

Final Environmental Assessment
For the Issuance of an Incidental Harassment Authorization for the
Take of Marine Mammals by Harassment Incidental to Conducting
Ice Overflight Surveys in the U.S. Chukchi and Beaufort Seas

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LOCATION: U.S. Chukchi and Beaufort Seas

ABSTRACT: National Marine Fisheries Service proposes to issue an Incidental Harassment Authorization (IHA) to Shell Offshore Inc. and Shell Gulf of Mexico Inc. (collectively "Shell") for the take of marine mammals incidental to conducting ice overflight surveys in the U.S. Chukchi and Beaufort Seas.

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List of Acronyms, Abbreviations, and Initialisms

2D	2-dimensional
3D	3-dimensional
4MP	Marine Mammal Monitoring and Mitigation Plan
ABWC	Alaska Beluga Whale Committee
ACIA	Arctic Climate Impact Assessment
ADEC	Alaska Department of Environmental Conservation
ADFG	Alaska Department of Fish and Game
AEWC	Alaska Eskimo Whaling Commission
AHD	Acoustic Harassment Device
ANO	Alaska Native Organization
BCB	Bering-Chukchi-Beaufort Seas (stock of bowhead whale)
BOEM	Bureau of Ocean Energy Management
BOEMRE	Bureau of Ocean Energy Management, Regulation and Enforcement
BP	BP Exploration Alaska
BSEE	Bureau of Safety and Environmental Enforcement
CFR	Code of Federal Regulations
CEQ	President's Council on Environmental Quality
COMIDA	Chukchi Offshore Monitoring in Drilling Area
CZMA	Coastal Zone Management Act
DASAR	Directional Autonomous Seafloor Acoustic Recorder
dB	decibel
DOI	Department of the Interior
DPS	Distinct Population Segment
EA	Environmental Assessment
EEZ	Exclusive Economic Zone
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EO	Executive Order
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FMP	Fishery Management Plan
ft	foot/feet
FR	Federal Register
hr	hour
Hz	hertz
IHA	Incidental Harassment Authorization
IMO	International Maritime Organization
IMP	Ice Management Plan
ION	ION Geophysical
IPCC	Intergovernmental Panel on Climate Change
IWC	International Whaling Commission
L-DEO	Lamont-Doherty Earth Observatory
LME	Large Marine Ecosystem
MMO	Marine Mammal Observer
MMPA	Marine Mammal Protection Act
MMS	Minerals Management Service

MSFCMA	Magnuson-Stevens Fishery Conservation and Management Act
NAO	NOAA Administrative Order
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollution Discharge Elimination System
NPFMC	North Pacific Fisheries Management Council
NRC	National Research Council
NSB	North Slope Borough
NSR	New Source Review
OMB	Office of Management and Budget
p-p	peak-to-peak
POC	Plan of Cooperation
psi	pounds per square inch
PSO	Protected Species Observer
psu	practical salinity units
PTS	Permanent Threshold Shift
rms	root-mean-square
SEL	Sound Exposure Level
SIWAC	Shell Ice and Weather Advisory Center
SPL	Sound Pressure Level
TS	Threshold Shift
TTS	Temporary Threshold Shift
UAS	Unmanned Aerial Surveys
U.S.C.	United States Code
USCG	United States Coast Guard
USGS	United States Geological Survey
USFWS	United States Fish and Wildlife Service

Chapter 1 INTRODUCTION AND PURPOSE AND NEED

1.1 Description of Proposed Action

The Marine Mammal Protection Act (MMPA) prohibits the incidental taking of marine mammals. The incidental take of a marine mammal falls under three categories: mortality, serious injury, or harassment, which includes injury and behavioral effects. The MMPA defines harassment as any act of pursuit, torment, or annoyance which: (1) has the potential to injure a marine mammal or marine mammal stock in the wild (Level A harassment); or (2) 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). There are exceptions to the MMPA's prohibition on take, such as the authority at issue here for us to authorize the incidental taking of small numbers of marine mammals by harassment upon the request of a U.S. citizen provided we follow certain statutory and regulatory procedures and make determinations. This exception is discussed in more detail in Section 1.2.

We propose to issue an Incidental Harassment Authorization (IHA) to the Shell Offshore Inc. and Shell Gulf of Mexico Inc. (collectively "Shell") under the MMPA for the taking of small numbers of marine mammals, incidental to Shell's ice overflight surveys in the U.S. Chukchi and Beaufort Seas during 2015/2016. We do not have the authority to permit, authorize, or prohibit Shell's ice overflight survey activities.

Our proposed action is a direct outcome of Shell requesting an IHA under Section 101(a)(5)(D) of the MMPA to take marine mammals, by harassment, incidental to conducting the ice overflight surveys. Underwater noises associated with the aircraft noise that potentially penetrating underwater have the potential to take, by harassment, marine mammals. Shell therefore requires an IHA for incidental take.

Our issuance of an IHA to Shell is a major federal action under the National Environmental Policy Act (NEPA), the Council on Environmental Quality (CEQ) regulations in 40 CFR §§ 1500-1508, and NOAA Administrative Order (NAO) 216-6. Thus, we are required to analyze the effects of our proposed action.

This Final Environmental Assessment (EA), titled "*Issuance of an Incidental Harassment Authorization for the Take of Marine Mammals by Harassment Incidental to Conducting Ice Overflight Surveys in the U.S. Chukchi and Beaufort Seas*," (hereinafter, EA or Final EA) addresses the potential environmental impacts of two alternatives, namely:

- Issue the Authorization to Shell under the MMPA for Level B harassment of marine mammals during Shell's ice overflight surveys, taking into account the prescribed means of take, mitigation measures, and monitoring requirements required in the proposed Authorization; or

- Not issue an Authorization to Shell, in which case, for the purposes of NEPA analysis we assume that Shell would forego the proposed ice overflight surveys in the Beaufort and Chukchi Seas.

1.2.1 Background on Shell's MMPA Application

On December 2, 2014, Shell submitted an application to the National Marine Fisheries Service (NMFS) for the taking of marine mammals incidental to ice overflight surveys the Chukchi and Beaufort Seas, Alaska. After receiving comments and questions from NMFS, Shell revised its IHA application on January 13, 2015.

Shell plans to conduct two periods of ice overflight surveys during May 2015 - April 30, 2016: Break-up surveys and freeze-up surveys. The break-up surveys would occur between June and July, and would include up to five fixed-wing flights of approximately 1,500 nm (up to 13 hours) total and one helicopter flight of 200 nm (up to 3 hours) total. The freeze-up surveys would occur between November 2015 and March 2016, and would include seven fixed-wing flight of 2,500 nm (up to 21 hours) total and one helicopter flight of 200 nm (up to 3 hours) total.

