for number of small and medium crude and refined oil spills for the proposed IAP (Table 17).

During the 19 years from 2000-2018, one large crude oil spill occurred, spilling an estimated 212,252 gallons in the North Slope region in 2006 as result of structural deficiency in a pipeline (i.e., corrosion) (BLM 2020c). During this same time period, a total of approximately 4.95 billion bbl of oil was produced and sent through the TAPS (BLM 2020c), averaging 260,461,683 bbl per year. The 2020 NPR-A IAP proposes that up to 500,000 bbl of crude oil will be produced per day during peak production under this IAP (i.e., 182.5 million bbl per year). Production is proposed to occur for 10-70 years according to the BA (BLM 2020c) and follow up emails between NMFS and BLM. Seventy years of peak production would result in 12.78 billion bbl of produced crude oil, over double the amount of crude sent through TAPS from 2000-2018. However, Appendix B of EIS for the proposed action states that peak production will begin in approximately the next 20 years, after which production is expected to decline at a rate of approximately 8 percent per year (BLM 2020c). Total lifetime production under this scenario is expected to be approximately 2.64 billion bbl. BLM confirmed via email that anticipated total crude oil volume produced under this IAP will not exceed 2.64 billion bbl. Based on a total production value of 2.64 billion bbl over a 70 year period, the ADEC 2000-2018 North Slope spill database, and the ABR and NMFS analyses, one large crude spill is anticipated to occur (Table 17).

Although a large refined oil spill (e.g., diesel spill) did not occur in the North Slope region in conjunction with oil and gas development activities between 2000-2018, it certainly can't be ruled out as a result of the proposed IAP activities, which will significantly increase the development footprint in this region. BLM confirmed via email that tugboats used for local (North Slope) ship-assist work would have fuel capacity of 10,000 to 30,000 gallons of diesel fuel, and tugboats involved in the sealift operations from Dutch Harbor would have capacity of up to 100,000 gallons. Additionally, NPR-A oil and gas developers operating under this IAP will rely on commercial fuel suppliers at existing port facilities on the North Slope to power significant components of their development actions. Refined fuel (i.e., diesel) is currently barged into existing North Slope ports and fuel barging and storage capacity has greatly increased in the past few years. The barges will certainly have fuel capacity greater than 100,000 gallons. Without knowing exactly which barges will be used for activities described by the IAP, we will assume a maximum capacity of 517,800 gallons, the maximum capacity of Crowley Fuels Alaska barges that are currently used in that region. Crowley Fuels Alaska is a common fuel delivery service throughout coastal Alaska and it is reasonable to assume that similar barges would be used for activities under the NPR-A IAP. BLM acknowledges in the BA that it is possible that a medium to large refined oil spill could occur along existing waterways leading to the barge transfer site (BLM 2020c). Based on our analysis, in addition to the small and medium spills listed in Table 16, we anticipate that one large diesel/refined oil spill will occur as a result of activities conducted under the IAP (Table 17).

Table 17. Number of crude and refined oil spills anticipated to occur as a result of activities conducted under the NPR-A IAP and analyzed in this opinion for potential effects to ESA-listed species and critical habitat under NMFS's jurisdiction.

	Spill size			
Substance	**Small (0 - 2,100 gal)**	**Medium (2,101 - 36,036 gal)**	**Large (36,036 - 6,300,000 gal)**	**Very Large (> 6,300,000 gal)**
Crude oil	342	7	1	0
Refined oil	1,487	4	1	0

It is highly unlikely but cannot be entirely dismissed that a VLOS could occur from a well control incident followed by a long duration flow during exploratory drilling, or during drilling for production. A VLOS is extremely unlikely to occur based on the frequency of past events. Historical data show that loss of well control events resulting in oil spills are infrequent and that those resulting in very large accidental oil spills are even rarer (Anderson and LaBelle 2000; Anderson et al. 2012; ABSG Consulting 2018). As the 2010 Deepwater Horizon (DWH) well blowout event illustrates, there is a risk for very large oil spills to occur and affect listed species.

The DWH well blowout falls within the category of VLOS, which is defined as spills greater than 150,000 bbl (6.3 million gallons), and is considered a low-probability, high-impact event. Prior to the DWH event, the three largest well blowout spills on the OCS were 80,000 bbl, 65,000 bbl, and 53,000 bbl, and all occurred before 1971 (Anderson et al. 2012). From 1964 to 2010 there were 283 OCS well control incidents, 61 of which resulted in crude or condensate spills (drilling mud or gas releases not included) (BOEM 2012). Excluding the DWH event, less than 2,000 bbl in crude or condensate were spilled from fewer than 50 well control incidents from 1971-2010. During the same time period, more than 41,800 wells were drilled on the OCS and almost 16 billion bbl of oil produced (BOEM 2012). In other words, a spill of this volume is highly unlikely to occur, but if one did occur, the impacts would be substantial. VLOS effects are analyzed separately from large oil spills, as they are not reasonably certain to occur.

Although the source point of most of the crude oil spills anticipated to occur as a result of the proposed IAP will be in lagoons or the terrestrial portion of NPR-A at some distance from the marine environment, it is not clear what proportion of the toxic components of spilled oil will travel through the freshwater environment to the ocean. Much of the NPR-A is comprised of wetlands and ponds, and is innervated by rivers and streams of various sizes (Figure 19). Contaminants and toxic components of oil can be transported in rivers and through terrestrial environments via sheet flow, surface water flow, and groundwater (Duffy et al. 1980; EPA 1999; Korotenko et al. 2004; Muller 2005). Without site-specific information about spill source locations and other environmental covariates, it is not possible to model the trajectory or weathering of the spilled oil to determine its fate.

Some mitigation measures have been put in place to reduce the likelihood or amount of spilled oil from entering rivers or lakes. Lease Stipulation K-1 prohibits pipelines from being adjacent to rivers, and Lease Stipulation K-2 prohibits pipelines from being near lakes. However, essential pipeline crossings of these areas may be allowed (BLM 2020c). Lease Stipulation K-3 prohibits exploratory drilling in rivers, streams, lakes, and riparian habitat. Without knowing distances that will be applied to these Lease Stipulations, and without knowing whether BLM will grant an exception to the lease stipulations, and knowing that pipelines fail and exploratory drilling can result in uncontrolled well blowouts (e.g., DWH event), NMFS anticipates that spills can and will enter freshwater leading to the marine environment. For this reason and reasons described above, we will assume that these spills will impact the marine environment and potentially overlap in time and space with ESA-listed species under NMFS's jurisdiction.

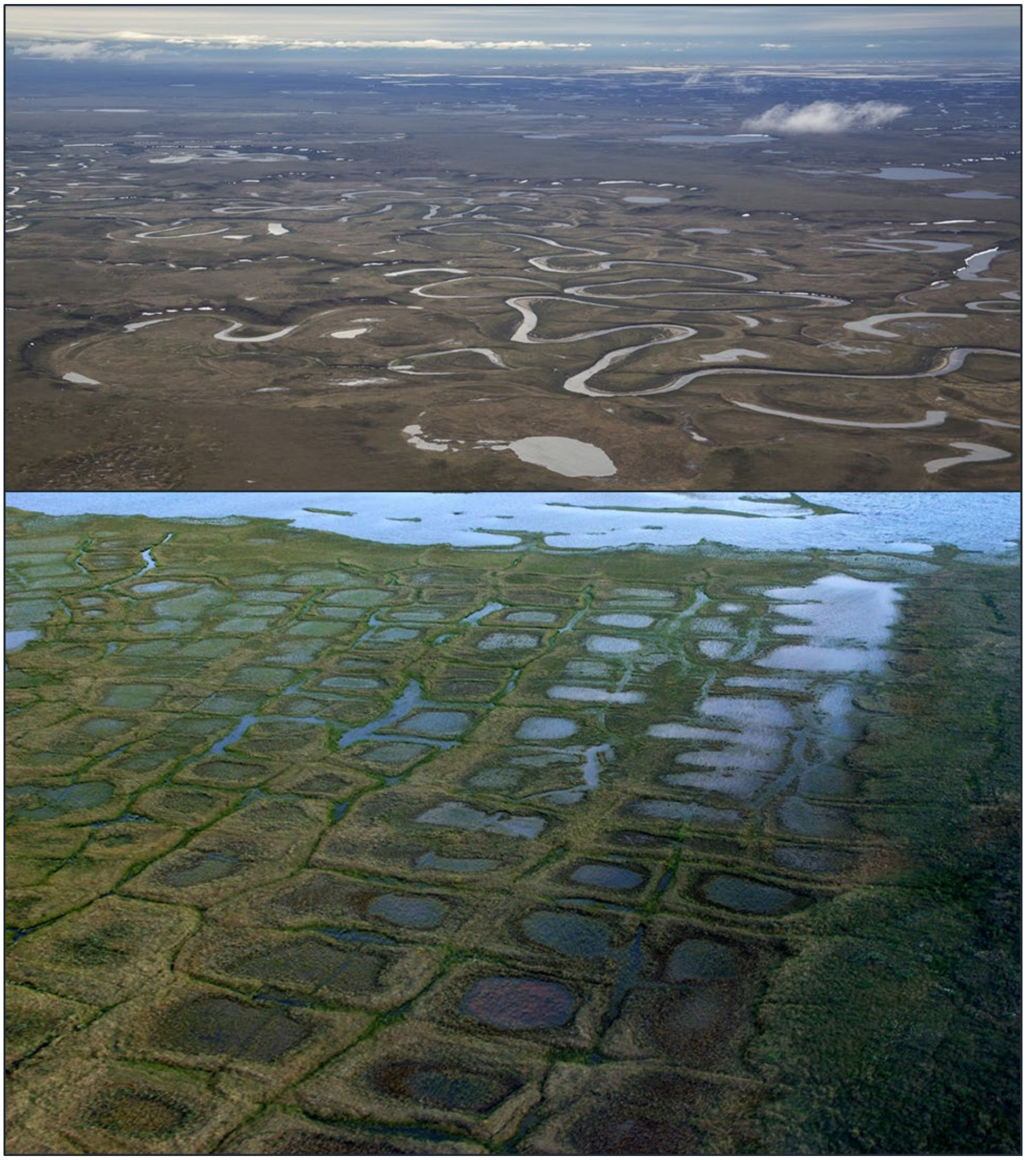

Figure 19. Aerial images of rivers and ponds in the NPR-A. Top image: https://www.blm.gov/programs/energy-and-minerals/oil-and-gas/about/alaska/NPR-A. Bottom image: https://www.usgs.gov/media/images/permafrost-national-petroleum-reserve-alaska. Images collected from websites on November 13, 2020.

If a greater spill frequency in any category is observed in actions taken under the IAP, ESA section 7 consultation may need to be reinitiated to ensure that accurate potential impacts have been considered.

Behavior and Fate of Crude Oil

Although most of the spills associated with the proposed IAP are anticipated to occur some distance inland, a proportion of the exploration, production, and transport of oil will occur in or near coastal lagoons or other water bodies that ultimately travel to the Beaufort and Chukchi seas. Additionally, sheeting of water through the vast wetlands of NPR-A could transport significant volumes and components of crude oil to the marine environment. For these reasons, we evaluated the behavior and fate of crude oil in water, where it is most likely to impact ESA-listed marine mammals under NMFS's jurisdiction.

Effects of oil are based on its chemical composition. Likewise, the composition of crude oil determines its behavior in the marine environment (Geraci and St. Aubin 1990). Weathering (spreading, evaporating, dispersing, emulsifying, degrading, oxidizing, dissolution: Figure 20) and aging processes can alter the chemical and physical characteristics of crude oil. The environment in which a spill occurs, such as the water surface or subsurface, spring ice overflow, summer open-water, winter under ice, winter on ice, or winter broken ice, will affect how the spill behaves. In ice-covered waters many of the same weathering processes occur, however, the sea ice and cold temperatures change the rates and relative importance of these processes (Payne et al. 1991; NRC 2014).

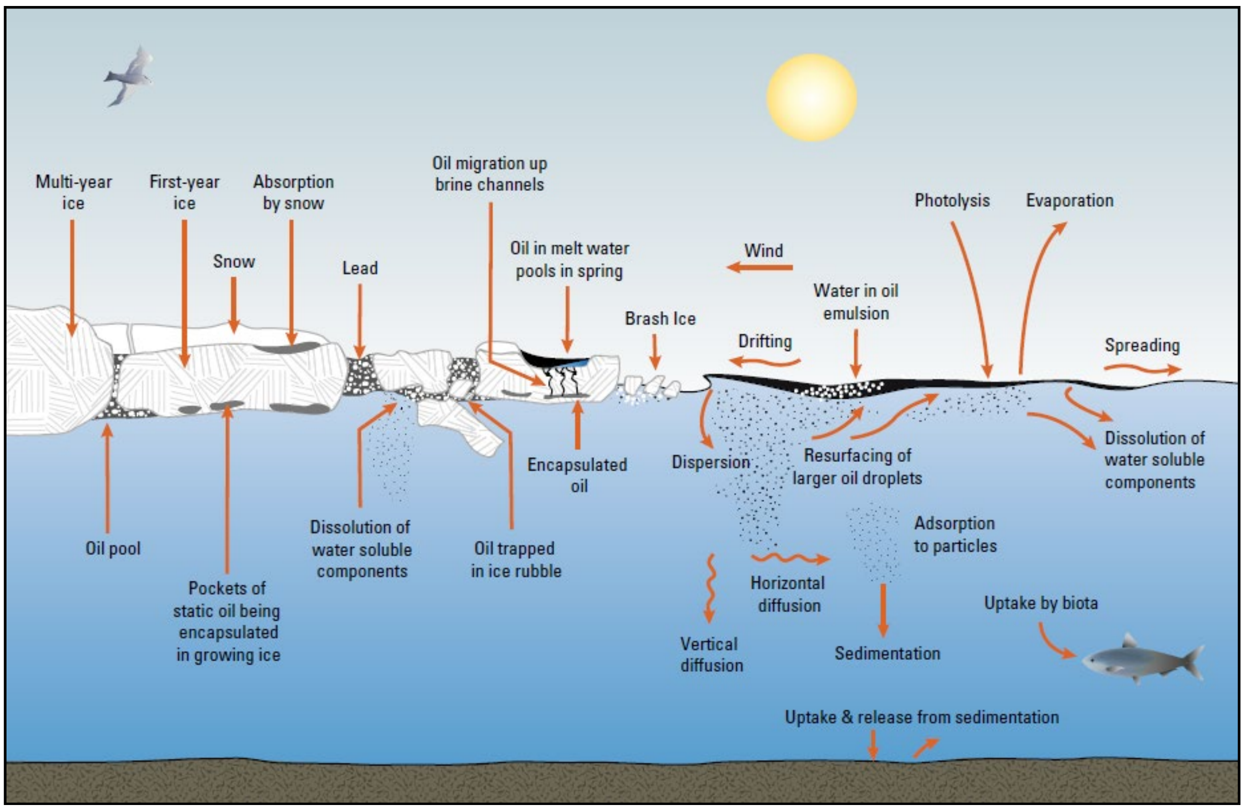

Figure 20. Diagram of some of the weathering processes that will occur to spilled oil in the marine Arctic environment (NRC 2014).

Oil entering the water at or near the surface will immediately begin to spread, or drift, horizontally in an elongated shape driven by wind and surface water currents (Elliott et al. 1986). If entering below the water, oil will travel through the water column before it forms an oil slick at the surface. The rate of spreading is positively associated with increased temperature and wave action (Geraci and St. Aubin 1990). Oil spills in the cooler waters of the Arctic are expected to spread less and remain thicker than in temperate waters due to increased viscosity of oil in colder temperatures (NRC 2014). The leading edge of the slick is typically thicker than the interior (Fannelop and Waldman 1972). The thicker oil tends to form patches that move downwind faster than the thinner part of the slick, eventually leaving it behind (Geraci and St. Aubin 1990).

In increasing ice conditions, spilled oil would be bound up in the ice, pumped to the surface by wind/wave action, or encapsulated in pack ice (Figure 20). In late spring or summer, the unweathered oil would melt out of the ice at different rates, depending on whether it was encapsulated in multiyear or first-year ice, and when the oil was frozen into the ice. In approximately mid-July based on current conditions (or potentially earlier in coming decades as the climate warms), the oil pools on first-year ice would drain into the water among the floes of the opening pack ice. Oil could be pooled on first-year ice (Figure 20) for up to 30 days before being discharged back into marine waters.

In the first few days following a spill, evaporation is the most significant weathering process affecting the volume and chemical composition of oil that may be accessible to listed species (Geraci and St. Aubin 1990) (Figure 21), the rate of which is highly dependent on wind speed, and, particularly during the first few days following the spill, on temperature (Yang and Wang 1977). The lighter, more volatile hydrocarbons evaporate most quickly, increasing the density and viscosity, and decreasing the toxicity and vapors of the oil (Mackay 1985). About 30-40% of spilled crude consists of volatile hydrocarbons that evaporate, with approximately 25% of the evaporation occurring in the first 24 hours (Fingas et al. 1979; NRC 1985). Initial evaporation rate increases with increased wind speed, temperature, and sea state. Evaporation rates decrease when oil spills in broken ice conditions, and stops altogether if the oil is under or encapsulated in ice (Payne et al. 1987; Payne et al. 1991). In the spring, oil that has been trapped in ice will be released to the surface and evaporation will occur.

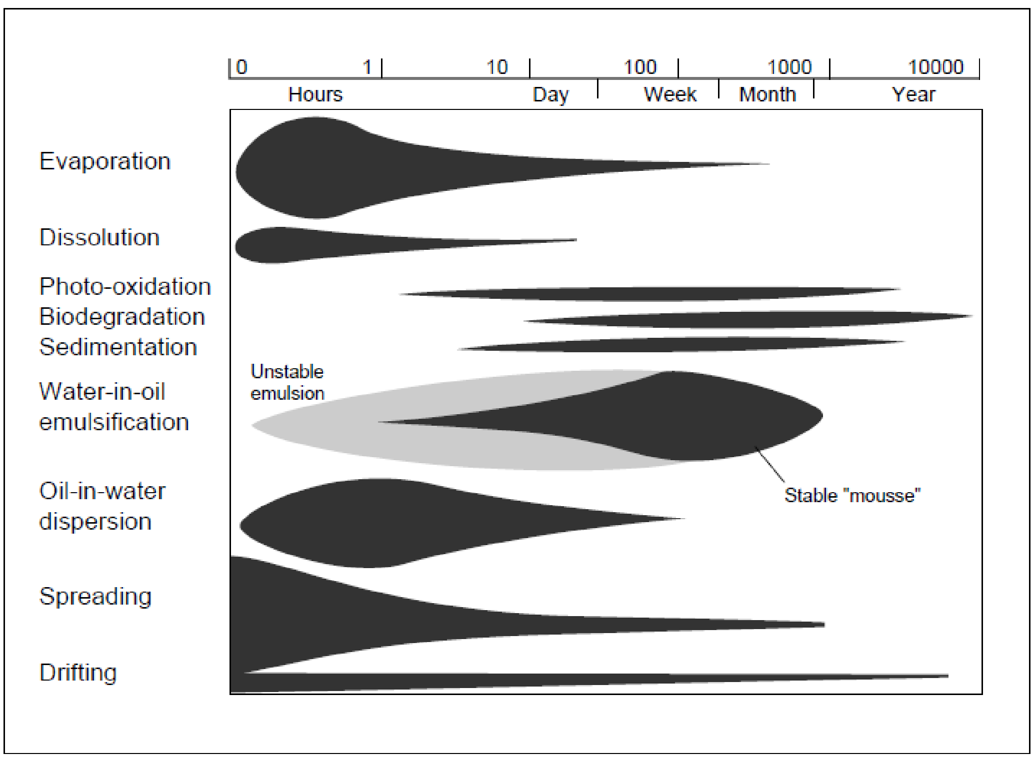

Figure 21. Schematic showing the relative importance of weathering processes of an oil slick over time (SINTEF 2010). The width of the line shows the relative magnitude of the process in relation to the other weathering processes.