1.2.2 Marine Mammals in the Action Area

Shell has requested an authorization to take seven marine mammal species by Level B harassment. These species are: beluga whale (*Delphinapterus leucas*); bowhead whale (*Balaena mysticetus*); gray whale (*Eschrichtius robustus*); bearded seal (*Erignathus barbatus*); ringed seal (*Phoca hispida*); spotted seal (*P. largha*); and ribbon seal (*Histiophoca fasciata*). Please refer to the *Federal Register* notice for the proposed IHA for more detailed information on specific stocks of these species.

1.2 Purpose and Need

The MMPA prohibits “takes” of marine mammals, with a number of specific exceptions. The applicable exception in this case is an authorization for incidental take of marine mammals in section 101(a)(5)(D) of the MMPA.

Section 101(a)(5)(D) of the MMPA directs the Secretary of Commerce (Secretary) to authorize, upon request, the incidental, but not intentional, taking of small numbers of marine mammals of a species or population stock, by United States citizens who engage in a specified activity (other than commercial fishing) within a specified geographical region if we make certain findings and provide a notice of a proposed authorization to the public for review. Entities seeking to obtain authorization for the incidental take of marine mammals under our jurisdiction must submit such a request (in the form of an application) to us.

We have issued regulations to implement the Incidental Take Authorization provisions of the MMPA (50 CFR Part 216) and have produced Office of Management and Budget (OMB)-approved application instructions (OMB Number 0648-0151) that prescribe the procedures necessary to apply for authorizations. All applicants must comply with the regulations at 50 CFR § 216.104 and submit applications requesting incidental take according to the provisions of the MMPA.

Purpose: The primary purpose of our proposed action—the issuance of an Authorization to Shell—is to authorize (pursuant to the MMPA) the take of marine mammals incidental to Shell’s proposed activities. The IHA, if issued, would exempt Shell from the take prohibitions contained in the MMPA.

To authorize the take of small numbers of marine mammals in accordance with Section 101(a)(5)(D) of the MMPA, we must evaluate the best available scientific information to determine whether the take would have a negligible impact on marine mammals or stocks and not have an unmitigable adverse impact on the availability of affected marine mammal species for certain subsistence uses. We cannot issue an IHA if it would result in more than a negligible impact on marine mammal species or stocks or if it would result in an unmitigable adverse impact on subsistence uses.

In addition, we must prescribe, where applicable, the permissible methods of taking and other means of effecting the least practicable impact on the species or stocks of marine mammals and their habitat (i.e., mitigation), paying particular attention to rookeries, mating grounds, and other areas of similar significance. If appropriate, we must prescribe means of effecting the least practicable impact on the availability of the species or stocks of marine mammals for subsistence uses. Authorizations must also include requirements or conditions pertaining to the monitoring and reporting of such taking. Also, we must publish a notice of a proposed Authorization in the *Federal Register* for public notice and comment.

The underlying purpose of this action is therefore to determine whether the take resulting from Shell’s ice overflight surveys in the Beaufort and Chukchi Seas during the 2015-2016 Arctic open-water season would have a negligible impact on affected marine mammal species or stocks and would not have an unmitigable adverse impact on the availability of marine mammals for taking for subsistence uses, and to develop mitigation and monitoring and reporting measures.

Need: On January 13, 2015, Shell submitted an adequate and complete application demonstrating both the need and potential eligibility for issuance of an IHA in connection with the activities described in section 1.1.1. We now have a corresponding duty to determine whether and how we can authorize take by Level B harassment incidental to the activities described in Shell’s application. Our responsibilities under section 101(a)(5)(D) of the MMPA and its implementing regulations establish and frame the need for this proposed action.

Any alternatives considered under NEPA must meet the agency’s statutory and regulatory requirements. Our described purpose and need guide us in developing reasonable alternatives for consideration, including alternative means of mitigating potential adverse effects.

1.3 Environmental Review Process

NEPA compliance is necessary for all “major” federal actions with the potential to significantly affect the quality of the human environment. Major federal actions include activities fully or partially funded, regulated, conducted, authorized, or approved by a federal agency.

Under the requirements of NAO 216-6 section 6.03(f)(2)(b) for incidental harassment authorizations, we prepared this EA to determine whether the direct, indirect and cumulative

impacts related to the issuance of an IHA for incidental take of marine mammals during the conduct of Shell's ice overflight surveys in the Beaufort and Chukchi Seas, could be significant. If we deem the potential impacts to be not significant, this analysis, in combination with other analyses incorporated by reference, may support the issuance of a Finding of No Significant Impact (FONSI) for the proposed Authorization.

1.3.1 Laws, Regulations, or Other NEPA Analyses Influencing the EA's Scope

We have based the scope of the proposed action and nature of the two alternatives considered in this EA on the relevant requirements in section 101(a)(5)(D) of the MMPA. Thus, our authority under the MMPA bounds the scope of our alternatives. We conclude that this analysis—when combined with the analyses in the following documents—fully describes the impacts associated with the proposed project with mitigation and monitoring for marine mammals. After conducting a review of the information and analyses for sufficiency and adequacy, we incorporate by reference the relevant analyses on Shell's proposed action as well as discussions of the affected environment and environmental consequences within the following document, per 40 CFR §1502.21 and NAO 216-6 § 5.09(d):

- *Application for Incidental Harassment Authorization for the Non-Lethal Taking of Whales and Seals in Conjunction with a Planned Ice Overflight Survey Program in the Chukchi and Beaufort Seas, Alaska May 2015 – April 2016* (Shell, 2015).
- *Chukchi Sea Planning Area Oil and Gas Lease Sale 193 in the Chukchi Sea, Alaska, Final Second Supplemental Environmental Impact Statement* (BOEM 2014).

MMPA APPLICATION AND NOTICE OF THE PROPOSED AUTHORIZATION

The CEQ regulations (40 CFR § 1502.25) encourage federal agencies to integrate NEPA's environmental review process with other environmental reviews. We rely substantially on the public process for developing proposed Authorizations and evaluating relevant environmental information and provide a meaningful opportunity for public participation as we develop corresponding EAs. We fully consider public comments received in response to our publication of the notice of proposed Authorization during the corresponding NEPA process.

We considered Shell's proposed mitigation and monitoring measures to effect the least practicable impact on affected marine mammals species or stocks. These measures include: (1) protected species observers (PSOs) aboard all flights recording all sighting/observations of marine mammals and any types of potential reaction to the aircraft; (2) the aircraft will maintain a 1 mi radius when flying over areas where seals appear to be concentrated in groups of ≥ 5 individuals; (3) the aircraft will not land on ice within 0.5 mi of hauled out pinnipeds or polar bears; and (4) the aircraft will avoid flying over polynyas and along adjacent ice margins as much as possible to minimize potential disturbance to cetaceans. Through the MMPA process, we determined that, provided that Shell implements the required mitigation and monitoring measures, the impact of the Project on marine mammals would be, at worst, a temporary modification in behavior of small numbers of certain species of marine mammals that may be hauled out and directly under the flight path in open water in the vicinity of the proposed activity.

We prepared a *Federal Register* notice (80 FR 11398; March 3, 2015) on the proposed activity and requested that the public submit comments, information, and suggestions concerning Shell's

request, the content of our proposed IHA, and potential environmental effects related to the proposed issuance of the Authorization. During the 30-day comment period, NMFS received comments from the Marine Mammal Commission, Shell, the Alaska Eskimo Whaling Commission, and one private citizen, Dr. Doreen Dupont. All comments will be addressed in the *Federal Register Notice* to announce NMFS action.

In addition, NMFS established an independent peer review panel to review Shell's 4MP for the proposed ice overflight surveys in the Beaufort and Chukchi Seas. The panel met in early March 2015 and provided comments and recommendations to NMFS in April 2015. The full panel report can be viewed on the Internet at: <http://www.nmfs.noaa.gov/pr/permits/incidental.htm>. NMFS worked with Shell to include some reporting measures in the IHA.

1.3.2 Scope of Environmental Analysis

Given the limited scope of the decision for which we are responsible (*i.e.*, issue the IHA including prescribed means of take, mitigation measures, and monitoring requirements, or not issue the IHA), this Final EA provides more focused information on the primary issues and impacts of environmental concern related specifically to our issuance of the IHA. This EA does not further evaluate effects to the elements of the human environment listed in Table 1, because the issuance of an IHA for Shell's proposed ice overflight surveys would not significantly affect those components of the human environment. Those effects are considered in BOEM's *Chukchi Sea Planning Area Oil and Gas Lease Sale 193 in the Chukchi Sea, Alaska, Final Second Supplemental Environmental Impact Statement* (BOEM 2014)

Table 1. Components of the human environment not affected by our issuance of an IHA.

Biological	Physical	Socioeconomic / Cultural
Lower trophic organisms	Air Quality	Commercial Fishing
Fish	Essential Fish Habitat	Military Activities
Mammal species not under NMFS jurisdiction	Geography	Recreational Fishing
Seabirds	Oceanography	Shipping and Boating
		National Historic Preservation Sites
		Low Income Populations
		Minority Populations
		Indigenous Cultural Resources
		Public Health and Safety
		Historic and Cultural Resources

1.3.3 Comments on This Draft EA

Consistent with the intent of NEPA and the clear direction in NAO 216-6 to involve the public in NEPA decision-making, we prepared a draft EA, along with a *Federal Register Notice* (80 FR 11398; March 3, 2015) for the proposed IHA for public comment.

During the 30-day public comment period, NMFS received comments from the Marine Mammal Commission; the Alaska Eskimo Whaling Commission; Shell; and a private citizen, Dr. Doreen Dupont. All comments will be addressed in the *Federal Register* notice announcing our final decision on the proposed issuance of the IHA. The comments primarily focused on: potential impacts from ice overflight surveys on marine mammals and subsistence activities, and mitigation and monitoring measures.

1.4 Other Permits, Licenses, or Consultation Requirements

This section summarizes federal, state, and local permits, licenses, approvals, and consultation requirements necessary to implement the proposed action.

1.4.1 National Environmental Policy Act

Under the requirements of 40 CFR §§ 1500-1508 and NAO 216-6 section 6.03(f)(2)(b) for incidental harassment authorizations, we prepared this EA to determine whether the direct, indirect and cumulative impacts related to the issuance of an IHA for incidental take of marine mammals during the conduct of Shell's ice overflight surveys in the Beaufort and Chukchi Seas, could be significant.

1.4.2 Marine Mammal Protection Act

The MMPA and its provisions that pertain to the proposed action are discussed above in section 1.2.

1.4.3 Endangered Species Act

The bowhead whale and ringed seal are the only marine mammal species currently listed under the ESA that could occur in the vicinity of Shell's proposed ice overflight surveys. However, bowhead is not expected to be affected by the ice overflight surveys. NMFS Office of Protected Resources engaged in formal consultation with NMFS Alaska Regional Office in 2015 regarding potential impacts of issuance of the IHA on threatened and endangered species. In a biological opinion dated May 20, 2015, NMFS Alaska Regional Office concluded that the issuance of the IHA is: (1) not likely to jeopardize the continued existence of the ESA-listed ringed seal; and (2) not likely to adversely modify or destroy critical habitat, as the proposed ice overflight survey areas are neither within nor nearby designated critical habitat for ESA-listed species.

1.4.4 Magnuson-Stevens Fishery Conservation and Management Act

Under the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA), Federal agencies are required to consult with the Secretary of Commerce with respect to any action authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken, by such agency which may adversely affect essential fish habitat (EFH) identified under the MSFCMA. The proposed IHA, while necessary for the conservation and management of marine life, do not affect policies relevant to the National Standards of the MSFCMA. NMFS' Office of Protected Resources Permits and Conservation Division has determined that the issuance of an IHA for the taking of marine mammals incidental to conducting an offshore ice overflight surveys in the U.S. Chukchi Seas will not have an adverse impact on EFH; therefore, an EFH consultation is not required.

1.4.5 Coastal Zone Management Act

Federal consistency is the CZMA requirement where Federal agency activities that have reasonably foreseeable effects on any land or water use or natural resource of the coastal zone (also referred to as coastal uses or resources and coastal effects) must be consistent to the maximum extent practicable with the enforceable policies of a coastal state's Federally-approved coastal management program. On July 1, 2011, the Federally-approved Alaska Coastal Management Program expired, resulting in a withdrawal from participation in CZMA's National Coastal Management Program. The Federal CZMA consistency provision in Section 307 no longer applies in Alaska.

Chapter 2

ALTERNATIVES

2.1 Introduction

NEPA and the CEQ implementing regulations (40 CFR §§ 1500-1508) require consideration of alternatives to proposed major federal actions and NAO 216-6 provides NOAA policy and guidance on the consideration of alternatives to our proposed action. An EA must consider all reasonable alternatives, including the Preferred Alternative. It must also consider the No Action Alternative, even if that alternative does not meet the stated purpose and need. This provides a baseline analysis against which we can compare the other alternatives.

To warrant detailed evaluation as a reasonable alternative, an alternative must meet our purpose and need. In this case, as we previously explained in Chapter 1 of this EA, an alternative only meets the purpose and need if it satisfies the requirements under section 101(a)(5)(D) the MMPA. We evaluated each potential alternative against these criteria; identified one action alternative along with the No Action Alternative; and carried these forward for evaluation in this EA. This chapter describes the alternatives and compares them in terms of their environmental impacts and their achievement of objectives.

As described in Section 1.2, the MMPA requires that we must prescribe the means of effecting the least practicable impact on the species or stocks of marine mammals and their habitat. In order to do so, we must consider Shell's proposed mitigation measures, as well as other potential measures, and assess how such measures could benefit the affected species or stocks and their habitat. Our evaluation of potential measures includes consideration of the following factors in relation to one another: (1) the manner in which, and the degree to which, we expect the successful implementation of the measure to minimize adverse impacts to marine mammals; (2) the proven or likely efficacy of the specific measure to minimize adverse impacts as planned; and (3) the practicability of the measure for applicant implementation.