Approximately 2-5% of spilled crude oil is dissolved into the water column (Payne et al. 1987). Although this appears to be a small proportion of the crude oil, this dissolution process is significant because it brings the most toxic hydrocarbons into contact with marine organisms in a form that is biologically available to them (Geraci and St. Aubin 1990). Dissolved hydrocarbon components appear to be transported through brine channels in first-year ice (Faksness and Brandvik 2008). Field studies showed that high air temperature led to more porous ice, thereby allowing the dissolved water-soluble components to rapidly leak out, but under cold air temperatures and less porous ice, the water-soluble components were released more slowly and had potentially toxic concentrations (Faksness and Brandvik 2008).

Dispersion is the most significant weathering process in the breakdown of an oil slick already reduced by evaporation (Geraci and St. Aubin 1990), and results in the transport of small oil particles into the water column (NRC 1985). Increased wave action and water turbulence are directly associated with an increased rate of dispersion (Mackay 1985). Small oil droplets break away from the main oil slick and become dispersed in the water column. If the droplets become smaller than 0.1 mm in size they rise so slowly as to remain indefinitely dispersed (Payne and McNabb 1985). More viscous and/or weathered crude oil may adhere to porous ice floes, concentrating oil within areas of broken ice and limiting oil dispersion. However, the presence of a small amount of ice is thought to promote dispersion (Payne et al. 1987).

After weathering, some oils will accumulate and retain water droplets within the oil phase. This process is called emulsification, and the emulsified oil is typically referred to as ‘mousse’ (Mackay 1985). Mousse can form more quickly under certain conditions; with sufficient gas, turbulence, and precursors in the oils, oil spilled subsurface can form mousse by the time it reaches the surface (Payne 1982). The formation of mousse slows the subsequent weathering of oil by inhibiting evaporation, dissolution, and degradation (Geraci and St. Aubin 1990). The presence of ice and turbulence increases emulsification (Payne et al. 1987).

Most oil droplets suspended in the water column will eventually be degraded by bacteria in the water column, or deposited to the seafloor. This deposition, or sedimentation, depends on many factors; suspended load in the water column, water depth, turbulence, oil density, and processing by zooplankton. Weathered oil can become heavier than seawater and sink (Boehm 1987). This process is enhanced when the density of water is lowered by input of fresh water from runoff or melting ice. In areas of significant down-welling (e.g., in a polynya or at the edge of an ice sheet) sinking water may carry oil droplets to the ocean bottom (Geraci and St. Aubin 1990).

Biodegradation, or natural degradation by marine fungi and bacteria (microbial organisms), begins 1-2 days following a spill and continues as long as hydrocarbons remain in the water and sediments (Lee and Ryan 1983). All components of hydrocarbons spilled into the marine environment are degraded by microbial organisms in the water and sediments simultaneously, but at very different rates (Atlas et al. 1981; Bartha and Atlas 1987). The rate of biodegradation is influenced by oxygen concentration, temperature, nutrients (especially nitrogen and phosphorous), salinity, physical state and chemical composition of the oil, and history of previous oil spills at the site (Atlas 1981; Bartha and Atlas 1987). Biodegradation is a very slow process. In Arctic environments, degradation by microbial organisms is slowed even further by a lack of nutrients (Atlas 1986) and low temperatures (Cundell and Traxler 1973).

Solar radiation acting on oil on the water results in photo-oxidation, or photolysis, of hydrocarbons (Figure 20). The molecular compounds in oil vary in their sensitivities to photolysis and are subject to photolysis at different rates. In general, photolysis decreases with decreasing water depths as light intensity decreases. In addition, photolysis is slower at higher latitudes where and when there is less sunlight, especially during the winter (Geraci and St. Aubin 1990). At 60° N latitude, there is approximately a tenfold decrease in the photolysis rate of benzo(a)pyrene between June and December (Zepp and Baughman 1978).

Persistence of oil from a spill in the marine environment can vary depending on the size of the spill, the environmental conditions at the time of the spill, the substrate of the shoreline, and whether the shoreline is eroding. Oil weathering models conducted by BOEM estimate that approximately 30% of oil from a slick would remain from a 60,000 bbl per day summer spill after 30 days, and 48% would remain from a winter (melt-out) spill after 30 days (BOEM 2014). These estimates assume that wind speeds remain consistent at approximately 4 m/s (BOEM 2014). At higher wind speeds, the oil slick would be dispersed and evaporate more quickly. Consequently, at least half of the oil in any of the leads or polynyas would quickly weathered out of the slick (BOEM 2015).

Effects of Oil on Listed Species

The severity of exposure and effects that result from oil and gas spills depends on a number of factors, including:

- size of a spill (flow rate and duration)
- type of oil (crude vs. refined)
- location (marine, freshwater, inland)
- time of year
- species, life history, migratory stage, age class
- manner of exposure (external only or inhalation, ingestion, or aspiration)

Potential Effects

Studies have shown that while marine mammals may show irritation, annoyance, or distress from oil, for the most part, an animal's need to remain in an area for food, shelter, or other biological requirements can override any avoidance behaviors to oil (Vos et al. 2003). Animals can be affected outside of a main spill area through oil transported by currents and oiled prey (Figure 4). The exposure to oil needs to be in sufficient quantity to produce adverse effects from either external oiling, internal absorption from ingestion of oil and prey, aspiration of oil, inhalation of volatile vapors in the air, and/or a combination of the above.

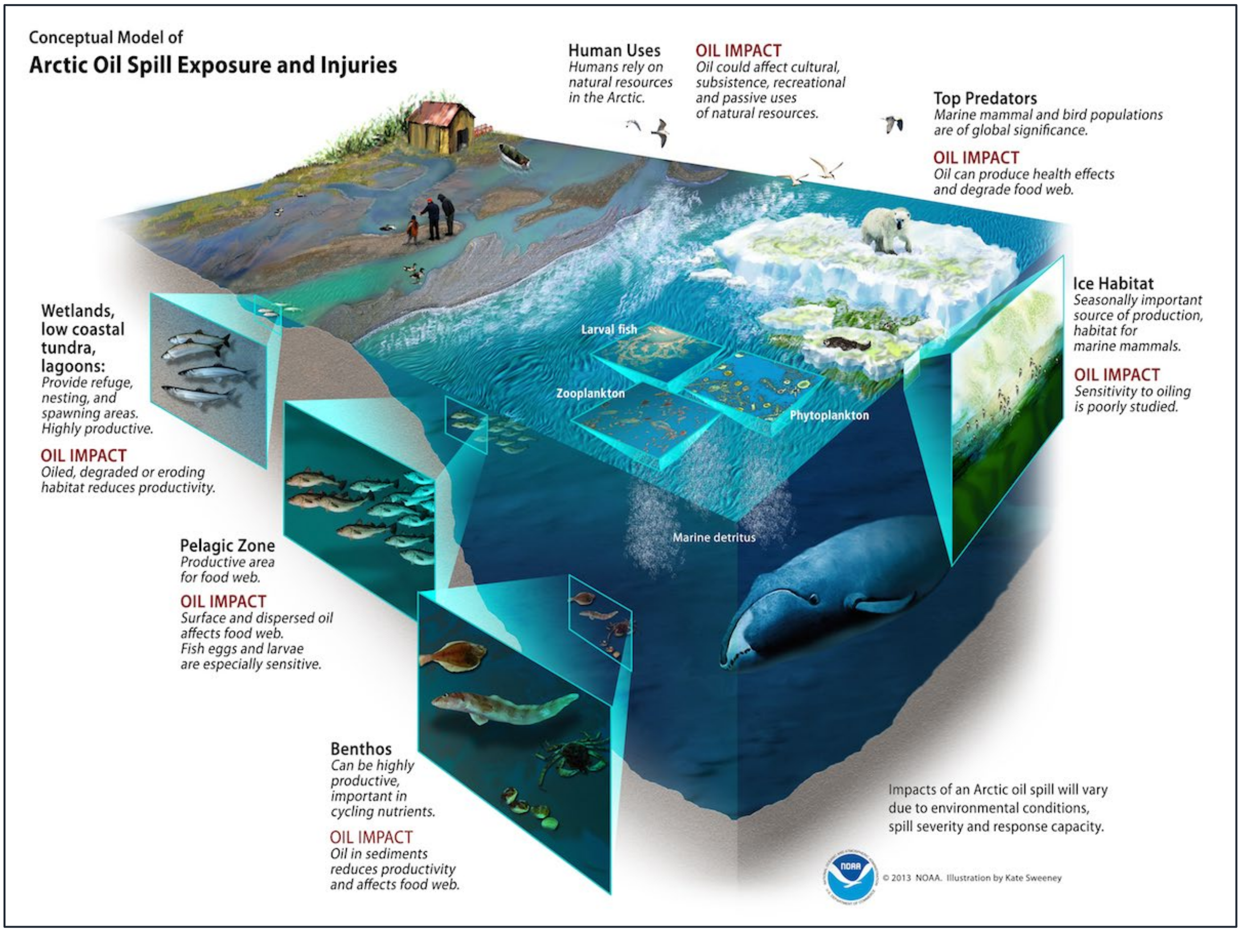

Figure 22. Conceptual model of the various pathways by which marine mammals and their prey can be exposed to spilled oil in the Arctic.

Inhalation of petroleum-derived chemicals is of primary concern for impacts to marine mammals, and can have acute or chronic effects. Cetaceans exchange 80-90% of their lung volume when breathing (relative to 10-20% for humans) and have significantly more blood supply in their lungs, increasing the absorption of toxicants (Takeshita et al. 2017). Aspiration of oil droplets directly into the lungs can occur when marine mammals incidentally draw seawater (and associated oil) into their lungs (Takeshita et al. 2017). Aspiration can directly injure the respiratory tract and lead to absorption of toxicants into the blood (pulmonary and arterial circulation) (Figure 23). Inhalation and aspiration of volatiles, aerosols, and droplets of spilled oil at the air-water interface can negatively impact lung function, lead to lung disease and death, compromise the immune system and body condition, and negatively impact adrenal function, reproduction, and liver function (Takeshita et al. 2017) (Figure 24).

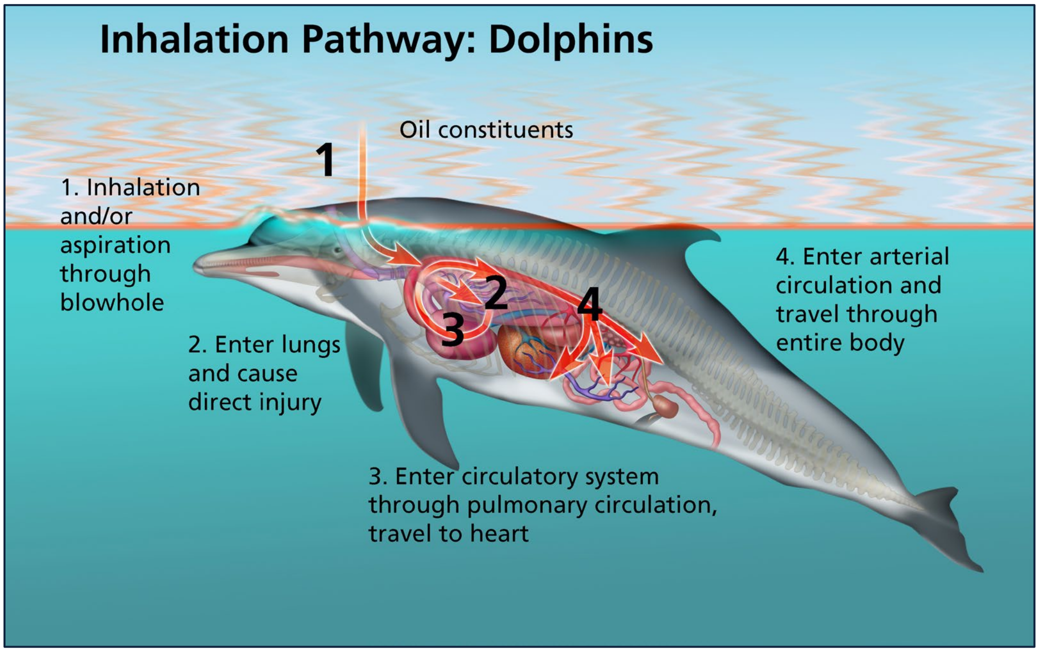

Figure 23. Diagram showing respiratory pathways for inhalation and aspiration of oil chemical components through a marine mammal's body. Illustration by Katie Sweeney, NOAA (NRDA 2016; Takeshita et al. 2017). Although dolphins are not present in the action area, this figure represents the inhalation pathway for all cetaceans. Pinniped respiratory pathways are similar, but breathing occurs through the mouth instead of a blowhole. Image used with permission.

Potential effects of dermal exposure include localized injury and wounds to the skin and eyes, and toxic effects to tissue underlying any lesions or abrasions in the skin (Hansbrough et al. 1985; Takeshita et al. 2017). Pinnipeds, particularly seal pups and fur seals, may be subject to compromised thermoregulation capabilities and ingestion of oil when maintaining their pelage (Geraci and St. Aubin 1990). Ingestion of oil directly or indirectly (consuming oiled prey) is an exposure pathway for all marine mammals (Figure 25). Ingestion of oil can cause lung or GI tract injury and can lead to vomiting, which can lead to aspiration of oil droplets. Adsorption of the toxic components of ingested oil can compromise the immune system of exposed marine mammals, decrease individual fitness and body condition, compromise adrenal function, and negatively impact reproduction and liver function (Takeshita et al. 2017) (Figure 24, Figure 25).

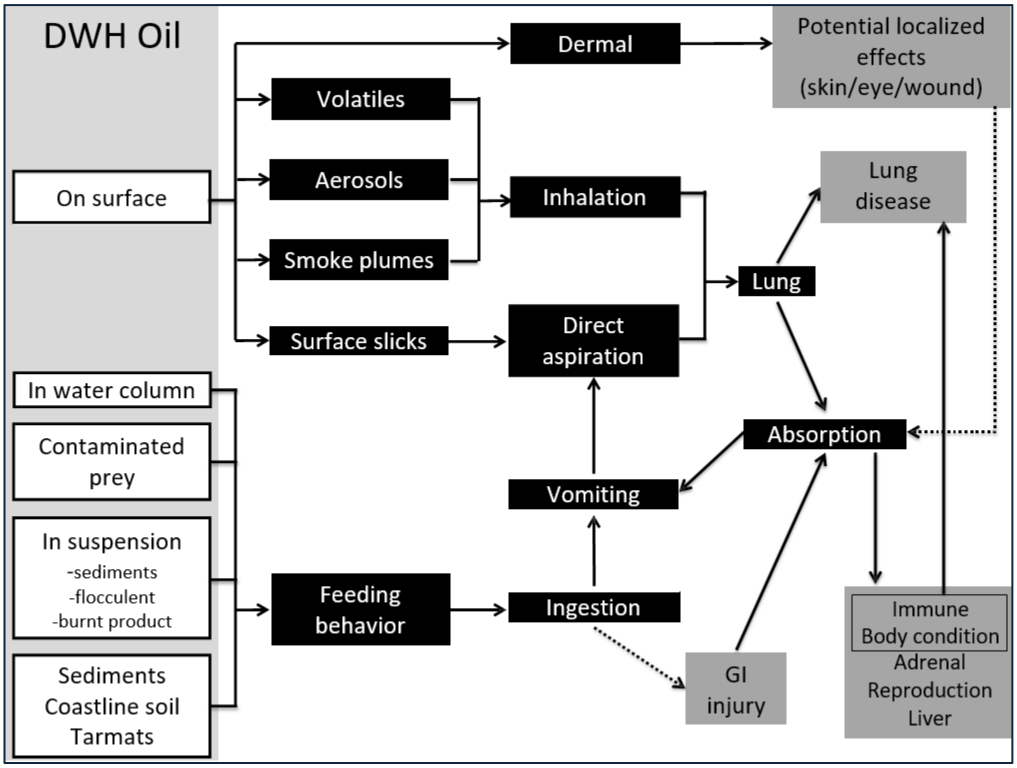

Figure 24. Schematic showing various pathways of exposure of marine mammals to spilled oil during and following the 2010 Deepwater Horizon spill and effects of that exposure (Takeshita et al. 2017). Image used with permission.

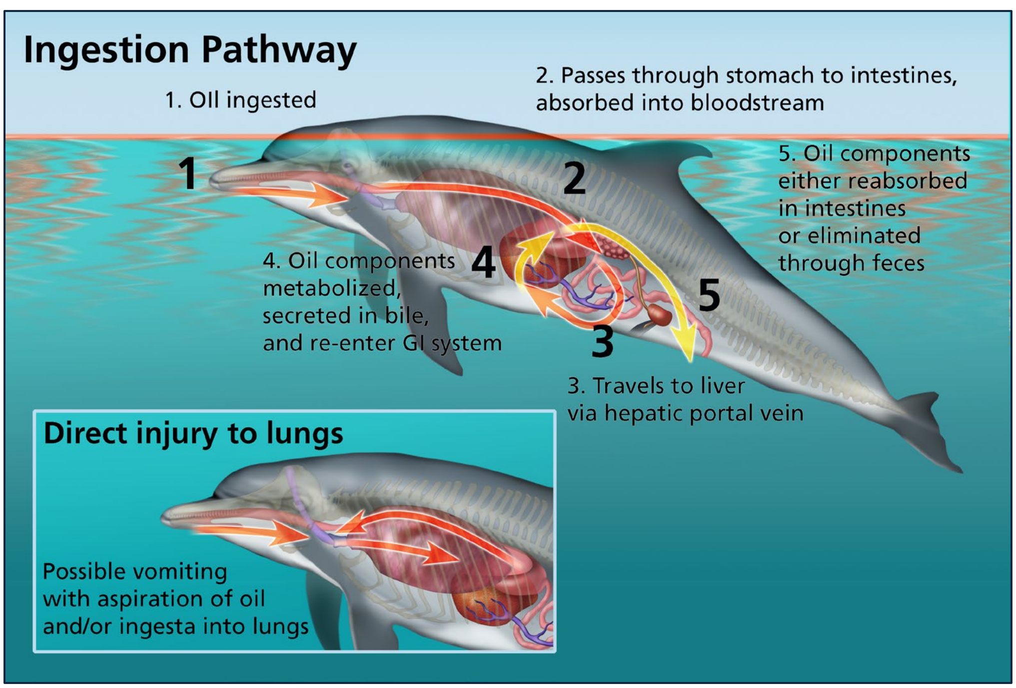

Figure 25. Diagram showing ingestion pathways to the gastro-intestinal (GI) system (including stomach, intestines, bile, liver) and lungs. Illustration by Katie Sweeney, NOAA

(NRDA 2016; Takeshita et al. 2017). Although dolphins are not present in the action area, this figure represents the ingestion pathway for all cetaceans and pinnipeds. Image used with permission.