Any additional mitigation measure proposed by us beyond what the applicant proposes should be able to or have a reasonable likelihood of accomplishing or contributing to the accomplishment of one or more of the following goals:

- Avoidance or minimization of marine mammal injury, serious injury, or death, wherever possible;
- A reduction in the numbers of marine mammals taken (total number or number at biologically important time or location);

- A reduction in the number of times the activity takes individual marine mammals (total number or number at biologically important time or location);
- A reduction in the intensity of the anticipated takes (either total number or number at biologically important time or location);
- Avoidance or minimization of adverse effects to marine mammal habitat, paying special attention to the food base; activities that block or limit passage to or from biologically important areas; permanent destruction of habitat; or temporary destruction/disturbance of habitat during a biologically important time; and
- For monitoring directly related to mitigation, an increase in the probability of detecting marine mammals, thus allowing for more effective implementation of the mitigation.

2.2 Description of Shell's Proposed Activities

Shell plans to conduct two periods of ice overflight surveys during May 2015 - April 2016: Break-up surveys and freeze-up surveys.

Shell plans to conduct the overflight surveys from fixed wing and rotary aircraft. The aircraft to be used for the surveys are not currently under contract to Shell or a contractor to Shell. Ice and weather conditions will influence when and where the surveys can be conducted.

2.2.1 Dates and Duration

For initial planning purposes, Shell proposes to conduct the overflight surveys during May 1, 2015 - April 30, 2016.

2.2.2 Specific Geographic Region

The ice overflight survey areas are the Chukchi and Beaufort Seas, Alaska, as indicated in Figure 1. Aircraft supporting these surveys will operate out of Barrow and Deadhorse, Alaska.

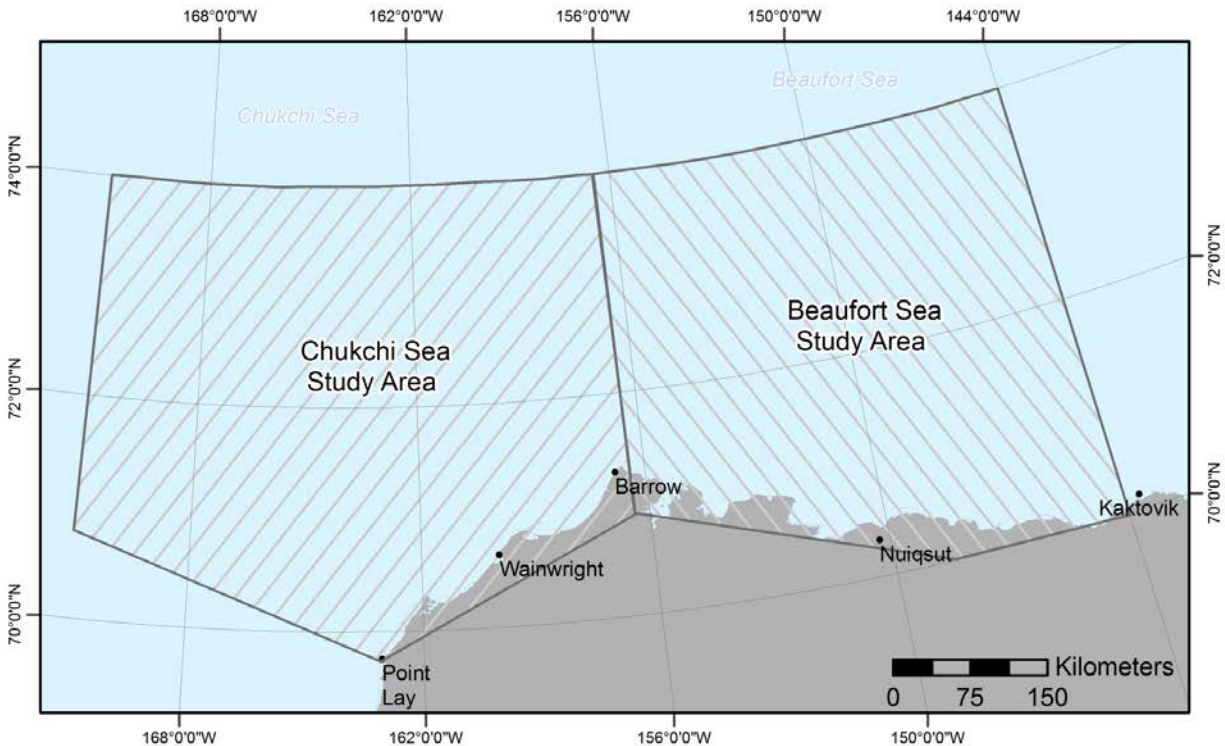


Figure 1. Location map for break-up and freeze-up overflight surveys

2.2.3 Detailed Description of Activities

(1) Proposed Break-Up Surveys

The break-up surveys will occur between June and July in either the Chukchi or Beaufort Sea and will include:

- Up to five fixed-wing flights of approximately 1,500 nm total for up to approximately 13 hours total;
- One helicopter flight totaling of approximately 200 nm total for up to approximately 3 hours total.

Flight altitudes for fixed wing surveys will mostly be at or above 152 m (500 ft) and range from 30 to 610 m (100 to 2,000 ft). For helicopter flights, the altitude will mostly be at or above 61 m (200 ft) with a range of 15 to 152 m (50 to 500 ft). Flights will occur when there is daylight, and aircraft are not scheduled to fly at the same time.

(2) Proposed Freeze-Up Surveys

The freeze-up surveys will occur between November 2015 and March 2016 in either the Chukchi or Beaufort Sea and will include:

- Up to seven fixed-wing flights of approximately 2,500 nautical miles (nm) total in early winter for up to approximately 21 hours total;

- One helicopter flight in the Beaufort of approximately 200 nm that will include approximately 4 landings to collect ice measurements during late freeze-up including sampling with a battery powered ice auger for up to approximately 3 hours total.

Flight altitudes for fixed wing surveys will mostly be at or above 152 m (500 ft) and range from 30 to 610 m (100 to 2,000 ft). For helicopter flights, the altitude will mostly be at or above 61 m (200 ft) with a range of 15 to 152 m (50 to 500 ft) and will also include landings. Flights will occur when there is daylight, and aircraft are not scheduled to fly at the same time.

(3) Proposed Aircraft to Conduct Ice Overflight Surveys

Shell plans to conduct the ice overflight surveys with an Aero Commander (or similar) fixed winged aircraft and a Bell 412, AW 139, EC 145 (or similar) helicopter.

Shell will also have a dedicated helicopter for Search and Rescue (SAR) for the spring 2015 surveys. The SAR helicopter is expected to be a Sikorsky S-92 (or similar). This aircraft will stay grounded at the Barrow shorebase location except during training drills, emergencies, and other non-routine events.