In the following sections on anticipated oil spill exposures to listed species we qualitatively describe the potential for listed species to be exposed. This is due to the fact that we have estimates of likelihood of the various sized spills occurring, but we do not have estimates on the potential for overlap between spills and listed species.

Anticipated Effects

Small Spills (less than 2,100 gallons)

BLM estimates that during the 85-year timeframe of the IAP, 1,829 small spills will occur (342 crude oil, and 1,487 refined oil) (BLM 2020c).

The crude oil spills would likely occur some distance from the marine environment and not directly in the marine environment. The likelihood of a significant volume of spilled crude oil from a small spill being transported to the marine environment via rivers, freshwater run off, or ground water is small. Small crude spills that occur during the winter months can likely be entirely remediated before the spring melt occurs and freshwater begins to transport the spilled product. Based on the localized nature of small spills, and the likely inland nature of crude spills, NMFS does not expect small spills of crude oil at the estimated spill frequencies (Table 17), will expose listed pinnipeds, cetaceans, or their prey.

Many of the anticipated small refined oil spills may occur directly in the marine or nearshore environment. Some small spills could be in or close to areas used by bowhead, humpback, or fin whales, or ringed or bearded seals. However, small refined oil spills rapidly dissipate volatile toxic components within hours to a few days through evaporation, and residual components rapidly disperse in open waters. Individual bowhead, humpback, or fin whales, or ringed or bearded seals could be exposed to small refined oil spills, which would have minimal effects on their health due to small spill sizes, weathering, and rapid spill dispersal. Exposure duration would be short. Densities of these whale and pinniped species in nearshore areas off the coast of the NPR-A vary seasonally with some species being absent during the winter months (see Status of the Species sections). Small spills occurring during low abundance periods will further reduce the likelihood of exposure.

Medium Spills (2,101 to 36,036 gallons)

BLM estimates that during the 85-year timeframe of the IAP, 11 medium oil spills will occur (7 crude oil, and 4 refined oil) (BLM 2020c).

It is likely that some portion of medium crude oil spills have the potential to travel from inland, freshwater spill sites, to lagoons, bays, and river outputs, and into the marine environment. We anticipate that most, if not all, of the aerosols and volatiles associated with a medium crude spill will have evaporated prior to reaching the marine environment. It is possible that small numbers of ESA-listed species under NMFS's jurisdiction would be exposed to crude oil dispersed in the water column or sheening at the water surface. We anticipate that OSROs will be able to remove a significant proportion of emulsified oil and surface slicks by the time a medium sized crude oil spill reaches the marine environment. For these reasons, we do not expect individual fitness of fin, bowhead, or humpback whales, or ringed or bearded seals to be impacted significantly as a result of 7 medium crude oil spills occurring on the NPR-A over an 85-year time period.

The four medium refined oil spills anticipated to occur as a result of activities conducted under the BLM IAP will likely occur in nearshore environments in association with fuel transport at ports or in designated tug and barge routes (BLM 2020c) (Figure 26). Fin and humpback whales occur in this coastal region in low densities during summer months (see Status of the Species sections) and are extremely unlikely to come in contact with a medium refined oil spill in the nearshore waters of the Beaufort and Chukchi seas. It is likely that bowhead whales and bearded and ringed seals could come in contact with medium refined oil spills in the nearshore environment, particularly if the spills occur during a peak density season, impact the barriers islands where seals are known to haul-out, or move outside the barrier islands. However, due to the rapid evaporation of volatiles in refined oils, we do not anticipate that individual whales or seals would experience extended exposures resulting in impacts to individual fitness from compromised immune systems, respiratory function, adrenal function, liver function, reproductive success, or direct injury to tissues. Any effects are expected to be short-lived and minor.

<u>Large Spills (36,036 to 6.3 million gallons)</u>

BLM estimates that during the 85-year timeframe of the IAP, one large crude oil spill will occur on the NPR-A (BLM 2020c). NMFS's analysis aligned with BLM on the anticipated single large crude spill, and added one anticipated accidental large refined oil spill based on increased shipping in the Arctic, an increased development footprint, and increased capacity in the fuel barges being used by commercial operators to the North Slope in recent years (Table 17).

Based on mitigation measures in place to shut down an uncontrolled release of crude oil, past precedent, and the fact that these terrestrial and lagoon-based drill sites are relatively low pressure, we do not anticipate the large crude oil spill will be over 1 million gallons. The single large crude oil spill that occurred during the 2000-2018 time period in the BLM oil spill risk analysis occurred in 2006, and spilled 212,252 gallons of crude oil from a corroded pipeline. Although well blowouts are possible, drilling conditions at terrestrial and lagoon-based sites in the NPR-A are relatively low pressure. Deepwater well blowouts, such as the DWH events, are much more difficult to cap and control, and therefore are of longer duration and release larger quantities of oil (Jernelöv 2010). Well blowout spills over 250,000 gallons are very rare, and except for the DWH event, less than 2,000 bbl (84,000 gallons) in crude or condensate were spilled on the US OCS from fewer than 50 well control incidents from 1971-2010. During the same time period, more than 41,800 wells were drilled on the OCS and almost 16 billion bbl of oil produced (BOEM 2012). Pipelines and platforms are the most likely source of OCS crude oil spills (ABSG Consulting 2018) and are the most likely source of crude oil spills resulting from activities conducted under the proposed IAP.

A large crude oil spill is expected to persist for a significant amount of time in marine waters. After 30 days 28-40% would evaporate, 3-6% would disperse, and 44-62% would remain (BOEM 2015). Modelling of a 5,100 bbl (214,200 gallon) crude oil spill into open-water estimates that a discontinuous area 54 km^2 would be covered after 3 days, and 1,063 km^2 after 30 days (BOEM 2015). A spill of this magnitude reaching the Beaufort or Chukchi seas could disperse beyond barrier islands and potentially come into contact with ice depending on ice extent. Oiled ice that drifts and subsequently melts during open water would introduce oil into surface waters in new areas (BOEM 2015).

The primary potential effects to marine mammals from accidental, unauthorized oil spills include 1) inhalation, ingestion, and aspiration of oil (Figure 23, Figure 24, and Figure 25), 2) fouling of individuals (baleen and fur), 3) habitat/prey degradation, and 4) disruption of migration. Disruption of other essential behaviors such as breeding, communication, and feeding may also occur. A significant portion of the aerosols and volatiles associated with a large crude oil spill will have likely evaporated by the time the oil reached the marine environment and overlapped in time and space with ESA-listed species. Crude oil spills are not expected to occur directly into the marine environment in this proposed action (BLM 2020c) but will be transported from lagoons, rivers, or other freshwater movement into the Beaufort or Chukchi seas. The duration and rate of flow will significantly influence the proportion of the large crude oil spill that reaches the marine environment.

Depending on the timing, size, and duration of the spill, bowhead, fin, and humpback whales and bearded and ringed seals could experience contact with slightly to heavily weathered crude oil during summer and/or fall feeding events and migration in the Beaufort and Chukchi seas. External dermal exposure could result in contact with the skin and eyes and other mucous membranes, causing irritation, various skin disorders, and toxic effects from contact with lesions or cuts in the skin. In addition, dispersed oil in the water column is expected to become more viscous in the cold ocean waters, and thus increases the hazards associated with fouling of seals by increasing exposure duration (Engelhardt 1987) and coating the fur. Seal fur maintenance behaviors will lead to ingestion of dispersed crude oil for any individuals that become fouled.

Toxic aerosolized hydrocarbons are associated with fresh oil, and would likely be significantly reduced before a large crude oil spill in the NPR-A exploration and production area comes in contact with the marine environment and overlaps with marine mammals. However, the cold temperatures in the Arctic slows the evaporation of volatile hydrocarbons, lessening the acute levels of toxins but lengthening the period of exposure (Engelhardt 1987).

Crude oil immersion studies resulted in 100% mortality in captive ringed seals (Geraci and Smith 1976b). Unlike the animals in the immersion study, seals in the open water would have ice as a resting/escape platform, and all marine mammals would have water depth and distance for escape routes from an oil spill. Well known killer whale populations in Prince William Sound experienced significant declines following the 1989 Exxon Valdez oil spill (Matkin et al. 2008). The volume of that spill (~11 million gallons) was smaller than what is anticipated for the proposed IAP, and that spill was directly into the marine environment.

Exposure of whales to toxic hydrocarbons via inhalation, ingestion, and aspiration, could lead to mortality, especially if calves are present. Fin and humpback whales are only present during the open water season and occur in low numbers in the nearshore Beaufort and Chukchi sea environment. A large crude oil spill could result in some individual humpback or fin whales coming into contact with the oil (potentially resulting in inhalation of hydrocarbon volatiles, baleen fouling, and ingestion of contaminated prey). Temporary and/or permanent injury and non-lethal effects could occur, but mortality is not likely. Temporary displacement from feeding and resting areas could also occur. Fin and humpback whale prey (schooling forage fish and zooplankton) could be reduced or contaminated, leading to modified distribution of these whales. Bowhead whales and bearded and ringed seals are more common, and could potentially be exposed for extended durations, particularly if oil becomes entrained in leads in the ice where bowheads and seals are present.

Bowhead whales are most vulnerable to oil spills in the Chukchi and Beaufort seas while feeding during late summer and fall and during the westward migration throughout the fall. A winter spill, or if oil persists in ice over winter, could impact bowheads migrating through the lead system during the spring. Exposure of bowheads could occur in the spring lead system during the spring calving and migration period. Exposure to aged winter spill oil (which has had a portion or all of the toxic aerosolized hydrocarbons dissipated into the atmosphere through the dynamic open water and ice activity in the polynya) presents a much reduced toxic inhalation hazard. Calves are likely more vulnerable than adults to harmful effects from inhalation of volatiles from a spill because they take breaths more frequently than do their mothers and spend more time at the surface—the air/water interface where volatiles and slicks are present.

Feeding whales could ingest dispersed oil in the water column and at the surface with their prey, which may also be contaminated with oil components. Incidental ingestion of oil components that may be incorporated into benthic sediments can also occur during near-bottom feeding. To the extent that ingestion of crude oil affected the weight or condition of the mother, the dependent calves could also be affected. Decreased food assimilation could be particularly important in very young animals, those that seasonally feed, and that need to accumulate high amounts of fat to survive in their environment. Ingestion of oil may result in temporary and permanent damage to whale endocrine function and reproductive system function; and if sufficient amounts of oil are ingested mortality of individuals may also occur (Takeshita et al. 2017). If an oil spill were to cause extensive mortality within a high latitude amphipod population with low fecundity and long generation times, a marked decrease in secondary production could ensue in some areas (Highsmith and Coyle 1992), which could impact all three whale species and both seal species.

Researchers have suggested that pups of ice-associated seals may be particularly vulnerable to fouling of their dense lanugo coats, and negative impacts to their thermoregulatory capabilities (Geraci and St. Aubin 1990; Jenssen 1996). Though bearded seal pups exhibit some prenatal molting, they are generally not fully molted at birth, and thus would be particularly susceptible to physical impacts of contacting oil. Adults, juveniles, and weaned young of the year rely on blubber for insulation, so effects of oiling on their thermoregulation are expected to be minimal. Other acute effects of oil exposure which have been shown to reduce seal health and possibly survival include lethargy, disorientation, and liver lesions. Direct ingestion of oil, ingestion of contaminated prey, or inhalation of hydrocarbon volatiles can cause serious health effects including death (Geraci and Smith 1976b; Geraci and St. Aubin 1990; Takeshita et al. 2017).

Effects of a large crude oil spill on the NPR-A would be fairly localized to a portion of the nearshore environment of the Beaufort and/or Chukchi seas. Although some ESA-listed species (bowhead whales, bearded and ringed seals) could suffer mortalities, numbers would be relatively small and localized. Long term impacts to individuals are possible with impacts to their fitness and reproductive success, and potential long term impacts to whale prey. Reduction or contamination of bearded and ringed seal food sources would be localized relative to the area of the crude spill entering the marine environment.

One large refined oil (e.g., diesel) spill is anticipated to occur over the time span of the proposed NPR-A IAP, and we assume that the spill would not exceed 517,800 gallons, the maximum capacity of Crowley Fuels Alaska barges that are currently used in that region. A large diesel spill is most likely to occur in or near the designated barge or tug routes in nearshore environments in association with fuel transport at ports (BLM 2020c) (Figure 26). Acute effects of a large diesel spill have the potential to be greater than an even larger volume crude spill for this proposed IAP because the diesel spill will likely occur directly in the marine environment, whereas a crude spill is more likely to occur inland and be transported to the ocean gradually via freshwater sources. Individual marine mammals coming into contact with fresh spilled diesel in the marine environment, particularly over multiple days or longer, could experience significant harm to their respiratory system, and adsorption of toxic components of oil into their bloodstream, leading to compromised immune systems and potentially even death.

However, the duration of a large refined oil spill would be significantly less than that of a crude oil spill. A diesel spill from a tanker barge would likely occur over a short period of time, whereas a large crude spill could be flowing from an uncontrolled well blowout, which may be flowing for weeks or longer. The footprint of a large refined oil spill would be smaller than a large crude oil spill because evaporation and other weathering processes (Figure 20) act more quickly on light fuels such as diesel. Impacts to prey would also be less significant from a refined oil spill than a crude oil spill due to the lower persistence of refined oil in the environment. Although a small number of whales, particularly bowhead whale calves, and bearded and ringed seals may suffer significant acute effects from extended exposure to a large diesel spill, leading to death, the effects would be localized in time and space relative to a large crude spill.

Bowhead, fin, and humpback whale numbers continue to increase in the North Slope region where OCS oil and gas production and development is increasing. Ringed and bearded seal abundance trends are less known (see Status of the Species sections). New modern technologies and additional mitigation measures based on lessons learned from past spills should reduce the likelihood and volume of large spills in this region, resulting in a lower or similar level of risk and impact from this potential stressor relative to recent decades.

Very Large Oil Spills

Although unexpected, very large spills may result from exploration, development, and production operations involving facilities, tankers, pipelines, and/or support vessels. Incidents with the greatest potential for catastrophic consequences are losses of well control with uncontrolled releases of large volumes of oil, where primary and secondary barriers fail, the well does not bridge (bridging occurs when the wellbore collapses and seals the flow path), and the flow is of long duration.

Very large oil spills (VLOS) are > 150,000 bbl. In general, historical data show that loss of well control events resulting in oil spills are infrequent and that those resulting in large accidental oil spills are even rarer events (Anderson and LaBelle 2000; Bercha Group 2006; Anderson et al. 2012; ABSG Consulting 2018). The Norwegian SINTEF Offshore Blowout Database, which tracks worldwide offshore oil and gas blowouts, where risk-comparable drilling operations are analyzed, supports the same conclusion. Blowout frequency analyses of the SINTEF database suggest that the highest risk operations are associated with exploration drilling in high–pressure, high-temperature conditions. As the 2010 DWH event illustrated, there is a risk for very large spills to occur and result in substantial impacts.

A fundamental challenge is to accurately describe this risk, especially since there have been relatively few large oil spills that can serve as benchmarks. To summarize, we anticipate that a very large oil spill is not reasonably certain to occur as a result of the proposed NPR-A IAP, but we will examine potential effects to ascertain whether jeopardy to any ESA-listed species is possible. In general, a very large oil spill on the NPR-A (> 6,300,000 gallons) would have catastrophic consequences to the marine environment of the Beaufort and/or Chukchi seas where the oil would be transported by freshwater sources into the ocean. A spill of that volume would be the result of an extended release from an uncontrolled well blowout, so effects would likely extend directly over multiple seasons and possibly multiple years. The chronic effects of persistent crude oil would be measurable for years, even decades, following the spill.

The primary effects of a VLOS in the NPR-A would likely be contained to the Beaufort and/or Chukchi seas, and due to prevailing currents, would not be expected to reach south of the Bering Strait (Overland and Roach 1987; Danielson et al. 2017). Although much of the effects analysis for a VLOS is similar to that of a large oil spill, due to the extended presence of dispersed crude oil in the water column of the Beaufort and Chukchi seas, bowhead, fin, and humpback whales, and bearded and ringed seals would all be exposed to oil to some degree. An additional factor that would lead to greater exposures and impacts is the certainty that oil would be entrained in the ice over the winter, and would release a pulse of oil during the spring melt-out. A significant volume of oil would occur at the ice edge during the spring ice retreat and migration of marine mammals into and through the Beaufort and Chukchi seas.

We anticipate that if a VLOS were to occur, the magnitude of the resulting impacts would be high because a large number of whales and seals (and their prey) could be impacted. The duration of the impacts on affected animals would range from temporary (such as dermal irritation/injury or short-term displacement) to permanent (e.g., compromised immune system, reproductive failure, endocrine impairment, lung damage), and would depend on the length of exposure and means of exposure, such as whether oil was directly inhaled or ingested, the quantity ingested, and whether ingestion was indirect through prey consumption.

If a VLOS on the NPR-A were to spill oil into the Beaufort and/or Chukchi seas during a time when many bowhead whale calves were present, mortality of a large portion of a year's cohort of calves and perhaps some individual adult females and other age and sex classes could occur. Recovery of the loss of a substantial portion of an age class cohort and its contribution to recruitment and species population growth could take decades. Displacement of whales, particularly bowhead whales, from areas impacted by the spill due to the presence of oil and increased vessel activity is likely. If the area is an important feeding area or migratory corridor, especially in the spring lead system, the impacts may be higher magnitude.

A VLOS reaching a polynya or lead system could have serious effects on local ringed seal and bearded seal sub-populations, potentially oiling of even killing a number of bearded and/or ringed seals. PBR for ringed and bearded seals is unknown because there are no reliable estimates of minimum abundance currently available (Muto et al. 2020). Without historical data on distribution and population size, it is difficult to predict the impacts of an oil spill on ringed or bearded seal populations (Cameron et al. 2010; Kelly et al. 2010b). Based on documented exposures of ringed seals and other phocid species to oil, however, significant effects on individual health and survival would be expected for seals immersed or coated in oil during the days and weeks following a spill (Geraci and St. Aubin 1990).