2.3 Description of Alternatives

2.3.1 Alternative 1 – Issuance of an Authorization with Mitigation Measures (Preferred Alternative)

Under this alternative, NMFS would issue an IHA under section 101(a)(5)(D) of the MMPA to Shell, allowing the take, by Level B harassment, of small numbers of marine mammal species incidental to conducting ice overflight surveys in the Chukchi and Beaufort Seas between May 2015 and April 2016. In order to reduce the impacts of the action on affected species or stocks, habitat, and subsistence availability to the lowest level practicable, Shell will be required to implement the mitigation, monitoring, and reporting measures described below.

PROPOSED MITIGATION MEASURES

Shell submitted a marine mammal monitoring and mitigation plan (4MP) as part the of IHA application (Shell 2015). In the 4MP, Shell proposes a suite of mitigation measures to minimize any adverse impacts associated with the ice overflight surveys in the Chukchi and Beaufort Sea. These include, among others discussed in the 4MP, the following: (1) the timing and locations for active survey acquisition work; and (2) increasing altitude or deviating from survey tract when the protected species observers sight visually (from the aircraft) the presence of marine mammals. To summarize:

- A PSO will be aboard all flights recording all sightings/observations (e.g. including number of individuals, approximate age (when possible to determine), and any type of potential reaction to the aircraft. Environmental information the observer will record includes weather, air temperature, cloud and ice cover, visibility conditions, and wind speed.

- The aircraft will maintain a 1,400 m radius when flying over areas where seals appear to be concentrated in groups of ≥ 5 individuals;
- The aircraft will not land on ice within 1,400 m of hauled out pinnipeds or polar bears;
- The aircraft will avoid flying over polynyas and along adjacent ice margins as much as possible to minimize potential disturbance to cetaceans; and
- Shell will routinely engage with local communities and subsistence groups to ensure no disturbance of whaling or other subsistence activities.

NMFS has carefully evaluated the applicant's proposed mitigation measures and considered a range of other measures in the context of ensuring that NMFS prescribes the means of effecting the least practicable impact on the affected marine mammal species and stocks and their habitat. Our evaluation of potential measures included consideration of the factors described above in section 2.1 in relation to one another

Based on our evaluation of these mitigation measures, NMFS has determined that the prescribed mitigation measures provide the means of effecting the least practicable impact on marine mammals species or stocks and their habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance. Furthermore, NMFS considers that these mitigation measures are effective given that aircraft will have clear view of pinnipeds hauled out on ice, thus their potential adverse effects can be minimized and/or avoided.

PROPOSED MONITORING AND REPORTING MEASURES

Proposed Monitoring Measures

(1) Protected Species Observers

Aerial monitoring for marine mammals will be conducted by a trained protected species observer (PSO) aboard each flight. PSO duties will include watching for and identifying marine mammals, recording their numbers, distances from, and potential reactions to the presence of the aircraft, in addition to working with the helicopter pilots to identify areas for landings on ice that is clear of marine mammals.

(2) Observer Qualifications and Training

Observers will have previous marine mammal observation experience in the Chukchi and Beaufort Seas. All observers will be trained and familiar with the marine mammals of the area, data collection protocols, reporting procedures, and required mitigation measures.

(3) Specialized Field Equipment

The following specialized field equipment for use by the onboard PSO: Fujinon 7 X 50 binoculars for visual monitoring, a GPS unit to document the route of each ice overflight, a

laptop computer for data entry, a voice recorder to capture detailed observations and data for post flight entry into the computer, and digital still cameras.

(4) Field Data-Recording

The observer on the aircraft will record observations directly into computers using a custom software package. The accuracy of the data entry will be verified in the field by computerized validity checks as the data are entered, and by subsequent manual checking following the flight. Additionally, observers will capture the details of sightings and other observations with a voice recorder, which will maximize observation time and the collection of data. These procedures will allow initial summaries of data to be prepared during and shortly after the surveys, and will facilitate transfer of the data to statistical, graphical or other programs for further processing.

During the course of the flights, the observer will record information for each sighting including number of individuals, approximate age (when possible to determine), and any type of potential reaction to the aircraft. Environmental information the observer will record includes weather, air temperature, cloud and ice cover, visibility conditions, and wind speed.

Monitoring Plan Peer Review

The MMPA requires that monitoring plans be independently peer reviewed “where the proposed activity may affect the availability of a species or stock for taking for subsistence uses” (16 U.S.C. 1371(a)(5)(D)(ii)(III)). Regarding this requirement, NMFS’ implementing regulations state, “Upon receipt of a complete monitoring plan, and at its discretion, [NMFS] will either submit the plan to members of a peer review panel for review or within 60 days of receipt of the proposed monitoring plan, schedule a workshop to review the plan” (50 CFR 216.108(d)).

NMFS has established an independent peer review panel to review Shell’s 4MP for the proposed ice overflight surveys in the Beaufort and Chukchi Seas. The panel met in early March 2015, and provided comments and recommendations to NMFS in April 2015. The full panel report can be viewed on the Internet at: <http://www.nmfs.noaa.gov/pr/permits/incidental.htm>.

The peer-review panel report contains recommendations that the panel members felt were applicable to the Shell’ monitoring plans. Specifically, the panel recommended that:

- (1) Aircraft crew members receive the same training as PSOs so that they are able to
1) detect pinnipeds hauled out on the ice, 2) identify marine mammals sighted by species (when possible) and 3) indicate any behavioral response of marine mammals to the aircraft;
- (2) Use of a video camera during overflight surveys to record behavioral responses in addition to having PSOs and trained crew members record behavioral responses;
- (3) Provide information and a map on the altitude at which aircraft were flown and the distance and altitude at which behavioral responses were noted in the 90-day report; and

- (4) Present sightings and behavioral response data separately for landing events (if animals were seen during that time).

NMFS discussed these recommendations with Shell to improve its monitoring and reporting measures. As a result, Shell agreed to provide information and a map on the altitude at which aircraft were flown and the distance and altitude at which behavioral responses were noted in the 90-day report. In addition, Shell will present sightings and behavioral response data separately for landing events (if animals were seen during that time).

However, NMFS considers that using aircraft crew members (the pilots) to collect marine mammal data a safety concern and could not be implemented under Shell's aviation standards. As stated in the monitoring plan, one trained biologist PSO will be aboard each flight collecting data. All personnel aboard the aircraft will be instructed to inform the PSO if they observe a marine mammal hauled out in the vicinity of a location where landing is being considered. Species identification training will not be necessary to perform this task.

NMFS also discussed with Shell the panel's recommendation of using video camera. Based on Shell's experience from testing a video camera during marine mammal aerial survey flights in 2012, we confirmed that the resolution is not good enough to observe seals ahead of the aircraft without using a long lens (or high magnification setting). Use of a long lens significantly reduces the field of view of the camera and thereby reduces the chance of recording animals as the aircraft approaches close to and over them. Use of a long lens also significantly limits the lateral swath covered which limits the ability to record and assess potential reactions at increasing lateral distances. Therefore, NMFS does not consider adding a video camera would achieve intended results of behavioral observation.

Additionally, though not requested, the peer review panel also provided two recommendations for mitigation measures listed below:

- (1) Aircraft maintain an altitude of at least 305 m (1,000 ft) until they reach the offshore survey areas of interest, and not land on ice within 1.6 km (1 mi) of hauled-out pinnipeds to minimize disturbance of marine mammals encountered during surveys and quantify more accurately numbers of Level B harassment takes.
- (2) Investigate the possibility of using unmanned aerial systems (UAS) to conduct the ice surveys, at least for the fixed-wing surveys that would not involve landing on the ice to collect samples

NMFS worked with Shell on the practicability of these mitigation recommendations and concluded that these measures either do not provide added value to the existing mitigation measures already prescribed and/or are beyond current technology can achieve. Shell states that their objectives of data collection on ice conditions would not be met if flights were conducted entirely at or above the altitude recommended by the panel. Nevertheless, Shell agrees to not landing on ice within 1.6 km (1 mi) of hauled-out pinnipeds. The updated mitigation measure is included in the IHA issued to Shell.

Shell states that it is interested in and actively pursuing the use of unmanned systems to conduct aerial surveys. However, the available technology and permitting process will not allow for the collection of the data sought by the proposed ice overflights at this time. Shell is collaborating with BOEM and NMML to improve use of UAS for open water observations and developing detection software to quickly process the thousands of digital images taken during a typical aerial survey. Shell is also advocating for rule changes by the FAA to allow for expanded commercial use of UAS systems.

Reporting Measures

(1) Final Report

The results of Shell's ice overflight monitoring report will be presented in the "90-day" final report, as required by NMFS under the proposed IHA. The initial final report is due to NMFS within 90 days after the expiration of the IHA. The report will include:

- Summaries of monitoring effort: total hours, total distances flown, and environmental conditions during surveys;
- Summaries of occurrence, species composition, and distribution of all marine mammal sightings including date, numbers, age/size/gender categories (when discernible), group sizes, ice cover and other environmental variables; data will be visualized by plotting sightings relative to the position of the aircraft; and
- Analyses of the potential effects of ice overflights on marine mammals and the number of individuals that may have been disturbed by aircraft.

The "90-day" report will be subject to review and comment by NMFS. Any recommendations made by NMFS must be addressed in the final report prior to acceptance by NMFS.

(2) Notification of Injured or Dead Marine Mammals

Shell will be required to notify NMFS' Office of Protected Resources and NMFS' Stranding Network of any sighting of an injured or dead marine mammal. Based on different circumstances, Shell may or may not be required to stop operations upon such a sighting. Shell will provide NMFS with the species or description of the animal(s), the condition of the animal(s) (including carcass condition if the animal is dead), location, time of first discovery, observed behaviors (if alive), and photo or video (if available). The specific language describing what Shell must do upon sighting a dead or injured marine mammal can be found in the "Proposed Incidental Harassment Authorization" section of the proposed IHA.

2.3.2 Alternative 2 – No Action Alternative

Under the No Action Alternative, NMFS would not issue the requested IHA to Shell for the potential take of marine mammals, by harassment, incidental to conducting ice overflight surveys in the U.S. Chukchi and Beaufort Seas in 2015/2016. This would be based on NMFS' determination that, based on the best available information, it cannot make one or more of the findings required under the MMPA as a condition of issuing an IHA. The MMPA prohibits all

takings of marine mammals unless authorized by a permit or exemption under the MMPA. The consequences of not authorizing incidental takes are (1) the entity conducting the activity may be in violation of the MMPA if takes do occur, (2) mitigation and monitoring measures cannot be required by NMFS, and (3) mitigation measures might not be performed voluntarily by the applicant. For this analysis we assume that if an IHA is not issued, Shell would effectively be precluded from engaging in ice overflight surveys in the U.S. Chukchi and Beaufort Seas in 2015/2016, as any takes of marine mammals under such activities would be violation of the MMPA.

2.3.5 Alternatives Considered but Rejected from Further Consideration

NMFS considered whether other alternatives could meet the purpose and need and support Shell's proposed activities.

Issuance of an IHA with No Required Mitigation, Monitoring, or Reporting Measures

An alternative that would allow for the issuance of IHAs with no required mitigation or monitoring was considered but eliminated from consideration, as it would not be in compliance with the MMPA requirements to prescribe mitigation, monitoring, and reporting, and therefore would not meet the purpose and need. For that reason, this alternative is not analyzed further in this document.

Use of Alternative Technologies

An alternative that would require Shell to use alternative technologies to conduct ice surveys in the Chukchi and Beaufort Seas was considered but eliminated from further consideration. NMFS is unaware of any alternative techniques currently available that would allow Shell to conduct the proposed ice surveys in such large areas in the U.S. Arctic Ocean.

Chapter 3 AFFECTED ENVIRONMENT

This chapter describes existing conditions in the proposed action areas. Complete descriptions of the physical, biological, and social environment of the action area are contained in the documents listed in Section 1.3.1 of this Final EA. We incorporate those descriptions by reference and briefly summarize or supplement the relevant sections for marine mammals in the following subchapters.

3.1 Physical Environment

We are required to consider impacts to the physical environment under NOAA NAO 216-6. As discussed in Chapter 1, our proposed action and alternatives relate only to the authorization of incidental take of marine mammals and not to the physical environment. Certain aspects of the physical environment are not relevant to our proposed action (see subchapter 1.3.2 - Scope of Environmental Analysis). Because of the requirements of NAO 216-6, we briefly summarize the relevant physical components of the environment here.

3.1.1 Marine Mammal Habitat

The Beaufort and Chukchi Seas Proposed Action areas cover the broad, continental shelf adjacent to the Arctic Ocean. A small portion in the north overlies the continental slope and abyssal plain. Water depths range from approximately 10 - 2,900 m (33 – 9,500 ft). Two shoals, the Hanna and Herald, are within the Chukchi Sea. These shoals rise above the surrounding seafloor to approximately 20 m (66 ft) below sea level. There are two major canyons—Herald Canyon and Barrow Canyon. The Barrow Sea Valley begins north of Wainwright and trends in a northeasterly direction parallel to the Alaskan coast. Herald Valley is to the north. Hope Valley, a broad depression, stretches from Bering Strait to Herald Canyon. These topographic features exert a steering effect on the circulation patterns in this area. In contrast, the Beaufort shelf is a narrow shelf with no large topographic features. Water depths within the proposed marine and seismic survey areas in the Beaufort and Chukchi Seas range from 0.1 – 50 m (3 - 164 ft).