Reduction or contamination of seal prey would be localized relative to the area of the spill in the Beaufort and Chukchi seas. The migratory behavior of these species would enable them to eat uncontaminated food during some seasons (Quakenbush et al. 2019). Exposure to contaminated prey multiple times over the long lifetime of these seals could increase contamination of bearded seal tissues through accumulation. A VLOS could affect large numbers of seals because they would be exposed to contaminated prey in a large area for a sustained amount of time.

Because a VLOS or multiple large oil spills is unlikely, infrequent consumption of contaminated prey over multiple years is unlikely to accumulate to levels that would harm a significant number of whales. A low probability, high impact event where large numbers of whales and seals experience prolonged exposure to toxic fumes, and/or ingest large amounts of oil, could result in injury and mortality that exceeds PBR. However, due to the low likelihood of multiple large spills or a VLOS, the risk of significant long term exposures to accidental discharges of oil is low.

6.2.8 Vessel Effects

NMFS assumed for this analysis that a maximum of 12 sealifts (large barges accompanied by two to several tugboats) may occur over a five year period in the MTR (Figure 3) to deliver large processing and drill site modules and bulk construction materials during summer months from mid-July to late September. Each sealift operation would consist of a maximum of 20 sealift barges and tugboat transits between Dutch Harbor and the North Slope, including transit to and from. No more than 35 heavy lift barges per development are anticipated (e.g. one sealift of 20 barges in the first summer, one sealift of 10 barges in the second summer, and one sealift of 5 barges in the third summer) for a total of 105 barges for all three developments. Support vessel traffic accompanying each sealift would include approximately 50-150 transits by crew boats, screeding barges, and lightering barges every season. Total vessel traffic over a 5-year sealift operational period would be approximately 35 heavy lift barge transits, 55 tugboat transits, and 500 support vessel transits. It is possible that two developments could be in the sealift operational phase simultaneously, however, this is unlikely to occur during the life of this plan. If two developments were in the sealift operational phase at the same time, in one summer 40 barges and up to 300 support vessels could be used. After a sealift operational period, vessel traffic to support an existing development would include 1-2 barges per year and 10-20 support vessel transits per year. Decommissioning would also include 1-2 barges annually; most of the equipment is repurposed for other developments or given to communities. Many structures have traveled the Dalton Highway via very wide loads to communities along the highway system[24].

6.2.8.1 Vessel Strikes

Pinnipeds

Current shipping activities in the Arctic pose varying levels of threats to marine mammals, including ringed and bearded seals, depending on the type and intensity of the shipping activity and its degree of spatial and temporal overlap with their habitats. The presence and movements of ships in the vicinity of seals can affect their normal behavior (Jansen et al. 2010) and may cause them to abandon their preferred breeding habitats in areas with high traffic (Smiley and Milne 1979; Mansfield 1983). To date, no bearded or ringed seal carcasses have been found with propeller marks and there is no record of bearded or ringed seal stranding due to vessel strike (Delean et al. 2020). However, Sternfeld (2004) documented a single spotted seal stranding in

[24] S. Rice, BLM, pers. comm. via email to S. Pautzke, 11/25/2020.

Bristol Bay, Alaska, that may have resulted from a propeller strike.

Vessels have the potential to disturb ringed or bearded seals hauled out on broken sea ice, but marine transportation for the proposed action is expected to occur during the open water season so such effects are unlikely. A ship strike of a seal is highly unlikely due to the maneuverability of seals and their general avoidance of ships (NMFS internal data). The probability of a ship strike occurring is very small and thus adverse effects to bearded or ringed seals are extremely unlikely to occur.

Harassment of sea lions on haulouts or rookeries is also unlikely because mitigation measures require that vessels come no closer than three nautical miles from identified haulouts or rookeries (that are listed in regulation at 50 CFR 224.103(d)(1)(iii) & 50 CFR 226.202). Although risk of vessel strike has not been identified as a significant concern for Steller sea lions, the recovery plan for this species states that Steller sea lions may be more susceptible to ship strike mortality or injury in harbors or in areas where animals are concentrated, e.g., near rookeries or haulouts (NMFS 2008). In 2007, a Steller sea lion was found in Kachemak Bay that may have been struck by a watercraft; one was struck in Sitka, AK (NMFS internal data); one was struck on the West Coast (Delean et al. 2020). For this action, no vessel strikes of Steller sea lions are anticipated. Despite all the vessel traffic around Dutch Harbor, there are no reported ship strikes of any Steller sea lions in this location or throughout the MTR (Delean et al. 2020; Muto et al. 2020). The probability of a ship strike occurring is very small and thus adverse effects to Steller sea lions are extremely unlikely to occur.

<u>Cetaceans</u>

Vessel strikes of humpback whales present a greater concern than for pinnipeds and most other whales. An examination of all known ship strikes for large (baleen and sperm) whales from all shipping sources indicates vessel speed is a principal factor in whether a vessel strike results in death (Laist et al. 2001; Vanderlaan and Taggart 2007). In assessing records with known vessel speeds, Laist et al. (2001) found a direct relationship between the occurrence of a whale strike and the speed of the vessel involved in the collision. The authors concluded that most deaths occurred when a vessel was traveling in excess of 24.1 km/hour (14.9 miles per hour; 13 knots), which is slightly less than the maximum speed for shipping vessels associated with this action (14 knots, 16 mph).

There has been one reported ship strike of a bowhead whale in the Arctic and it occurred in 2015 (NMFS internal data). George et al. (2017) examined records for 904 bowhead whales harvested between 1990 and 2012. Of these, 505 whales were examined for scars from ship strikes, including propeller injuries. Only 10 whales harvested between 1990 and 2012 (approximately 2 percent of the total sample) showed clear evidence of scarring from ship propeller injuries. Assuming harvested whales are representative of the extant population, we can assume that 2% of bowheads encounter vessel strikes and survive to bear propeller scars or similar injuries.

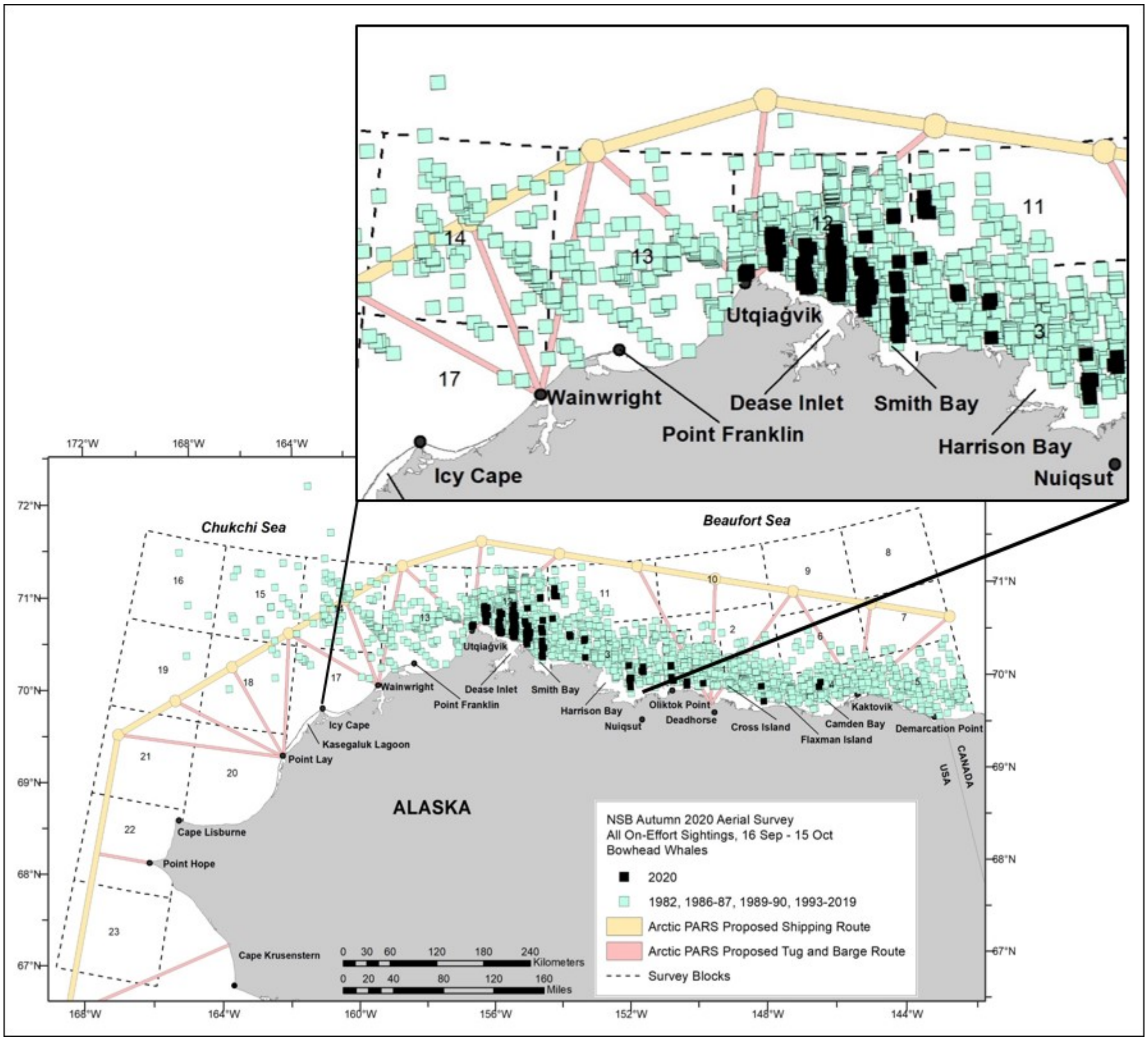

Figure 26. Bowhead whale sightings during the 2020 aerial survey overlapping the proposed Arctic shipping route and tug and barge routes; inset focuses on just the NPR-A project area. **Source: NSB/NOAA unpublished data**

The project area for the NPR-A extends from Icy Cape to Nuiqsut. Barge landing areas may be at Atigaru Point in Harrison Bay, Smith Bay, or Utqiaġvik (Figure 26). Bowhead whales are present throughout the Arctic area of the MTR and in close proximity to proposed barge landing areas. Bowheads use the areas near Barrow Canyon upwelling in the western Beaufort Sea during the summer (Citta et al. 2015) and migrate past the NPR-A coastal waters. However, despite the hundreds of small vessels that work with barges to lighter goods and conduct subsistence fishing and hunting, only one bowhead has been documented being struck by a vessel (and 2% of subsistence-harvested bowheads bear scars from vessel encounters (George et al. 2017). Given the mitigation measures associated with this action including reduced vessel speed and vessel approach distances, and the low number of documented ship strikes to date ship strikes of bowhead whales are considered improbable.

There have been no documented injuries to blue or North Pacific right whales by ship strike in waters off Alaska. From 2012-2020, there were two documented injuries by ship strikes of fin whales and one ship strike of a sperm whale (Delean et al. 2020)(NMFS unpublished data). One vessel strike of a fin whale occurred while the commercial vessel was traveling over 18 knots (NMFS unpublished data), which is faster than the vessels associated with this action. The sperm whale was struck by a vessel traveling at 24 knots (NMFS unpublished data). Despite the high amount of vessel traffic and the expected growth of vessel traffic including the contribution by this project, we expect vessel strikes to remain relatively uncommon for these four whale species. Two of the three strikes occurred by vessels traveling faster than the allowable speeds in the mitigation measures of this proposed action (the third possible strike is from a whale found dead). Given the low number of current strikes compared to vessel traffic and the mitigation measures associated with this action including reduced vessel speed, vessel approach distances, and observer requirements, ship strikes on sperm, blue, fin, and North Pacific right whales due to the proposed action are improbable.

Humpback whales are the most frequent victims of ship strikes in Alaska, accounting for 86 percent of all reported collisions (Neilson et al. 2012). Vessel strikes are a concern given the increasing humpback whale populations and increasing vessel traffic. Small vessel strikes were most common (<15 m, 60%), but medium (15–79 m, 27%) and large (≥80 m, 13%) vessels also struck humpback whales. Most strikes (91%) occurred in May through September, and there were no reports from December or January. The majority of strikes (76%) were reported in southeastern Alaska. From 2013 to 2017, 29 humpbacks incurred mortality or serious injury from vessel strikes (Delean et al. 2020); from 2012 through 2020, there have been 44 recorded vessel strikes of humpback whales (NMFS unpublished data), all of which ranged from the Gulf of Alaska to Southeast Alaska. These strikes occurred while vessels were traveling up to 22 knots, although some occurred while anchored (i.e. the humpback whale struck the boat). Vessels ranged from small 20-foot pleasure craft to a 950-foot cruise ship.

Humpback whales appear to be moving farther north into areas they may not have occupied since the end of commercial whaling. They were regularly documented in the southern Chukchi Sea from the 1920s to 1950s, but few were reported thereafter. Brower et al. (2018) documented humpback whales in the eastern Chukchi Sea from July through October, with the majority seen in September. They were also documented as far north as Utqiaġvik in July. The median distance to shore was 78 km, but the range was 1-145 km. Recent sightings in the Arctic suggest populations may be recovering from commercial whaling (Brower et al. 2018).

Three DPSs of humpback whales occur in the MTR portion of the action area (Wade et al. 2016). Throughout the Aleutian Islands, Bering Sea, and Chukchi Sea in which the vessels for this action will transit, 4.4% of observed humpbacks are likely to be from the endangered Western North Pacific (WNP), 86.5% from the non-listed Hawaii DPS, and 11.3% from the threatened Mexico DPS (NMFS 2016c). Considering the vessel speed restrictions intended to reduce the risk of vessels striking cetaceans, required observer coverage, and the absence of documented humpback whale strikes to date in the Bering or Chukchi seas, the probability of project vessels striking a listed humpback whale is low but not zero. As noted above, humpback whales are the most frequent victims of ship strikes in Alaska, accounting for 86 percent of all reported collisions (Neilson et al. 2012). It is reasonable to expect that a few listed humpback whales may be struck by vessels associated with the proposed action over the time frame covered by the IAP.

6.2.8.2 Vessel Noise

Vessel noise from commercial shipping traffic is a major source of low frequency (5 to 500 Hz) sound (Simmonds and Hutchinson 1996). The types of vessels in the MTR portion of the action area typically include commercial fishing boats and trampers, barges, skiffs with outboard motors, icebreakers, tourism and scientific research vessels, and vessels associated with oil and gas exploration, development, and production. The primary underwater noise associated with vessel operations due to this action is the continuous cavitation noise produced by the propeller arrangement on the oceanic tugboats, especially when pushing or towing a loaded barge. Other noise sources include onboard diesel generators and the firing rate of the main engine, but both are subordinate to the blade rate harmonics (Gray and Greeley 1980). These non-impulsive (continuous) sounds for sea going barges have been measured at a peak sound source level of 170 dB re 1 µPa rms at 1 m (broadband), and they are emitted at dominant frequencies of less than 5 kHz, and generally less than 1 kHz (Miles et al. 1987; Richardson et al. 1995). Coastal barges and tugs produce a peak sound source level of approximately 164 dB re 1 µPa rms at 1 m (Richardson et al. 1995). Tugs pulling empty barges can produce source levels of 145 to 170 dB re 1 µPa-m (Richardson et al. 1995). The source level of approximately 170 dB at 1 meter associated with oceanic tug boat noise is anticipated to decline to 120 dB re 1µPa rms within 1.85 km (1.15 mi) of the source (Richardson et al. 1995). Crew boats and hovercraft are expected to have smaller peak sound source levels of approximately 156 dB re 1µPa rms at 1 m (Richardson et al. 1995) and 149 dB re 1µPa rms at 1 m (Blackwell and Greene 2005), respectively.

Vessel traffic and associated noise in the Chukchi and Beaufort seas presently is limited primarily to late spring, summer, and early autumn. Shipping sounds are often at source levels of 150–190 dB re 1 µPa at 1m (rms) (BOEM 2011). Shipping traffic is mostly at frequencies from 20–300 Hz (Richardson et al. 1995), which overlaps with the frequency distributions of all listed species along the MTR (Table 18). Zykov et al. (2008) observed that vessel sounds for barges, tugs, and support vessels at the Oooguruk Production Island were between 163 dB rms - 183 dB rms within 1 m (3 ft) from the source. This level of noise would not produce any injury to marine mammals, such as a TTS or PTS. However, marine mammals will likely move to avoid any approaching vessel. Vessel noise has the potential to disturb or temporarily displace marine mammals from preferred habitat along transit routes.

Table 18. Sound frequency distributions of listed species and project-related activities

Activity	Minimum Sound Frequency	Maximum Sound Frequency
Vessel traffic	5 Hz	0.5 kHz
Aircraft	60 Hz	0.102 kHz
Vibroseis	1.5 Hz	0.096 kHz
Species	**Minimum Sound Frequency**	**Maximum Sound Frequency**
Bowhead whale*	7 Hz	35 kHz
Blue whale*	7 Hz	35 kHz
Fin whale	20 Hz	10 kHz
Gray whale*	7 Hz	35 kHz
Humpback whale*	7 Hz	35 kHz
North Pacific Right whale	10 Hz	22 kHz

Activity	Minimum Sound Frequency	Maximum Sound Frequency
Sperm whale*	150 Hz	160 kHz
Ringed seal*	50 Hz	86 kHz
Bearded seal*	50 Hz	86 kHz
Steller sea lion*	60 Hz	39 kHz

*Indicates using the applied frequency range for that type of species. Otherwise, the levels listed are from studies of that particular species.

Numerous studies of interactions between surface vessels and marine mammals have demonstrated that free-ranging marine mammals engage in avoidance behavior when surface vessels move toward them. It is not clear whether these responses are caused by the physical presence of a surface vessel, the underwater noise generated by the vessel, or an interaction between the two (Goodwin and Cotton 2004; Lusseau 2006). However, several authors suggest that the noise generated during motion is probably an important factor (Evans et al. 1992; Blane and Jaakson 1994; Evans et al. 1994). These studies suggest that the behavioral responses of marine mammals to surface vessels are similar to their behavioral responses to predators.

Some marine mammals could receive sound levels in exceedance of the acoustic threshold of 120 dB from the vessels or be disturbed by their visual presence. NMFS has interpreted the term "harass" (as used in the ESA) (Wieting 2016) as to "create the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering." While listed marine mammals will likely be exposed to acoustic stressors from vessel transit, the nature of the exposure will be low-frequency, with much of the acoustic energy emitted by the vessels at frequencies below the best hearing ranges of the marine mammals expected to occur within the action area. In addition, because vessels will be in transit, the duration of the exposure will be very brief (a vessel with a source level of approximately 170 dB at 1 meter travelling at 10 knots will be audible at received levels exceeding 120 dB at a fixed point in space for a maximum duration of about 13 minutes).. We expect that the effects to ESA-listed species from vessel noise will be minor.

Pinnipeds

Ringed and Bearded Seals

Few authors have specifically described the responses of pinnipeds to boats, and most of the available information on reactions to boats concerns pinnipeds hauled out on land or ice. However, the mere presence and movements of ships in the vicinity of seals and sea lions can cause disturbance to their normal behaviors (Calkins and Pitcher 1982; Kucey 2005; Jansen et al. 2006). Disturbances from vessels may motivate seals and sea lions to leave haulout locations and enter the water (Kucey 2005), but they are expected to return to their normal activities when the vessel passes (BLM 2019).

Seals would be most affected by project-related vessels in the nearshore area of the NPR-A, especially as vessels approach and depart barge landing sites. Bearded seals may also be affected farther north into the MTR. Vessel traffic and its associated noise in the Chukchi and Beaufort seas is currently limited primarily to late spring, summer, and early autumn during ice free times; however, with declining sea ice conditions forecasted for the future (Section 5.x), vessel traffic could expand to include other times of the year. Ship traffic could elicit behavioral changes in bearded and ringed seals, mask their underwater communications, mask other sources of noise, and cause them to avoid noisy areas. Increases in ambient noise, however temporary, have the potential to mask communication between seals (Terhune et al. 1979) and some marine mammals have been known to alter their own signals to compensate for increased ambient noise levels (Au et al. 1974; Di Lorio and Clark. 2010; Parks et al. 2011), incurring energetic costs in the process.

During open water surveys in the Beaufort and Chukchi seas, bearded and ringed seals showed only slight aversions to vessel activity (Harris et al. 2001; Blees et al. 2010; Funk et al. 2010). Funk et al. (2010) noted among vessels operating in the Chukchi Sea where received sound levels were <120 dB, 40% of observed seals showed no response to a vessel's presence, slightly more than 40% swam away from the vessel, 5% swam towards the vessel, and the movements of 13% of the seals were unidentifiable. In the same Chukchi Sea surveys, 60% of the observed seals exhibited no reaction to vessels and 27% simply looked at the vessels. Funk et al. (2010) found that bearded seals were more likely to occur near the pack ice margin than in open water, and that it is likely some individuals near the vessel activity were displaced to some limited extent.

More recently, Bisson et al. (2013) reported on behavioral observations of seals during vessel-based monitoring of exploratory drilling activities by Shell in the Chukchi Sea during the 2012 open-water season. The majority of seals (42%) responded to moving vessels by looking at the vessel, while the second most identified behavior was no observable reaction (38%). The majority of seals (58%) showed no reaction to stationary vessels, while looking at the vessel was the second most common behavioral response (38%). Other common reactions to both moving and stationary vessels included splashing and changing direction. Richardson et al. (1995) found vessel noise does not seem to strongly affect seals in the water, concluding that seals on haul outs often respond more strongly to the presence of vessels.

Greene and Moore (1995) concluded that the effects of vessel traffic on seals are generally negligible to non-existent when they are in the water. Vessel traffic in the developed oil fields to the west of the NPR-A has been operating in the nearshore environment for many years and has not been shown to adversely affect seals. As such, seals are thought to have habituated to the anthropogenic activities or learned to avoid the area (BLM 2019). In addition, some seals are expected to move away from the vessels (BLM 2019). Based on our interpretation of the evidence, we expect that vessel noise and presence will likely briefly interrupt a seal's behavior until the vessel moved away from the seal or until the seal moved away from the vessel (or both). However, such an effect is not expected to disrupt seal behavioral patterns for more than a brief period of time and in a minor or immeasurably small manner. Vessels have been using an established route for years in the central Beaufort Sea in an effort to minimize impacts to marine mammals (BLM 2019) and subsistence hunters, so few seals outside the transit corridor (proposed MTR) should be disturbed by vessels.

In summary, vessel traffic (sound, presence, or both) is not expected to significantly disrupt normal seal behavioral patterns (breeding, feeding, sheltering, resting, migrating, etc.). While a seal may be exposed to vessel noise in open water or hauled out on land or ice, the effects of the vessel noise are likely to be temporary and transient. A vessel under way will pass the seal(s), thus the disturbance is transitory in nature. A vessel coming to a barge landing will, after docking, turn off the propellers and engine, reducing noise in the environment. The seal(s), upon hearing vessel noise, typically show limited responses such as increased alertness, diving, moving from the vessel's path by up to several hundred feet, or ignoring the vessel. If hauled out, seals typically enter the water when approached by vessels. Seals may be disrupted from feeding or resting, but for only a short duration that the vessel noise is present (typically less than 20 minutes for a transiting vessel). Thus, the effects of vessel presence on seals in open water or hauled out on land or ice would likely be temporary and transient. We expect the impact of project vessel sound on bearded and ringed seals to be very minor because:

1) vessel traffic associated with the proposed action will be subject to mitigation measures described in Section 2.2 that are designed to avoid or minimize adverse effects to seals; and
2) previously documented behavioral observations showed little to no reaction by seals to vessels, and any observed reactions were (and are expected to be) temporary.

Steller Sea Lions

The possible impact of vessel disturbance on Steller sea lions has not been well studied, yet the response by sea lions to disturbance will likely depend on the season and life stage in the reproductive cycle (NMFS 2008). Vessel disturbance could potentially cause Steller sea lions to abandon their preferred breeding habitats in areas with high traffic (Kenyon and Rice 1961). Vessel-induced stampedes of Steller sea lions off haulouts and rookeries may result in the death or injury of smaller sea lions.

Vessels cause both underwater and in-air noise. Increases in ambient noise, however temporary, have the potential to mask communication between sea lions and affect their ability to detect predators (Richardson and Malme 1993; Weilgart 2007). Potential impacts to Steller sea lions from disturbances, such as anthropogenic noise produced by vessel activity, would generally occur at haul-outs and near rookeries, where in-air vessel noise could cause behavioral responses (avoidance of the sound source, spatial displacement from the immediate surrounding area, trampling, and abandonment of pups) (Calkins and Pitcher 1982; Kucey 2005). Sea lions could also respond with temporary movements from the area as a result of anthropogenic disturbances (Kucey 2005). The response of sea lions to disturbance may vary both temporally and spatially among groups within an area, and may result in greater avoidance or tolerance of certain areas depending on the source of the disturbance (Suryan and Harvey 1999; Gill et al. 2001; Kucey and Trites 2006).

Steller sea lions communicate under water using clicks, growls, snorts, and bleats (Poulter 1968). Anthropogenic noise, such as noise from vessel traffic, could mask and/or reduce the effectiveness of sea lion communication. However, NMFS (2008) ranked disturbance by vessel traffic as a minor threat to the recovery of the Steller Sea lion population.

Frequently Steller sea lions are observed hauling out in areas experiencing a high level of vessel traffic and human activity, such as boat marinas and navigation buoys (Jeffries et al. 2000; Fisheries and Oceans Canada 2010). Dutch Harbor has heavy vessel traffic (>62,000 transits in 2018-2019), thus it is likely that Steller sea lions in that area are habituated to vessel noise.

Vessels that approach rookeries and haulouts at slow speed, in a manner that allows sea lions to observe the approach, have less effects than vessels that appear suddenly and approach quickly (NMFS 2008). Sea lions may become accustomed to repeated slow vessel approaches, resulting in minimal response. Low levels of occasional disturbance may have long-term effects if the disturbance results in stampedes and injury or crushing of pups. Areas subjected to repeated disturbance may be permanently abandoned. Repeated disturbances that result in abandonment or reduced use of rookeries by lactating females could negatively affect body condition and survival of pups through interruption of normal nursing cycles (NMFS 2008). Pups are the age-class most vulnerable to disturbance from vessel traffic (NMFS 2008).

Sea lions in the action area are more likely to respond to vessel noise when a vessel passes a haulout than when a vessel passes a sea lion in the water (NMFS 2019d). However, the implementation of mitigation measures (Section 2.2.2), particularly vessels remaining more than 3 nm from major Steller sea lion rookeries and haulouts (listed in regulation at 50 CFR 224.103(d)(1)(iii) & 50 CFR 226.202), will make it unlikely that vessels associated with this action will disturb hauled-out Steller sea lions. The effects of vessel presence on sea lions in open water is likely to be temporary and transient in nature as the vessel approaches and passes sea lions.

Project vessel activity will result in a marginal increase in vessel noise in the MTR with the increase up to a potential 20 barges annually in the first year of a project, which could all travel within the same sealift. This one sealift could temporarily cause an increase in sound received by sea lions, but the impacts would be temporary and minor. A series of barges with a source level of approximately 170 dB at 1 meter travelling at 10 knots will be audible at received levels exceeding 120 dB at a fixed point in space for a maximum duration of about 1.2 hours). Subsequent to the first few years, only one to two barge transits are anticipated annually. The impact of vessel noise is expected to be temporary and very minor, and thus adverse effects to western DPS Steller sea lions will be immeasurably small.

Cetaceans

Bowhead whales

Bowhead whales are common throughout the waters, including the nearshore waters, off the NPR-A. Given that bowhead whales are on migration over extended distances, vessel traffic associated with the proposed barge landing areas may impact the whales (Figure 26). Vessel noise and presence can impact whales by causing behavioral disturbances, auditory interference, or non-auditory physical and physiological effects (e.g., vessel strike; Section 6.2.7.1.). The distance, speed, and direction of vessel travel in relation to whales, the whales' sensitivity to the vessels, and the activities engaged in by the whales all contribute to the level of response of the whales to the vessels. Bowhead whales are among the more vocal of the baleen whales (Clark and Johnson 1984). They mainly communicate using low frequency sounds. Most underwater calls are at a fairly low frequency that are audible to the human ear. Bowhead whales may use low-frequency sounds to obtain information about the ocean floor and locations of ice.

Based on a suite of studies of cetacean behavior to vessel approaches (Au and Perryman 1982; Hewitt 1985; Bauer and Herman 1986; Corkeron 1995; Bejder et al. 1999; Au and Green 2000; Nowacek et al. 2001; David 2002; Magalhaes et al. 2002; Ng and Leung 2003; Goodwin and Cotton 2004; Bain et al. 2006; Bejder et al. 2006; Lusseau 2006; Richter et al. 2006; Lusseau and Bejder 2007), the set of variables that help determine whether marine mammals are likely to be disturbed by surface vessels include 1) the number of vessels, 2) distance between the animal and the vessel, 3) vessel speed and vector, and 4) behavioral state of the animal(s). Most of the investigations reported that animals tended to reduce their visibility at the water's surface and move horizontally away from the source of disturbance or adopt erratic swimming strategies (Williams et al. 2002; Lusseau 2003; Lusseau 2006). In the process, their dive times increased, vocalizations and breaching were reduced (with the exception of beaked whales), individuals in groups moved closer together, swimming speeds increased, and their direction of travel took them away from the source of disturbance (Kruse 1991; Evans et al. 1994). Some individuals also dove and remained motionless, waiting until the vessel moved past their location. Most animals finding themselves in confined spaces, such as shallow bays, during vessel approaches tended to move towards more open, deeper waters (Kruse 1991). We assume that this movement would give them greater opportunities to avoid or evade vessels as conditions warranted.

Bowhead whale hearing sensitivity is thought to be greatest at lower frequencies, which is where acoustic energy from vessels is greatest. While it is theoretically possible for vessel noise to result in physical injury to a bowhead, this would require a bowhead to occur within a few meters of a sound source (propeller of a moving vessel). And even then, many vessels do not produce sound loud enough to cause bowhead injury (i.e., the TTS onset threshold for bowheads is 199 dB and vessels create sound levels of 190 dB or less). Bowheads are expected to detect and avoid areas where continuous sound exposure levels exceed tolerable limits (BLM 2019). Given those conditions, vessel noise and presence more likely would elicit short-term behavioral responses.

According to Richardson and Malme (1993), most bowheads will swim away quickly in response to vessels that approach them rapidly and directly. Avoidance usually begins when the vessel is 1–4 km (0.6–2.5 mi) away. Vessels can also temporarily disrupt whale activity and social groups (Richardson and Malme 1993). Retreating from a vessel generally stopped within minutes after the vessel passed, but scattering of whales may persist (Koski and Johnson 1987), while some bowheads return to their original locations (Richardson and Malme 1993). Bowheads often are more tolerant of vessels moving slowly or in directions other than toward the whales. Whale reactions to vessel presence was also reported by Bisson et al. (2013) where most whales exhibited no observable movement or neutral movement relative to moving vessels.

Multiple studies have reported that after disturbance and displacement by vessels, bowheads may return to a disturbed area within several days (Koski and Johnson 1987; Thomson and Richardson 1987). Other reactions can be more subtle, such as behavioral changes in their surfacing and blow cycles, while others appear to be unaffected. Further, bowheads actively engaged in social interactions or mating may be less responsive to vessels (MMS 2002).

Bowhead whales could encounter barge traffic along the MTR in the Bering, Chukchi, and Beaufort seas several times during this action for the 5 years, and once to twice a year thereafter; there are several mitigation measures that will reduce potential impacts to bowhead whales from noise associated with vessels. Although some bowheads could receive sound levels in exceedance of the acoustic threshold of 120 dB from the tugs during this proposed project, the noise is not likely to significantly disrupt normal behavioral patterns (Wieting 2016). While bowheads will likely be exposed to acoustic stressors from this proposed project, the duration of the exposure will be temporary and of very short duration because vessels will be in transit. A vessel with a source level of approximately 170 dB at 1 meter travelling at 10 knots will be audible at received levels exceeding 120 dB at a fixed point in space for a maximum duration of about 13 minutes. Because vessels will be emitting continuous sound as they transit through the area, vessel activities will alert bowheads of their presence before the received level of sound exceeds 120 dB (Level B take threshold). Therefore, a startle response is not expected. Rather deflection and avoidance are expected to be common responses in those instances where there is any response at all. The implementation of mitigation measures is expected to further reduce the significance of bowhead whale reaction to transiting vessels. While a few whales may be exposed to vessel noise, the effects are anticipated to be too small to detect or measure and are not likely to significantly disrupt normal bowhead whale behavioral patterns.

Humpback, fin, blue, sperm, and North Pacific right whales

Sub-arctic whales occurring in the MTR could be affected by vessel presence and noise in the same manner as previously described for the bowhead whale. The primary underwater noise associated with barging operations is the continuous cavitation noise produced by the propeller arrangement on the oceanic tugboats, especially when pushing or towing a loaded barge. For the MTR, the source levels of approximately 170 dB at 1 meter are associated with oceanic tug boat noise and are anticipated to decline to 120 dB re 1μPa rms within 1.85 km (1.15 mi) of the source (Richardson et al. 1995a).

Masking is of special concern for baleen whales that vocalize at low frequencies over long distances, such as humpback and fin whales, as their communication frequencies overlap with anthropogenic sounds such as shipping traffic. Some baleen whales have adjusted their communication frequencies, intensity, and call rate to limit masking effects. For example, McDonald et al. (1995) found that blue whales (*Balaenoptera musculus*) in California shifted their call frequencies downward by 31 percent since the 1960s, possibly to communicate below shipping sound frequencies. Melcon et al. (2012) found that blue whales increase their call rates in the presence of typically low frequency shipping sound, but significantly decrease call rates when exposed to mid-frequency sonar. Fin whales have reduced their calling rate in response to boat noise (Watkins 1986). Right whales have been observed changing vocal behavior due to shipping that has increased overall background noise (Parks et al. 2007).

Ship noise due to propeller cavitation can cause behavioral changes by baleen whales. Humpback whale reactions to approaching boats are variable, ranging from approach to avoidance (Payne 1978; Salden 1993). Baker et al. (1983) reported that humpbacks in Hawaii responded to vessels at distances of 2 to 4 km, however humpbacks showed no reaction at distances beyond 800 m when the whales were feeding (Watkins 1981; Krieger and Wing 1986). Humpback whales are especially responsive to fast moving vessels (Richardson et al. 1995), exhibiting aerial behaviors such as breaching or tail/flipper slapping (Jurasz and Jurasz 1979). However, temporarily disturbed whales often remain in the area despite the presence of vessels (Baker et al. 1988; Baker et al. 1992).

Bauer and Herman (1986) concluded that reactions to vessels are probably stressful to humpback whales, but that the biological significance of that stress is unknown. Humpback whales seem less likely to react to vessels when actively feeding than when resting or engaged in other activities (Krieger and Wing 1986). Mothers with newborn calves seem most sensitive to vessel disturbance (Clapham and Mattila 1993). Marine mammals that have been disturbed by anthropogenic noise and vessel approaches are commonly reported to shift from resting behavioral states to active behavioral states, which would imply that they incur an energy cost. Morete et al. (2007) reported that undisturbed humpback whale cows that were accompanied by their calves were frequently observed resting while their calves circled them (milling) and rolling interspersed with dives. When vessels approached, the amount of time cows and calves spent resting and milling declined significantly.

Fin whales responded to vessels at distances of about 1 km (Edds and Macfarlane 1987). Watkins (1981) found that fin and humpback whales appeared startled and increased their swimming speed to avoid approaching vessels. Jahoda et al. (2003) studied responses of fin whales in feeding areas when they were closely approached by inflatable vessels. The study concluded that close vessel approaches caused the fin whales to swim away from the approaching vessel and to stop feeding. These animals also had increases in blow rates and spent less time at the surface (Jahoda et al. 2003). This suggests the whales experienced increases in metabolic rates, which may indicate a stress response. All these responses can manifest as a stress response in which the mammal undergoes physiological changes with chronic exposure to stressors, and can interrupt behavioral and physiological events, alter time budget, or a combination of these stressors (Sapolsky 2000; Frid and Dill. 2002).

Although some whales could receive sound levels in exceedance of the acoustic threshold of 120 dB from vessels during this proposed action, the noise is not likely to significantly disrupt normal behavioral patterns (Wieting 2016). While they will likely be exposed to acoustic stressors from this proposed action, the duration of the exposure will be temporary and of very short duration, because vessels will be in transit. At 10 knots, vessels will ensonify a given point in space for no more than about 13 minutes. Project vessels will emit continuous sound while in transit, which will alert marine mammals before the received sound level exceeds 120 dB. Therefore, a startle response is not expected. Rather, slight deflection and avoidance are expected to be common responses in those instances where there is any response at all. The adherence to mitigation measures in Section 2.2 are expected to further reduce the potential for blue whales, North Pacific right whales, sperm whales, fin whales, or humpback whales to react discernibly to transiting vessels. We expect any effects to these species to be too small to detect or measure and that any effects would not significantly disrupt normal whale behavioral patterns. Additional stressors from vessel traffic (e.g., non-native species and trash and debris) are discussed in Sections 6.2.8 and 6.2.9, respectively.