3.2 Biological Environment

The primary component of the biological environment that would be impacted by the proposed action and alternatives would be marine mammals, which would be directly impacted by the authorization of incidental take. We briefly summarize this component of the biological environment here.

3.2.1 Marine Mammals

The Chukchi and Beaufort Seas support a diverse assemblage of marine mammals, including: bowhead, gray, beluga, killer, minke, humpback, and fin whales; harbor porpoise; ringed, ribbon, spotted, and bearded seals; narwhals; polar bears; and walrus. Both the walrus and the polar bear are managed by the U.S. Fish and Wildlife Service (USFWS) and are not considered further.

Among the rest of marine mammal species, only beluga, bowhead, and gray whales, and ringed, spotted, bearded, and ribbon seals, regularly occur in the proposed action area. The remaining

cetacean species are rare and not likely to be encountered during Shell’s ice overflight surveys, which are planned either during winter when nearly 10/10 ice coverage is present, or during spring when sea ice also pre-dominates the study area. In addition, cetaceans species such as beluga, bowhead, and gray whales are not likely to be affected by Shell’s proposed ice overflight surveys. Therefore, all cetacean species are not further discussed.

The Arctic ringed seal is listed as “threatened” under the ESA. Certain stocks or populations of gray, beluga, and spotted seals are listed as endangered under the ESA; however, none of those stocks or populations occur in the proposed activity area.

Shell’s application contains information on the status, distribution, seasonal distribution, abundance, and life history of each of the species under NMFS jurisdiction mentioned in this document. When reviewing the application, NMFS determined that the species descriptions provided by Shell correctly characterized the status, distribution, seasonal distribution, and abundance of each species. Please refer to the application for that information. Additional information can also be found in the NMFS 2013 Stock Assessment Reports (SAR) (Allen and Anglyss, 2014). The Alaska 2013 SAR is available at: http://www.nmfs.noaa.gov/pr/sars/pdf/ak2013_final.pdf

Table 1 lists the seven marine mammal species under NMFS jurisdiction with confirmed or possible occurrence in the proposed project area.

Table 1. Marine mammal species and stocks that could be affected by Shell’s ice overflight surveys in the Beaufort and Chukchi Seas.

Common Name	Scientific Name	Status	Occurrence	Seasonality	Range	Abundance
Pinnipeds		Candidate				
Bearded seal (Beringia distinct population segment)	<i>Erigathus barbatus</i>		Common	Spring and summer	Bering, Chukchi, and Beaufort Seas	155,000
Ringed seal (Arctic stock)	<i>Phoca hispida</i>	Threatened; Depleted	Common	Year round	Bering, Chukchi, and Beaufort Seas	300,000
Spotted seal	<i>Phoca largha</i>	-	Common	Summer	Japan to U.S. Arctic Ocean	141,479
Ribbon seal	<i>Histiophoca fasciata</i>	Species of concern	Occasional	Summer	Russia to U.S. Arctic Ocean	49,000

3.3 Socioeconomic Environment

3.3.1 Subsistence

Subsistence hunting continues to be an essential aspect of Inupiat Native life, especially in rural coastal villages. The Inupiat participate in subsistence hunting activities in and around the Beaufort and Chukchi Seas. The animals taken for subsistence provide a significant portion of

the food that will last the community through the year. Marine mammals represent on the order of 60-80% of the total subsistence harvest. Along with the nourishment necessary for survival, the subsistence activities strengthen bonds within the culture, provide a means for educating the younger generation, provide supplies for artistic expression, and allow for important celebratory events.

The main species that are hunted include bowhead and beluga whales, ringed, spotted, and bearded seals, walruses, and polar bears. (As mentioned previously in this document, both the walrus and the polar bear are under the USFWS' jurisdiction.) The importance of each of these species varies among the communities and is largely based on availability.

Chapter 4 ENVIRONMENTAL CONSEQUENCES

This chapter of the EA analyzes the impacts of the two alternatives and addresses the potential direct, indirect, and cumulative impacts of our issuance of an IHA. Shell's application and other related environmental analyses identified previously facilitate this analysis.

Under the MMPA, we have evaluated the potential impacts of Shell's ice overflight surveys in order to determine whether to authorize incidental take of marine mammals. Under NEPA, we have determined that an EA is appropriate to evaluate the potential significance of environmental impacts resulting from the issuance of an IHA.

4.1 Effects of Alternative 1— Issuance of an IHA with Mitigation Measures

Under this alternative, NMFS would issue an IHA to Shell for the proposed ice overflight surveys in the Beaufort and Chukchi Seas in 2015/2016 with required mitigation, monitoring, and reporting requirements as discussed in Chapter 2 of this EA. As part of NMFS' action, the mitigation and monitoring described in this EA would be undertaken as required by the MMPA. No serious injury or mortality of marine mammals is expected, nor any behavioral disruption that could have an impact on the reproductive or survival ability of affected species would occur.

4.1.1 Effects on Marine Mammals

The reasonably expected or reasonably likely impacts of the specified activities on marine mammals will be related primarily to localized, short-term acoustic disturbance from aircraft flying primarily over areas covered by sea ice with limited flight activity over open water and adjacent ice edges. The acoustic sense of marine mammals probably constitutes their most important distance receptor system. Potential acoustic effects relate to sound produced by helicopters and fixed-wing aircraft.

Dominant tones in noise spectra from helicopters are generally below 500 Hz (Greene and Moore 1995). Harmonics of the main rotor and tail rotor usually dominate the sound from helicopters; however, many additional tones associated with the engines and other rotating parts are sometimes present. Because of Doppler shift effects, the frequencies of tones received at a stationary site diminish when an aircraft passes overhead. The apparent frequency is increased while the aircraft approaches and is reduced while it moves away.

Aircraft flyovers are not heard underwater for very long, especially when compared to how long they are heard in air as the aircraft approaches an observer. Very few cetaceans, including the species in the proposed ice overflight survey areas, are expected to be encountered during ice overflights due to the low density of cetacean species in the winter survey area and small area to be flown over open water during spring. Most of these effects are expected in open-water, where limited aircraft noise could penetrate into the water column. For cetaceans under the ice, the noise levels from the aircraft are expected to be dramatically reduced by floating ice. Adverse effects on annual rates of recruitment or survival (i.e., population level effects) are not expected for any cetacean species.

Evidence from flyover studies of ringed and bearded seals suggests that a reaction to helicopters is more common than to fixed wing aircraft, all else being equal (Born et al. 1999; Burns and Frost 1979). Under calm conditions, rotor and engine sounds are coupled into the water through ice within a 26° cone beneath the aircraft (Richardson et al. 1995). Scattering and absorption, however, will limit lateral propagation in the shallow water (Greene and Moore 1995). The majority of seals encountered by fixed wing aircraft will unlikely show a notable disturbance reaction, and approximately half of the seals encountered by helicopters may react by moving from ice into the water (Born et al. 1999). Any potential disturbance from aircraft to seals in the area of ice overflights will be localized and short-term in duration with no population level effects.