The probability of sperm whale and North Pacific right whales encountering project vessel noise at levels above 120 dB is extremely small. Thus, the probability of exposure to vessel noise at the level of harassment by transiting vessels is very small, and adverse effects to North Pacific right and sperm whales are extremely unlikely to occur. Therefore, we conclude that adverse effects from the vessel noise to North Pacific right and sperm whales are improbable.

6.2.9 Trash and Debris

Projects on NPR-A will generate trash comprised of paper, plastic, wood, glass, metal, and organic material from vessels, galley and food service operations. A substantial amount of waste products could be generated from construction, production, and decommissioning activities. The possibility exists that trash and debris could be released into the marine environment. Discharge of trash and debris is illegal and it can pose significant risks to marine mammals, such as ingestion and entanglement.

Two ROPs (A-1 and A-2; see Section 2.2.3) and one mitigation measure (2.2.4, #10) address the handling of trash and debris. We expect that applicants will abide by these measures and all other regulations related to waste management. Even in the absence of these mitigation measures, most of the activities are terrestrial, limiting the likelihood of trash and debris entering the marine environment and listed species encountering it. However, some activities that may generate trash and debris will occur on the coast (vessel traffic, STP, and MTI). Even in those instances, we do not expect trash and debris to be generated to such a degree as to cause significant effects. Consequently, the amount of uncontained trash and debris occurring within the action area is expected to be minimal and result in an immeasurably small effect on ESA-listed species.

6.2.10 Non-native Species

Throughout the world, introduced invasive species have caused havoc in natural ecosystems. The impact of nonnatives in marine systems includes extirpation of native species through competition or predation, a decline in biodiversity, shifts in ecosystem food webs, and changes to the physical structure of the habitat (Trombulak et al. 2004; Norse and Crowder 2005). Ballast water is an important vector for introducing exotic species. We assume that all vessels used to transport equipment and modules to the NPR-A will transit from an Alaska port, most likely Dutch Harbor. Unlike most busy ports on the west coast, non-native species have not been documented in Dutch Harbor[25]. If modules or barges originated from foreign ports, EPA Vessel General Permit and Coast Guard regulations regarding ballast water would need to be followed. Under these circumstances we anticipate that it is extremely unlikely that non-native species will be delivered to the NPR-A through ballast water. In addition, compliance with federal and State rules and regulations regarding ballast water will further reduce the potential for non-natives to be introduced. For these reasons, it is extremely unlikely that non-native species will adversely affect any listed marine mammal.

6.2.11 Aircraft Noise

Aircraft operations would support NPR-A construction, operations, surveys, and monitoring activities. Section 2.1.1.11 outlines the potential for aircraft (i.e. helicopters and fixed-winged aircraft) to be used during summer in undeveloped portions of the NPR-A. Marine mammals could be disturbed by the acoustic noise or physical presence of low-flying aircraft. Airborne noise and visual cues are more likely to disturb individuals resting at the sea surface or hauled out on ice or land (BOEM 2012). Marine mammals underwater at the time of exposure could also be disturbed by noise propagating beneath the surface of the water or by shadows of an aircraft flying overhead. Observations made from low-altitude aerial surveys report highly variable behavioral responses from marine mammals ranging from no observable reaction to diving or rapid changes in swimming speed/direction (Efroymson and Suter 2001; Smultea et al. 2008). In general, it is difficult to determine if behavioral reactions are due to aircraft noise, to the physical presence and visual cues associated with aircraft, or a combination of those factors (Richardson et al. 1995).

Helicopters and fixed-wing aircraft generate noise from their engines, airframe, and propellers. The dominant tones for both types of aircraft generally are greater than 500 Hz (Richardson et al. (1995). Richardson et al. (1995) reported that received sound levels in water from aircraft flying at an altitude of 152 m (approximately 500 ft) were 109 dB re 1 µPa for a Bell 212 helicopter, 101 dB re 1 µPa for a small fixed-wing aircraft, 107 dB re 1 µPa for a twin otter, and 124 dB re 1 µPa for a P-3 Orion. Greene and Moore (1995) determined that fixed-wing aircraft typically used in offshore activities were capable of producing tones mostly in the 68 to 102 Hz range and at noise levels up to 162 dB re 1 µPa m at the source. In-air sound pressure levels for helicopters have been measured at 84 dB re 20µPa at 300 m (984 ft) (Boeker and Schulz 2010; SLR Consulting 2017).

Transmission of aircraft noise into the water is greatest directly below the aircraft at angles of incidence of 13 degrees or less. At angles greater than 13 degrees from vertical, much of the

[25] http://www.adfg.alaska.gov/index.cfm?adfg=invasive.main

sound is reflected off the water's surface and generally does not penetrate (Richardson et al. 1995). During calm seas, sound is completely reflected at larger angles and does not enter the water. However, during rough sea conditions, airborne sound may penetrate water at angles greater than 13°. Water depth and bathymetry can also influence the propagation of a noise from a passing aircraft into water. In shallow waters, lateral propagation is greater than in deep water, particularly when the sea floor is reflective. As the aircraft's altitude increases, the base of the cone gets bigger but the sound pressure levels (SPLs) reaching the water surface decrease because of distance.

Aircraft flying at lower altitudes will transmit more intense sound to a smaller sized disc at the water surface. Duration of underwater sound from passing aircraft is much shorter in water than air; for example, a helicopter passing at an altitude of 152 m (approximately 500 ft), audible in air for 4 minutes, may be detectable underwater for 38 seconds at 3 m (10 ft) depth, and 11 seconds at 18 m (59 ft) depth (Richardson et al. 1995).The duration of noise from passing fixed-wing aircraft is shorter, because fixed-wing aircraft generally travel faster and are quieter than helicopters.

Sounds from aircraft would not have physical effects on marine mammals, but represent acoustic stimuli (primarily low-frequency sounds from engines and rotors) that have been reported to affect the behavior of some marine mammals.

Bowhead Whales

There are studies of the responses of marine animals to air traffic but the few that are available have produced mixed results. The nature of sounds produced by aircraft above the surface of the water does not pose a direct threat to the hearing of marine mammals that are in the water; however, minor and short-term behavioral responses of cetaceans to aircraft have been documented in several locations, including the Arctic (Richardson et al. 1985; Patenaude et al. 2002). Richardson et al. (1995) reported that there is no evidence that single or occasional aircraft flying above large whales in water cause long-term displacement of these mammals.

Different aircraft maneuvers can have varying behavioral effects on bowhead whales. Fixed-wing aircraft flying at low altitude often cause bowhead whales to make hasty dives (Richardson and Malme 1993). Reactions to circling aircraft are sometimes conspicuous if the aircraft is below 300 m (1,000 ft), uncommon at 460 m (1,500 ft), and generally undetectable at 600 m (2,000 ft). Repeated low-altitude overflights at 150 m (500 ft) during aerial photogrammetry studies of feeding bowhead whales sometimes caused abrupt turns and hasty dives.

Individual bowhead whales affected by aircraft traffic are expected to exhibit brief behavioral responses. In the Patenaude et al. (2002) study, when bowhead whales did display discernible reactions to aircraft, reactions included abrupt dives, breaching, and short surfacing periods. Helicopters were more likely to elicit responses than fixed-wing aircraft (Patenaude et al. 2002). Patenaude et al. (2002) found that most reactions by bowhead whales to a Bell 212 helicopter occurred when the helicopter was at altitudes of 150 m or less and lateral distances of 250 m or less. The most common reactions were abrupt dives and shortened surface time and most, if not all, reactions seemed brief. However, the majority of bowhead whales showed no obvious reaction to single passes, even at those distances.

Patenaude et al. (2002) found that few bowhead whales (2.2%) during the spring migration were observed to react to Twin Otter overflights at altitudes of 60 to 460 m (197 to 1,509 ft). Reaction frequency diminished with increasing lateral distance and with increasing altitude. Most observed reactions by bowhead whales occurred when the Twin Otter was at altitudes of 182 m (597 ft) or less and lateral distances of 250 m (820 ft) or less. There was little, if any, reaction by bowhead whales when the aircraft circled at an altitude of 460 m (1,509 ft) and a radius of 1 km (0.6 mi). From this study it can be concluded that the effects from an aircraft are brief, and the bowhead whales should resume their normal activities within minutes. Unmanned aircraft systems are not as noisy as fixed-wing and helicopters, so we assume any effects from the use of these aircraft would be even less than the already minor effects from other aircraft.

Given that bowhead whales are rarely observed in the action area inside the barrier islands and the implementation of mitigation measures (see Section 2.2), the probability of aircraft traffic disturbing a bowhead whale is very small, and thus adverse effects to bowhead whales are extremely unlikely to occur. Additionally, given the short duration of exposure to aircrafts and the limited reactions bowhead whales have had to aircraft, if a bowhead whale is exposed to aircraft the impact is very minor, and thus adverse effects to bowhead whales will be immeasurably small.

Ringed and Bearded Seals

Ringed and bearded seals may be disturbed year-round from aircraft flying to and from NPR-A; however, the presence of bearded seals during the winter months is expected to be minimal. Most studies have analyzed the effects of aircraft on ringed seals. Bearded seals are expected to elicit similar responses to aircraft as ringed seals unless otherwise noted. Ringed seals have displayed various responses to aircraft (Kelly et al. 1986). Aircraft noise may directly affect seals hauled out on ice during molting or pupping; however, the presence of snow cover above ringed seal lairs will reduce the received levels of airborne sound for seals inside lairs (Richardson et al. 1995). Richardson et al. (1995) noted pinnipeds hauled out for pupping or molting are the most responsive to aircraft. Other authors noted ringed seal responses to aircraft are variable, depending on the time of year and environmental conditions (Burns and Harbo 1972; Burns and Frost 1979; Alliston 1981; Burns et al. 1982).

Born et al. (1999) indicated that the disturbance of hauled out ringed seals can be substantially reduced if a small helicopter does not approach ringed seals closer than 1,500 m. There are reports of seals habituating to frequent overflights to the point where there was no reaction. Richardson et al. (1995) and Hoover (1988) did not attribute seal pup mortality to low-flying aircraft, noting a temporary avoidance behavior reaction to aircraft as close as 76 m. A greater number of ringed seals responded to helicopter presence than to fixed-wing aircraft presence, and at greater distances (up to 2.3 km [1.4 mi] from the aircraft), suggesting sound stimuli trigger escape responses in ringed seal (Smith and Hammill 1981; Born et al. 1999). Kelly et al. (1986) also reported ringed seals leaving the ice when a helicopter was within 2 km (1.2 mi), flying below 305 m (1,000 ft) altitude. However, escape responses are not elicited consistently (Richardson et al. 1995).

Born et al. (1999) reported that the probability of hauled out ringed seals responding to aircraft overflights with escape responses was greatest at lateral distances of less than 200 m (600 ft) and overhead distances less than 150 m (~450 ft). Individual bearded seals have been documented exhibiting escape reactions when approached by aircraft (Burns and Harbo 1972; Richardson et al. 1995). Born et al. (1999) also reported ringed seals showed a 21 percent probability of fleeing from fixed wing aircraft at 100 m from the aircraft, 6% between 100 and 300 m from the flight track, and 2% between 300 and 500 m from the flight track. There was no specific study for Northstar operations that documented seal reactions to aircraft; however, incidental observations documented that most seals near Northstar reacted briefly and mildly when a helicopter arrived on the island. Less than 2% of seals reacted by diving to fixed-wing aircraft flying at 91 m (300 ft) during aerial surveys conducted in the late ice-covered season (Richardson 2008). Blackwell et al. (2004b) documented that 92 percent (11 of 12) ringed seals reacted to low-flying helicopter operations; however, these reactions were not strong or long lasting, with only 8% (1 of 12) seals returning to the water. The remaining 11 seals increased their vigilance and looked at the helicopter (Blackwell et al. 2004b).

Given the short duration of exposure to aircraft and the altitude of 1,500 ft helicopters and fixed wing airplanes will travel (along with additional mitigation measures; see Section 2.2.2), we conclude that the probability of aircraft traffic disturbing ringed and bearded seals is very small, and thus adverse effects to these species are extremely unlikely to occur. Additionally, since seal reactions have previously been documented as temporary and aircraft exposure would be limited in duration, we conclude that if ringed and bearded seals are exposed to aircraft noise the impact is expected to be very minor, and thus adverse effects to these species will be immeasurably small.

6.2.12 Screeding and Dredging

It is anticipated that screeding and dredging would occur on a regular basis to facilitate barge landings related to project work at the NPR-A. These activities would likely be performed in the summer immediately prior to the arrival of each sealift and as soon as sea ice conditions allow mobilization of the equipment. It is also likely that screeding or dredging would be needed for the construction and/or maintenance of the STPs and MTIs.

Screeding and dredging may affect marine mammals directly by introducing underwater noise into the environment and indirectly through seafloor disturbance and habitat alteration. Without knowing the specific type of equipment that will be used, the level of underwater sound expected, the amount of area effected, or the length of time the activity is needed, it is not possible to quantify the magnitude of effects that could occur. However, for other screeding and dredging projects on the North Slope the sound source level generated by these activities was either measured or estimated from similar projects and a distance to the Level B threshold for marine mammals was estimated. Level A disturbance would not be expected. We anticipate that when screeding and dredging projects are proposed, the Level B threshold for specific projects will be calculated and project-specific effects will be considered through section 7 consultations. Protective measures such as shutdown zones will then be incorporated into the mitigation measures for each project. With proper implementation of a required shutdown zone, based on our previous experience with such projects it is extremely unlikely that any listed marine mammals will be exposed to screeding and grading sounds capable of harassing them.

Screeding and dredging would displace or kill benthic invertebrates living on or in the substrate. In general, benthic infauna abundance and diversity are very low in this area, probably due to the harsh and unstable environmental conditions. Shallow water depth (< 5 m), freshwater run-off from rivers, and ice-related stress all contribute to the unpredictability and instability of the substrate and water quality (Carey et al. 1984). Freezing and thawing sea ice and river runoff during the summer melting season significantly affect the coastal water mass characteristics and decrease the salinity. River outflow and coastal erosion also transport significant amounts of suspended sediments (Dunton et al. 2006). Sea ice pressure ridges scour and gouge the seafloor and move sediments, creating natural, seasonal disruptions of the seafloor. These factors result in an unstable and unfavorable habitat for benthic organisms in the nearshore area where screeding and dredging would occur. Bottom disturbance is a natural and frequent occurrence in this nearshore region resulting in benthic communities with patchy distributions (Carey et al. 1984). The naturally low nearshore densities of benthic prey, the adaptation of these organisms to an unstable environment, and the relatively small area that would be impacted by screeding and dredging suggest that screeding and dredging would have a negligible effect on benthic productivity in this already highly disturbed (by ice) ecosystem. For these reasons, we conclude that screeding and dredging would not have an appreciable effect on the availability of prey to listed marine mammals and therefore would have a negligible effect on them.

Water quality would be temporarily affected in the localized area surrounding screeding and dredging projects. Turbidity and sedimentation rates are naturally high in this region due to ice scouring and gouging of the seafloor, delivery of suspended sediments from river outflow, and coastal erosion. Consequently, the additional suspension of sediment from screeding and dredging over a limited amount of time and area is not anticipated to have a measurable impact on water quality, prey important to listed marine mammals, nor to marine mammals themselves.

6.2.13 Effects on Critical Habitat

There are two designated critical habitats that could be affected by the proposed action: North Pacific right whale and Steller sea lion critical habitats.

6.2.13.1 North Pacific Right Whale Critical Habitat

A portion of the marine transit route passes adjacent to the Bering Sea unit of North Pacific right whale critical habitat (Figure 3). The BLM has stated that vessels would avoid North Pacific right whale critical habitat. However, there could be a scenario where the vessel would need to transit through critical habitat (e.g., due to operational or safety considerations). In the event that vessels must transit through the Bering Sea critical habitat unit, vessel operators would be required to exercise caution and reduce their vessel speed to ten knots, to reduce risks of vessel strike to North Pacific right whales. NMFS has imposed additional mitigation measures regarding vessel traffic through North Pacific right whale critical habitat (see section 2.2.2).

The BLM identified vessel presence and associated vessel noise as stressors that could deter North Pacific right whales from feeding in the critical habitat. We consider vessel activity and noise to be stressors that may affect North Pacific right whales, and discuss the impacts in Section 6.2.7.

The physical and biological features of the designated critical habitat for North Pacific right whales are species of large zooplankton in areas where right whale are known or believed to feed. In particular, these are the copepods *Calanus marshallae*, *Neocalanus cristatus*, and *N. plumchrus*, and a euphausiid, *Thysanoessa raschii*, whose very large size, high lipid content, and occurrence in the region likely make it a preferred prey item for right whales. For our effects analysis for North Pacific right whale critical habitat, we will focus on the effects of the action on the availability of these prey resources as the essential physical and biological feature of the critical habitat.

A stressor that could impact the essential feature of North Pacific right whale critical habitat is pollution from an accidental spill (e.g., fuel, oil) originating from the vessels associated with the action. If a spill were to occur, copepods and euphausiids in the critical habitat could be negatively impacted. Studies of the effects of ingestion of crude oil and polycyclic aromatic hydrocarbons by copepods have indicated impacts to survival, egg production rates, egestion rates, and egg hatching (Almeda et al. 2014).

The fact that the marine transit route for the proposed action does not occur in North Pacific right whale critical habitat, and rather, adjacent to it, reduces the likelihood that an oil spill or other pollution from the vessels would reach the designated critical habitat. An accidental spill would have to be of a sizable magnitude to reach the critical habitat from the nearby marine transit route. While vessels could transit through North Pacific right whale critical habitat unexpectedly if course alteration is necessary for safety reasons, we do not consider it likely that this will be a regular occurrence, as BLM has indicated vessels would avoid the area.

Pollution from fuel or oil leakages from transiting vessels is extremely unlikely. An oil or fuel leak will likely pose a significant risk to the vessel and its crew and actions to correct a leak should occur immediately to the fullest extent possible. In the event that a leak should occur, the amount of leaked fuel or oil is unlikely to cause widespread, high-dose contamination (excluding the remote possibility of severe damage to a vessel) that will impact copepods or euphasiids directly. If a small spill were to occur originating from project vessels, we expect that the released product will evaporate and disperse quickly in offshore waters.

The probability of an oil spill or fuel release originating from a vessel on the marine transit route and measurably affecting North Pacific right whale critical habitat is extremely small, and thus adverse effects are extremely unlikely to occur. Therefore we conclude that the adverse effects from a project-related fuel or oil spill on North Pacific right whale critical habitat are improbable.

6.2.13.2 Steller Sea Lion Critical Habitat

Steller sea lion critical habitat includes five PBFs: 1) terrestrial zones that extend 3,000 feet (0.9 km) landward from each major haulout and major rookery in Alaska; 2) air zones that extend 3,000 feet (0.9 km) above the terrestrial zone of each major haulout and major rookery in Alaska; 3) aquatic zones that extend 3,000 feet (0.9 km) seaward of each major haulout and major rookery in Alaska that is east of 144° W longitude; 4) aquatic zones that extend 20 nm (37 km) seaward of each major haulout and major rookery in Alaska that is west of 144°W longitude; and 5) three special aquatic foraging areas (Shelikof Strait area, the Bogoslof area, and the Seguam Pass area) (50 CFR §226.202).

Within the MTR of the action area, terrestrial and aquatic zones and the Bogoslof special aquatic foraging area may be impacted by project associated vessels through oil contamination. The MTR may also overlap with the critical habitat designated on and around the Pribilof Islands, St. Matthew Island, or St. Lawrence Island. An oil spill could alter the quality of critical habitat at a local scale. The most likely spills from the proposed action in the MTR would be a small spill of refined fuel oil (e.g., diesel fuel) within Dutch Harbor or in offshore waters. Small refined oil spills rapidly dissipate volatile toxic components within hours to a few days through evaporation, and residual components rapidly disperse in open waters. Although this type of spill would be expected to evaporate and disperse quickly, it may contact Steller sea lion critical habitat. Localized prey populations could be contaminated if a small spill were to occur. However, if a small spill were to reach the critical habitat, impacts would most likely be localized and temporary. The quality and availability of important habitat would not likely be impacted after a short recovery period, during which Steller sea lions would continue to have access to other areas of unaffected critical habitat nearby.

Terrestrial zones

The terrestrial zones extend 3,000 feet landward from each major haulout and major rookery. Small spills associated with vessel traffic from this project may occur, but are expected to evaporate or dissipate quickly in the ocean, minimizing impact to the coast to the point where we expect it will have no measurable impact upon shoreline habitat near rookeries or haulouts.

Air zones

There are no anticipated impacts to the air zone above Steller sea lion critical habitat.

Aquatic Zones east of 144ºW

The action area does not overlap with Steller sea lion aquatic zones east of 144ºW.

Aquatic Zones that extend 20 nm (37 km) seaward of each major haulout and major rookery in Alaska that is west of 144ºW

A small portion of the proposed marine transit route overlaps with or is adjacent to parts of the 20-nm aquatic zones in the Bering Sea, including near Dutch Harbor (Figure 3). In addition, depending on the routes vessels take to transit through the Bering Strait, they may also overlap with critical habitat designated on the Pribilof Islands, St. Matthew Island, or St. Lawrence Island.

Waters near Unalaska and Unimak Pass are frequently used by many ocean-going and commercial fishing vessels. Despite all of the traffic in and around rookery and haulout locations near Dutch Harbor, the Steller sea lion population in and around Dutch Harbor has been increasing at 3.07% y-1 for non pups, and 2.90% $^{y-1}$ for pups (Sweeney et al. 2018).

The incremental increase in vessel traffic due to this action will be extremely small. Transiting project vessels will be present within or adjacent to the aquatic zones for a very short period of time (about 3 hours), and they will most likely travel only along the outermost edges of these zones. Additionally, project vessels will not travel within 3 nm (5.5 km) of any Steller sea lion rookery or major haulout (see 50 CFR 224.103(d) and 226.202(a), and mitigation measure #7 in Section 2.2.2). Given the minimum distance to be maintained from these sites, as well as the limited overlap of the marine transit route with the aquatic zones, we find it extremely unlikely that the proposed vessel traffic will cause visual or acoustic disturbance to Steller sea lion rookeries or major haulouts. We also consider the probability of a spill or other discharge occurring that would have more than a de minimus effect on the aquatic zones to be very small. Moreover, if a small fuel spill occurred in these waters, within 24 hours it would be expected to evaporate, dissipate, or become entrained. For these reasons, we conclude effects from the proposed project to this PBF will be negligible and unlikely to occur.

Aquatic zones west of 144ºW may experience small spills associated with vessel traffic from this action. However, there are only one to two transits anticipated annually, the risk of small spills is very low, and any spills are expected to dissipate quickly.

Special aquatic foraging areas

Dutch Harbor is located within the Bogoslof special aquatic foraging area; consequently, transiting project vessels will travel through this designated area. Waters within the Bogoslof foraging area are frequently used by many ocean-going and commercial fishing vessels. As discussed above, the incremental increase in vessel traffic due to this action will be extremely small. Project vessels will be present within the Bogoslof foraging area for about 20 hours per traverse.

Transiting project vessels are not expected to have adverse impacts on Steller sea lion prey that occur in this foraging zone for the same reasons they are not expected to affect North Pacific right whale critical habitat. For the reasons discussed above with respect to the 20-nm aquatic zones, the small number of vessels transiting through the Bogoslof foraging area are also not expected to have other adverse impacts upon these waters. Therefore we conclude that the proposed project will have negligible effects on this PBF.

The Bogoslof special aquatic foraging area may experience small spills associated with vessel traffic from this action. However, the number of annual transits will be very few, the risk of small spills is very risk, and any spills are expected to dissipate quickly.

Due to the limited number of transits anticipated for this project and the tendency of a small spill associated with the vessels in transit to dissipate quickly, the impacts of a small oil spill are expected to be very minor, and thus any adverse effects to Steller sea lion critical habitat are expected to be immeasurably small. Therefore we conclude that adverse effects from a small oil spill on Steller sea lion critical habitat are negligible, and if critical habitat is exposed to a small spill we expect the effects to be inconsequential.

7 CUMULATIVE EFFECTS

"Cumulative effects" are those effects of future state or private activities, not involving Federal activities that are reasonably certain to occur within the action area (50 CFR 402.02). The proposed IAP is a land-use plan that covers a suite of activities, many of which are subject to future section 7 consultation. This programmatic Biological Opinion addresses foreseeable effects to listed species and critical habitat from all activities covered by the IAP, and we expect future consultations to address those effects in more detail as planning progresses for specific related projects. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA. The majority of future development that is likely to occur in or near the action area will be in the federally managed National Petroleum Reserve and the marine outer continental shelf, would require a federal permit or other action subject to section 7 consultation, and thus is excluded from the following discussion. Likewise, undeveloped lands that have been conveyed to Alaska Native corporations under the Alaska Native Claims Settlement Act are almost entirely wetlands and therefore require CWA Section 404 permits for development, which would trigger consultation under the ESA. A brief discussion of nonfederal actions contributing to potential cumulative effects follows.

We searched for information on non-Federal actions reasonably certain to occur along the North Slope and along the marine transit route portions of the action area in the Bering, Chukchi, and Beaufort seas. We did not find any information regarding non-Federal actions other than what has already been described in the *Environmental Baseline* (see Section 5 of this opinion).

The effects of continuing climate change pose major challenges to the future well-being of many marine and terrestrial species, probably leading to population declines and range contraction for some ice-dependent marine species. Some continuing non-Federal activities are reasonably certain to contribute to climate change within the action area. However, it is difficult if not impossible to distinguish between the action area's future environmental conditions caused by global climate change that are properly part of the environmental baseline versus cumulative effects. Therefore, all relevant future climate-related environmental conditions in the action area are described in the environmental baseline (Section 5).

We expect fisheries, subsistence harvest (bowhead whales, ice seals), oil and gas development, authorized and unauthorized pollutants and discharges (including spills), scientific research, and commercial shipping activities and other vessel traffic will continue into the future. Along with these activities, we expect the associated stressors of pollution, underwater noise, entanglement risks, vessel strikes, and competition for prey. We expect increases in fishery-related stressors in the northern Bering Sea, where there have been recent range expansions of commercially harvested species such as Pacific cod and walleye pollock.[26] We expect moratoria on commercial whaling and bans on commercial sealing in the U.S. will remain in place, aiding in the recovery of ESA-listed whales and pinnipeds. With the Northern Sea Route along the northern Russian coast and the Northwest Passage being open more often as ice cover declines, commercial shipping and other forms of vessel traffic (e.g., tourism) will certainly expand. We also expect that increases in shipping will result in increased occurrence of non-permitted oil and pollutant discharges.

Most development along the central Beaufort Sea coast in general, and in the action area in particular, is located in terrestrial habitats. Marine drill sites have been developed (e.g., Oooguruk, Nikaitchuq, and Northstar) and terrestrial oil and gas facilities in the region are prevalent (e.g., multiple facilities east of the action area, near Oliktok Point, Milne Point, and Point McIntyre, as well as the Alpine, Endicott, Badami, and Point Thomson fields, and the future Liberty Development). The oil and gas industry will continue to develop into the foreseeable future, and the activities that may affect listed species will be subject to section 7 consultation.

No future plans have been publicized for residential expansion in the action area. The local population of people is low. While their summer and winter subsistence activities occur throughout the coastal areas of the action area, the amount of human activity in the coastal areas is very low overall. Since coastal access is not expected to be increased by the proposed action, subsistence activities are not be expected to increase substantially.

Effects of climate change, fisheries, subsistence harvest, noise, ongoing oil and gas activities, authorized and unauthorized pollutants and discharges (including spills), scientific research,

[26] https://arctic.noaa.gov/Report-Card/Report-Card-2019/ArtMID/7916/ArticleID/845/Comparison-of-Near-bottom-Fish-Densities-Show-Rapid-Community-and-Population-Shifts-in-Bering-and-Barents-Seas Accessed 12/1/2020.

commercial shipping, and other vessel traffic each could contribute to cumulative effects on listed whales, Steller sea lions, and seals.

8 INTEGRATION AND SYNTHESIS

The Integration and Synthesis section is the final step of NMFS's assessment of the risks posed to species and critical habitat as a result of implementing the proposed action. In this section, we add the effects of the action (Section 6) to the environmental baseline (Section 5) and the cumulative effects (Section 7) to formulate the agency's biological opinion as to whether the proposed action is likely to: (1) result in appreciable reductions in the likelihood of both the survival or recovery of the species in the wild by reducing its numbers, reproduction, or distribution; or (2) result in the adverse modification or destruction of critical habitat as measured through direct or indirect alterations that appreciably diminish the value of designated critical habitat as a whole for the conservation of the species. These assessments are made in full consideration of the status of the species (Section 4).

As we discussed in the *Approach to the Assessment* section of this opinion, we begin our risk analyses by asking whether the probable physical, physiological, behavioral, or social responses of endangered or threatened species are likely to reduce the fitness of endangered or threatened individuals or the growth, annual survival or reproductive success, or lifetime reproductive success of those individuals.

As part of our risk analyses, we identified and addressed all potential stressors and considered all consequences of exposing listed species to all the stressors associated with the proposed action, individually and cumulatively, given that the individuals in the action area for this consultation are also exposed to other stressors in the action area and elsewhere in their geographic range.

In this opinion, our analyses focused on the BLM's Integrated Activity Plan for the National Petroleum Reserve-Alaska and the proposed activities that would be conducted pursuant to that plan. The activities that are likely to continue through year 85 include activities associated with maintenance, exploration, development, production, and abandonment/reclamation associated with the oil and gas industry, as well as other activities that may be authorized by BLM. Some of these activities would occur regularly, on an annual basis, while others would occur for as long as is necessary to complete the activity, affecting the frequency and duration of the associated stressors on listed species.

The activities covered in this action would occur in phases. BLM provided a hypothetical time frame of the activities that would occur under the Integrated Activity Plan. The timing and duration of the activities covered in the plan are associated with the timing of the lease sale, with seismic exploration and exploratory well drilling occurring first, within 2 to 4 years of the lease sale. Development activities that would occur further in time from the lease sale would include construction of up to two seawater treatment plants and module transfer islands (7 to 9 years after the lease sale). Once production begins (8 or more years after the lease sale), production would increase over the next 9 to 40 years after the lease sale; development of additional fields could occur 11 to 85 years after the lease sale. Abandonment and reclamation of the sites would occur 19 to 85 years after lease sale, or 2 to 5 years after production ends.

Ice road, trail, and pad construction, use, and maintenance would occur annually over 70 years, and occur in the ice-covered season. Dredging and screeding would occur on a regular basis to facilitate access for barges. Vessel traffic along the marine transportation route would occur in the summer months (July to September) from Dutch Harbor to the North Slope, carrying large processing and drill site modules, as well as bulk construction materials. Additional vessel traffic would occur along the North Slope during the open water season to transport equipment, personnel, and supplies along the coastline to and from established docks, barges, or the module transfer islands. The open water season is typically from July through October but may extend from June through November, depending on the year and the timing of sea ice melt and freeze up.

There are many variables that may affect a lessee's future activities (e.g., whether exploratory activities will lead to new wells, the price of oil and gas, etc.). Although we do not have information on any lessee's activities, a lessee's activities will be subject to review and approval by BLM and BLM will make its approval of any activity with the potential to take a marine mammal contingent upon the lessee having a valid MMPA incidental take authorization from NMFS. These activities therefore will be subject to separate ESA consultation. Given the lack of information we have on a lessee's activities through year 85, we assume that they will be similar to those analyzed in this opinion, and the analysis considers the potential effects from them.

BLM's lease stipulations are designed to minimize impacts to listed species and habitats. However, in a few cases, BLM indicated that there may be exceptions granted to certain parts of these lease stipulations in the future, changes that may possibly cause different effects to listed species than those analyzed in this opinion. BLM submitted Lease Notices, Lease Stipulations, and Required Operating Procedures as part of the description of the action. Given the programmatic nature of both the IAP and this consultation, certain mitigation measures included in sections 2.2.1, 2.2.2, and 2.2.3 lack sufficient details to ensure that their intended effect of reducing impacts to listed marine mammals will be realized. We therefore did not rely upon them in our jeopardy analysis or in reaching our conclusion. . These measures include: Lease Notice 3, Lease Stipulation K-1, K-2, K-3, K-4, and Required Operating Procedure E-5). Subsequent consultations will be required for specific actions taken under the IAP that may affect listed species, and we will analyze all mitigation measures in those consultations where we expect that the action agency will be able to provide more specificity about a proposed project and related mitigation measures. These consultations will also afford BLM the opportunity to specify additional action-specific mitigation measures as we analyze whether those subsequent actions are likely to jeopardize the continued existence of listed species or destroy or adversely modify their critical habitat.

8.1 Cetacean Risk Analysis

Based on the results of the Exposure Analysis, we expect bowhead whales will not be adversely affected by exposure to seismic exploration noise, or vessel or aircraft noise. With the implementation of mitigation measures, exposure to vessel noise, aircraft noise, vibroseis survey activities, and small oil spills may occur, but the effects on bowhead whales are expected to be minor. Construction of the MTIs and STPs is proposed to occur in winter on grounded ice. With this seasonal limitation, we anticipate that bowhead whales would not be in the area. If construction or decommissioning occurred, in the open water season, bowhead whales could be exposed to noise from sheet pile and pipe pile installation or removal, gravel placement, and dredging/screeding. We expect that appropriate mitigation measures specified in Section 2.2

and/or via subsequent project-specific section 7 consultations would effectively avoid or minimize effects to listed cetaceans.

Our consideration of probable exposures and responses of listed whales to oil and gas exploration, development, production, and abandonment activities associated with the proposed action is designed to help us assess whether those activities are likely to increase the extinction risks or jeopardize the continued existence of listed whales. The activities associated with this action include ice road construction, use, and maintenance, vibroseis surveys of shorefast ice, potential need for a seawater treatment plant, module transfer island, exploratory, delineation, and production well drilling, installation of a barge landing, and vessel and air traffic. Implementation of mitigation measures in association with the actions reduce the impacts of these stressors to listed cetaceans, and some of these future activities may require additional ESA section 7 consultation.

We expect that bowhead whales will not be exposed to the noise associated with ice road, trail, and pad construction, use, and maintenance because these activities would occur primarily in winter when bowheads are not expected to be present. Screeding and dredging would occur on a regular basis to facilitate barge landings, and could expose bowhead whales to underwater noise in addition to altering habitat and impacting benthic invertebrates. Any impacts on marine mammal prey occurring from the proposed action are likely to be immeasurably small, and mitigation measures would avoid or minimize the effects from noise to bowhead whales. Finally, vessel strikes for most large whales are extremely unlikely to occur due to the included mitigation measures. However, a small number of Western North Pacific DPS and/or Mexico DPS humpback whales may be struck by vessels included in the proposed action, owing to the increasing numbers of humpbacks along the marine transit route and the documented occurrence of humpback whale strikes by vessels in Alaska over time.

Based on the results of the Exposure Analysis, we expect fin, sperm, blue, humpback, and North Pacific right whales will not be measurably affected by exposure to vessel noise. With implementation of mitigation measures, exposure to vessel noise and small oil spills may occur, but the effects are expected to be minor. The probability of impacts on marine mammal prey occurring from such spills is very small, and thus any adverse effects are likely to be immeasurably small. Finally, exposure to large and very large oil spills and unauthorized discharge is extremely unlikely to occur.

Small spills will be localized in nature, and we expect relatively rapid weathering for spills <1,000 bbl of oil. There will be a relatively small number of transits in proposed action, and there will be safeguards in place to avoid and minimize oil spills. While we expect small oil spills to occur as a result of this action, we do not expect these spills will have a measurable effect upon listed cetaceans.

Although the vessel transit and noise associated with shipping activities of the lessee(s) are likely to cause some individual whales to experience changes in their behavioral states that might have adverse consequences (Frid and Dill. 2002), these responses are not likely to alter the physiology, behavioral ecology, or social dynamics of individual whales in ways or to a degree that would reduce their fitness because it is anticipated that the whales will continue to actively forage in waters around operations or will seek alternative foraging areas during brief periods of disturbance. The primary mechanism by which the behavioral changes we have discussed affect the fitness of individual animals is through the animal's energy budget, time budget, or both (the two are related because foraging requires time). Large whales such as fin and humpbacks have an ability to store substantial amounts of energy, which allows them to survive for months on stored energy during migration and while in their wintering areas, and their feeding patterns allow them to acquire energy at high rates. The individual and cumulative energy costs of the behavioral responses we have discussed are not likely to markedly reduce the energy budgets of listed cetaceans (i.e., reduce the amount of time they spend at the ocean's surface, increase their swimming speed, change their swimming direction to avoid tug operations, change their respiration rates, increase dive times, reduce feeding behavior, or alter vocalizations and social interactions). Their probable exposure to noise sources is not likely to reduce their fitness or current or expected future reproductive success or reduce the rates at which they grow, mature, or become reproductively active. Therefore, these responses are not likely to reduce the abundance, reproduction rates, or growth rates (or increase variance in one or more of these rates) of the populations those individuals represent.

As mentioned in the Environmental Baseline section, bowhead whales may be impacted by anthropogenic activities present in the action area. However, throughout the action area where bowhead whales occur, there is a low amount of human activity associated with the anthropogenic activities posing risks to bowhead whales. The risk factors include ship strikes, oil and gas development, subsistence hunting, climate change, noise pollution from aircraft and vessels, and potential oil spills. The whales along the MTR may experience, in addition to the impacts associated with sealift (vessel) operations during transit, impacts from other commercial vessels in transit, commercial fishing gear entanglement, marine debris, and climate change. The species may be affected by multiple threats at any given time, compounding the impacts of the individual threats.

As we discussed in the Approach to the Assessment section of this opinion, an action that is not likely to reduce the fitness of individual whales would not be likely to reduce the viability of the populations those individual whales represent (that is, we would not expect reductions in the reproduction, numbers, or distribution of such populations). For the same reasons, an action that is not likely to reduce the viability of those populations is not likely to increase the extinction probability of the species those populations comprise. As a result, the proposed action is not likely to appreciably reduce the sperm, blue, bowhead, North Pacific right, fin, Mexico DPS humpback, or Western North Pacific DPS humpback whales' likelihood of surviving or recovering in the wild.

The strongest evidence supporting the conclusion that the proposed action will likely have minimal impact on fin, humpback, and bowhead whale populations is the estimated growth rate of these populations in the sub-Arctic and North Pacific. Zerbini et al. (2006) estimated the annual rate of increase for fin whales in coastal waters south of the Alaska Peninsula to be around 4.8 percent (95 percent CI: 4.1-5.4 percent) for the period 1987-2003. The maximum net productivity rate for the Northeast Pacific fin whale stock is estimated to be 4 percent per year (Muto et al. 2020). While there is no accurate estimate of the maximum productivity rate for the Central North Pacific stock of humpback whales, it is thought to be 7 percent (Muto et al. 2020). Bowhead whale population numbers also increased at a rate of 3.7 percent from 1968 to 2011 (Muto et al. 2020); however, evidence from subsistence-harvested bowhead whales show injuries consistent with vessel collisions, and entanglement in fishing gear (George et al. 2017), indicating these impacts pose threats to the population. Sperm whales population numbers are unknown, but there are no documented ship strikes in the Bering Sea or northern Alaska, and only one entanglement in western Alaska. There are no documented adverse interactions between North Pacific right whales and vessels in the action area. The Eastern North Pacific blue whale stock abundance is uncertain, with little evidence to support a population increase, while the Central North Pacific stock is estimated at 133 individuals (Carretta et al. 2020). There have been no documented vessel strike of blue whales or blue whale entanglements with fishing gear in Alaska from 2012 to 2016. Despite exposure to vessel traffic, a number of humpback and fin whale entanglements in fishing gear, and two known unauthorized subsistence takes of humpback whales in Alaska, the increase in the number of listed whales suggests that the stress regime these whales are exposed to in the MTR and North Slope portions of the action area has not reduced their range and frequency of occurrence in the action area.

Due to the implementation of mitigation measures in Section 2.2.4, including reducing vessel speed when visibility is limited and/or when whales are spotted, and because of the limited number of transits annually, exposures to vessel strikes and to vessel noise at received levels that could cause harassment to listed whales are expected to be minimal. Individuals may experience masking by vessel sounds, and may exhibit behavioral responses from vessel transit. Therefore, ESA-listed whales may experience stress responses. If whales are not displaced and remain in a stressful environment (i.e., within the behavioral harassment zone), we expect the stress response will dissipate shortly after the individual leaves the area or after the cessation of the acoustic stressor. TTS and PTS may occur if a listed species is within the Level B or Level A harassment zone, respectively; however, the severity of TTS and PTS depends on the duration, frequency, sound pressure, and rise time of a sound (Finneran and Schlundt 2013). No exposure of cetaceans to sounds capable of causing PTS or TTS is anticipated from this proposed action. Although vessel transit is likely to cause individual whales to experience changes in their behavioral states that might have adverse consequences (Frid and Dill. 2002), these responses are not likely to alter the physiology, behavioral ecology, or social dynamics of individual whales in ways or to a degree that would reduce their fitness. The proposed action therefore is not expected to reduce the reproduction, numbers, or distribution of listed cetaceans.

Based on the best information currently available, the proposed action is not expected to appreciably reduce the likelihood of survival and recovery of the listed cetaceans in this action and the only anticipated takes for listed cetaceans from this action are a small number of possible vessel strikes of Western North Pacific DPS and/or Mexico DPS humpback whales over the 85-year duration of the Integrated Activity Plan. A more specific take analysis would be conducted on a project-specific level during future Section 7 consultations.

8.2 Pinniped Risk Analysis

According to the Status of the Species section, the best available data on abundance estimates indicates the population in the Chukchi and Beaufort Seas to be at least 300,000 ringed seals (Kelly et al. 2010). Boveng et al. (2017) reported model-averaged abundance estimates of 170,000 (in 2012), and 125,000 (in 2013). However, as we noted in the Environmental Baselines, ice-dependent species like ringed and bearded seal populations could face more pronounced consequences because of a loss of sea ice due to climate change. In addition, a loss of sea ice in the future could mean that the Northern Sea Route and Northwest Passage would be more available for vessels, leading to an increase in vessel effects to ice seals. We expect that subsistence harvest of ringed and bearded seals will continue into the future. Although Steller sea lion abundance is declining in the western Aleutians, it is thought to be increasing in the eastern part of the Western DPS range. Other risk factors discussed in the Environmental Baseline include oil and gas development, fisheries interaction, climate change, disease, noise pollution from aircraft and vessels, and potential oil spills. The pinniped species may be affected by multiple threats at any given time, compounding the impacts of individual threats.

Based on the results of the exposure analysis (see Section 6.2), we expect ringed and bearded seals and Steller sea lions will likely be exposed to underwater noise associated with this action. Exposure to vessel noise and small oil spills may occur but effects would be immeasurably small.

Screeding and dredging would occur on a regular basis to facilitate barge landings, and could expose bearded and ringed seals to underwater noise while altering habitat and impacting prey resources. The extent of impacts on pinniped prey from the proposed action would be immeasurably small, and mitigation measures would avoid or minimize the effects from noise.

Activities could expose seals to noise, either in-air or in-water noise, depending on where the activity took place and during what season. Exploratory well drilling, ice road, trail, and pad construction, MTI and STP construction, and vibroseis surveys would take place during winter, and may expose ringed and to a far lesser extent, bearded seals to in-air noise. We expect that take by harassment would occur to these species as a result of this in-air or in-water noise. If construction of STPs or MTIs extended into the open water season, or if the structures were decommissioned during open water season, seals could be exposed to in-water noise. Screeding and dredging would occur in the open water season, possibly exposing seals to in-water noise. We expect that the project's mitigation measures will avoid and minimize the project's adverse effects to ringed and bearded seals.

Exposure to aircraft noise and noise from vibroseis surveys may occur but would not rise to the level of take of ringed or bearded seals. Stressors associated with on-ice activities (ice road and ice trail/pad construction, maintenance, and operation) are not expected to result in Level B harassment from noise for ringed seals, Level B harassment through physical presence for ringed seals, or mortality for ringed seals. Finally, exposure to vessel strike is extremely unlikely to occur for Steller sea lions and ringed and bearded seals. Mitigation measures required for ice roads and aircraft operations further reduce the impacts of project activities to ringed and bearded seals (Section 2.2.4.1; (BLM 2020c)).

The primary mechanism by which the behavioral changes we have discussed affect the fitness of individual animals is through the animal's energy budget, time budget, or both (the two are related because foraging requires time). Fall and early winter periods, prior to the occupation of breeding sites, are important in allowing female ringed seals to accumulate enough fat stores to support estrus and lactation (Kelly et al. 2010a). Fall and early winter overlaps with ice road construction. Winter is when the vibroseis surveys would occur, when pups and their mothers are in their lairs, effectively insulated from in air sound and visual disturbance by humans. The individual and cumulative energy costs of the behavioral responses that may be exhibited are not likely to reduce the energy budgets of ringed seals. As a result, the ringed seal's probable responses (i.e., tolerance, avoidance, short-term masking, and short-term vigilance behavior) to close approaches by vehicles and their probable exposure to noise or human disturbance are not likely to reduce the fitness, or current or expected future reproductive success, or reduce the rates at which they grow, mature, or become reproductively active. Therefore, these exposures are not likely to reduce the abundance, reproduction rates, or growth rates (or increase variance in one or more of these rates) of the populations those individuals represent. For physical disturbance, if an active ringed seal lair is not detected and is impacted by heavy equipment, the adult female could likely escape into the water but the pup could be killed by crushing or premature exposure to the water or frigid air. However, this is not anticipated because of required exclusion areas set forth in the mitigation measures. Equipment is only permitted to operate on grounded ice out to depths of 10 feet with the exception of snow machines to place and retrieve recorders per the nearshore seismic activities mitigation measure in Section 2.2.4, (3.d). Additionally, there is a 500 foot exclusion zone around known seal locations per the nearshore seismic activities mitigation measure in Section 2.2.4 (3.c). Any impacts to individual ringed seals are not likely to reduce the abundance, reproductive rates, or growth rates of the populations those individuals represent.

Based on the localized nature of small oil spills, the relatively rapid weathering expected for spills <1,000 bbl of oil, and the safeguards in place to avoid and minimize oil spills, we conclude that the probability of exposing ringed or bearded seals or Steller sea lions is extremely small. If exposure were to occur, due to the ephemeral nature of small oil spills, NMFS does not expect detectable responses from pinnipeds, and we would consider the effects of the proposed action to be minor. A VLOS or multiple large oil spills is unlikely; however, if a low probability, high impact event where pinnipeds experience prolonged exposure to toxic fumes, and/or ingest large amounts of oil, could result in injury and mortality that exceeds PBR. Because of the low likelihood of multiple large oil spills or a VLOS, we consider the risk of significant, long-term exposures to accidental discharges of oil to be low.

The activities associated with barging to the North Slope are not expected to cause individual ringed and bearded seals and Steller sea lions to experience changes in their behavioral states that might have adverse consequences that alter the physiology, behavioral ecology, and social dynamics of individuals in ways or to a degree that would reduce their fitness. Transiting vessels will emit sounds, but those sounds will be short term as the vessel passes. If the ringed or bearded seals are actively foraging in the waters off of the North Slope when a barge arrives at the barge landing site, they can actively avoid the vessel.

Based on the best information currently available, the proposed action is not expected to appreciably reduce the likelihood of survival and recovery of the listed pinnipeds.

8.3 Critical Habitat Risk Analysis

As discussed above in Section 6.2.12, effects to critical habitat are limited to the potential for small spills and visual or acoustic disturbance along the portions of the MTR that are nearest to critical habitat for North Pacific right whales and Steller sea lions. The probability of a small oil spill of refined oil occurring is possible; however any spills that do occur are expected to evaporate or dissipate quickly in the ocean; thus adverse effects to critical habitat are extremely unlikely. Given the minimum distance to be maintained from Steller sea lion major haulouts and rookeries, as well as the limited overlap of the marine transit route with the aquatic zones, we find it extremely unlikely that the presence of project vessels will have an adverse impact upon the physical and Biological features (or Primary Constituent Elements) of Steller sea lion critical habitat. Because the incremental increase in vessel traffic due to this action will be extremely small within Steller sea lion critical habitat, transiting project vessels are not expected to have adverse impacts on Steller sea lion prey that occur in the special aquatic foraging zones. We conclude that the proposed action will have negligible effects on these foraging zones within

Steller sea lion critical habitat. Likewise, we do not expect the proposed action will have any discernible effects on the prey feature of North Pacific right whale critical habitat. Any adverse effects to critical habitat therefore will not appreciably diminish the value of the critical habitat for the conservation of North Pacific right whales or western DPS Steller sea lions.

9 CONCLUSION

After reviewing the current status of the species, the environmental baseline within the action area, the effects of the proposed action, and cumulative effects, it is NMFS's biological opinion that the proposed action is not likely to jeopardize the continued existence of Beringia DPS bearded seals, Arctic ringed seals, western DPS Steller sea lions, bowhead whales, blue whales, fin whales, Western North Pacific DPS humpback whales, Mexico DPS humpback whales, North Pacific right whales, or sperm whales. The action is also not likely to destroy or adversely modify designated critical habitat for North Pacific right whales or Steller sea lions.

10 INCIDENTAL TAKE STATEMENT

Pursuant to section 7(a)(2) implementing regulations (80 FR 26832, May 11, 2015), an Incidental Take Statement is not required at the programmatic level for framework programmatic actions where information on the specific number, location, timing, frequency, and intensity of actions is unknown, and any incidental take resulting from any actions subsequently authorized, funded, or carried out under the program will be addressed in separate ESA section 7 consultations (see 50 CFR §402.14(i)(6)). A framework programmatic action is a Federal action that approves an agency program or plan that is the framework for the development of future action(s) authorized, funded, or carried out at a later time, and any take of a listed species would not occur unless and until those future action(s) are authorized, funded, or carried out and subject to further section 7 consultation (50 CFR §402.02).

The Integrated Activity Plan in and of itself will not affect listed species under NMFS's jurisdiction and will not alone result in the incidental take of listed species under NMFS's jurisdiction (80 FR 26832, 26835; May 11, 2015). If blocks are leased in the sale, the subsequent authorization of exploration permits or plans, permits to drill, and development and production plans may affect listed species and require BLM and other action agencies to initiate project-specific consultation associated with those subsequent actions, including NMFS's issuance of MMPA incidental take authorizations. Similarly, activities covered by the Integrated Activity Plan that are not related to the oil and gas industry may affect listed species. Subsequent consultation will be required for all future activities related to the Integrated Activity Plan that may affect listed species.

For each subsequent consultation, NMFS will determine whether a future activity under this framework program is or is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of the critical habitat of such species. NMFS also will determine whether take is reasonably certain to occur and will specify the reasonable and prudent measures necessary or appropriate to minimize and monitor the amount and extent of take, with implementing terms and condition, in accordance with 50 CFR 402.14(i).

For all future activities associated with the Integrated Activity Plan, project-specific information will aid in the assessment of effects on listed species and the amount and extent of incidental take resulting from that project. Project-specific information also will aid in the development of sufficiently specific and meaningful reasonable and prudent measures and terms and conditions intended to minimize and monitor impacts from each future activity (80 FR 26832, 26835-36; May 11, 2015). In addition to the mitigation measures provided in this opinion, additional mitigation measures may be included in subsequent section 7 consultations.

NMFS will compare the effects of future project-specific actions and associated take levels to the effects anticipated under this overarching Integrated Activity Plan opinion. If the project-specific effects on the listed species or designated critical habitat will occur in a manner or to an extent not considered in this opinion, reinitiation of consultation on the Integrated Activity Plan will be required.

Reasonable and prudent measures (RPMs) and Terms and Conditions (T&Cs) are usually included in biological opinions. However, under a framework programmatic consultation, all subsequent activities that could cause take will be subject to section 7 consultation, thus NMFS will craft specific and meaningful RPMs and T&Cs at that time so that they are relevant to the specific activity(ies). For a framework programmatic action, it is preferred to develop RPMs and T&Cs once NMFS has more detailed, project-specific information from the subsequent consultations on future activities (80 FR 26832, 26835-36; May 11, 2015).

11 CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs Federal agencies to use their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of the threatened and endangered species. Specifically, conservation recommendations are suggestions regarding discretionary measures to minimize or avoid adverse effects of a proposed action on listed species or critical habitat or regarding the development of information (50 CFR 402.02).

In order to keep NMFS's Protected Resources Division informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats, BLM should notify NMFS of any conservation recommendations they implement in their final action.

1. BLM should conduct or fund surveys to determine densities and distribution of ringed and bearded seals on ice and in marine waters offshore of the NPR-A.
2. BLM should conduct or fund surveys to determine densities and distribution of cetaceans in marine waters offshore of the NPR-A.
3. BLM should design and implement studies to measure the contaminant load in ringed and bearded seals and bowhead whales.
4. BLM should conduct sound source verifications to ensure that vibroseis and winter pile driving operations do not transmit significant acoustic energy into adjacent waters beneath ice that may be used by ringed seals.
5. BLM should encourage all vessel operators to take photos and/or videos of humpback whales from appropriate distance (remain at least 100 yards away). Getting a view of the flukes is extremely valuable. Also record the geographic coordinates for the observed animals, with the position recorded by using the most precise coordinates practicable.

Include the number of animals per sighting event and the number of adults/juveniles/calves if possible. Recording the environmental conditions at the time, including sea conditions, weather conditions, visibility (km/mi), lighting conditions, and percent ice cover is also valuable information. Transmit the information to AKR.section7@noaa.gov. Include the tracking number from this consultation (AKRO-2020-01519) in the subject line.

BLM should strongly encourage or require applicants to work with NMFS to develop marine mammal deterrence plans/tactics that can be applied when large oil spills occur. This will reduce the likelihood of exposure to toxic hydrocarbons.

12 REINITIATION OF CONSULTATION

As provided in 50 CFR 402.16, reinitiation of consultation is required where discretionary Federal agency involvement or control over the action has been retained or is authorized by law and if: (1) the amount or extent of incidental take is exceeded, (2) new information reveals effects of the agency action on listed species or designated critical habitat in a manner or to an extent not considered in this opinion, (3) the agency action is subsequently modified in a manner that causes an effect on the listed species or critical habitat not considered in this opinion, or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount of incidental take is exceeded, section 7 consultation must be reinitiated immediately.

13 DATA QUALITY ACT DOCUMENTATION AND PRE-DISSEMINATION REVIEW

Section 515 of the Treasury and General Government Appropriations Act of 2001 (Public Law 106-554) (Data Quality Act (DQA)) specifies three components contributing to the quality of a document. They are utility, integrity, and objectivity. This section of the opinion addresses these DQA components, documents compliance with the DQA, and certifies that this opinion has undergone pre-dissemination review.

13.1 Utility

This document records the results of an interagency consultation. The information presented in this document is useful to NOAA, BLM, and the general public. These consultations help to fulfill multiple legal obligations of the named agencies. The information is also useful and of interest to the general public as it describes the manner in which public trust resources are being managed and conserved. The information presented in these documents and used in the underlying consultations represents the best available scientific and commercial information and has been improved through interaction with the consulting agency.

This consultation will be posted on the NMFS Alaska Region website http://alaskafisheries.noaa.gov/pr/biological-opinions/. The format and name adhere to conventional standards for style.

13.2 Integrity

This consultation was completed on a computer system managed by NMFS in accordance with relevant information technology security policies and standards set out in Appendix III, 'Security of Automated Information Resources,' Office of Management and Budget Circular A-130; the Computer Security Act; and the Government Information Security Reform Act.

13.3 Objectivity

Standards: This consultation and supporting documents are clear, concise, complete, and unbiased; and were developed using commonly accepted scientific research methods. They adhere to published standards including the ESA Consultation Handbook, ESA Regulations, 50 CFR 402.01 et seq.

Best Available Information: This consultation and supporting documents use the best available information, as referenced in the literature cited section. The analyses in this opinion contain more background on information sources and quality.

Referencing: All supporting materials, information, data and analyses are properly referenced, consistent with standard scientific referencing style.

Review Process: This consultation was drafted by NMFS staff with training in ESA implementation, and reviewed in accordance with Alaska Region ESA quality control and assurance processes.

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