Historically, there have been far greater levels of aviation activity in the offshore Chukchi and Beaufort Seas compared with that of the proposed ice overflights. None of this previous offshore aviation activity is believed to have resulted in population level impacts to marine mammals, as demonstrated by results from a wide range of monitoring programs and scientific studies. Impacts to marine mammals from aviation activities in Arctic offshore habitats have been shown to be, at most, short-term and highly-localized in nature (e.g., Funk et al. 2013; Richardson et al. 1985a, b; Patenaude et al. 2002; Born et al. 1999).

The effect of aircraft overflight on marine mammals will depend on the behavior of the animal at the time of reception of the stimulus, as well as the distance from the aircraft and received level of sound. Cetaceans (such as bowhead, gray, and beluga whales) will only be present, and thus have the potential to be disturbed, when aircraft fly over open water in between ice floes; seals may be disturbed when aircraft are over open water or over ice on which seals may be present. Disturbance reactions are likely to vary among some of the seals in the general vicinity, and not all of the seals present are expected to react to fixed wing aircraft and helicopters.

Behavioral distances from marine mammals also depend on the altitudes of the aircraft overflight. Marine mammals are not likely to be affected by aircraft overflights that are above 1,000 ft. Therefore, behavioral harassments discussed above are only limited to those aircraft flying at lower altitudes. Proposed measures discussed in this EA would further reduce potential effects.

In light of the nature of the activities, and for the reasons described below, NMFS does not expect marine mammals will be injured or killed as a result of ice overflight surveys. In addition, due to the low received noise levels from aircraft overflights, NMFS does not expect marine mammals will experience hearing impairment such as TTS or PTS.

Of the seal species which may be encountered, only ringed seals are abundant in the Chukchi and Beaufort Seas during the winter and early spring when the overflights are scheduled to occur. In March-April, ringed seals give birth in subnivean lairs established on shorefast and stable pack ice (Smith and Stirling 1975; Smith 1973). Ringed seals in subnivean layers have been known to react to aircraft overhead by entering the water in some instances (Kelly et al. 1986); however, there is no evidence to indicate injurious effects to adults or pups from such a response.

Bearded seals spend the winter season in the Bering Sea, and then follow the ice edge as it retreats in spring (MacIntyre and Stafford 2011). Large numbers of bearded seals are unlikely to be present in the project area during the time of planned operations. However, some individuals may be encountered. Spotted seals are found in the Bering Sea in winter and spring where they breed, molt, and pup in large groups (Quakenbush 1988; Rugh et al. 1997). Few spotted seals are expected to be encountered in the Chukchi and Beaufort seas until July. Even then, they are rarely seen on pack ice but are commonly observed hauled out on land or swimming in open water (Lowry et al. 1998). The ice overflights are designed to maximize flying over ice, avoiding coastal and terrestrial areas. Haul outs for spotted seals are generally known, and Shell will avoid these areas during the break up surveys.

Based on extensive analysis of digital imagery taken during aerial surveys in support of Shell's 2012 operations in the Chukchi and Beaufort Seas, ice seals are very infrequently observed hauled out on the ice in groups of greater than one individual (Shell 2015). Tens of thousands of images from 17 flights that took place from July through October were reviewed in detail. Of 107 total observations of spotted or ringed seals on ice, only three of those sightings were of a group of two individuals (Shell 2015). Since seals typically are found as individuals or in very small groups when they are in the project area, the chance of a stampede event is very unlikely. Finally, ice seals are well adapted to move between ice and water without injury, including "escape reactions" to avoid predators.

Ringed and bearded seals sometimes, but not always, dive when approached by low-flying aircraft (Burns and Frost 1979; Burns et al. 1982). Ringed and bearded seals may be more sensitive to helicopter sounds than to fixed-wing aircraft (Burns and Frost 1979). In 2000, a study was conducted to measure the impacts of pipe-driving sounds on pinnipeds at Northstar in the Beaufort Sea (Blackwell et al. 2004). Only some of the ringed seals present exhibited a reaction to an approaching helicopter: of 23 individuals, 11 reacted; of those 11, 10 increased alertness and only 1 moved into the water (when the helicopter was 100 m away; Blackwell et al. 2004). Reactions of ringed seals while they are in subnivean lairs vary with the characteristics of the flyover, including lateral distance and altitude of aircraft (Kelly et al. 1986).

The sound of aircraft is also reduced by the snow of the lair (Cummings and Holliday 1983). Spotted seals are sensitive to aircraft, reacting erratically at considerable distances which may result in mother-pup separation or injury to pups (Frost et al 1993, Rugh et al. 1993). However, as previously noted, few spotted seals are expected to be present in the project area during the time of planned ice overflights, and overflights will focus on offshore areas as opposed to terrestrial habitat with potential spotted seal haulouts.

Regarding effects of aircraft overflight on cetaceans, NMFS conducted additional analysis to evaluate the potential airborne noise that enters water which might result takes of cetacean species. Takes of cetaceans (or other marine mammal species) incidental to aerial overflights depends on a variety of factors, such flight altitude, flight speed, types of aircraft, and species of marine mammals and their sensitivity to aircraft and their density in the vicinity under the flight route.

Shell stated that the potential maximum areas under a 260 cone of sea surface when the aircraft fly below 1,000 ft is 169 km². Multiplying this area by cetacean density yielded a total of 1 beluga, 2 bowhead, and 2 gray whales being exposed in the total area of the 260 cone. However, received noise levels within this 260 cone area is expected to vary greatly from the center below the flight path to the edge where the 130° incidental angle forms between the aircraft and sea surface. The only area where cetacean could be exposed to aircraft noise with minimum reflection from the sea surface is where the animal is normal to the aircraft, i.e., right beneath the flight path. As the one considers the distribution of animals that are not right beneath the flight path, the amount of airborne noise enters the water column is reduced exponentially as one moves away from the normal angle, thus the underwater acoustic intensity away from the center is also reduced exponentially. At an incident angle of 130° from the aircraft, the acoustic wave undergoes total reflection. Therefore, NMFS considers that only a fraction of the cetaceans initially assessed in the Federal Register notice for the proposed IHA could be exposed, if they are at the sea surface. As a result, NMFS concludes that it is very unlikely that cetaceans would be affected by Shell's proposed ice overflight survey activities. Consequently, in the IHA issued to Shell, NMFS does not authorize any takes of cetacean species.

4.1.2 Effects on Marine Mammals Habitat

Shell's planned 2015/16 ice overflight surveys will not result in any permanent impact on habitats used by marine mammals, or to their prey sources. The primary potential impacts on marine mammal habitat and prey resources that are reasonably expected or reasonably likely are associated with elevated sound levels from the aircraft passing overhead. Effects on marine mammal habitat from the generation of sound from the planned surveys would be negligible and temporary, lasting only as long as the aircraft is overhead. Water column effects will be localized and ephemeral lasting only the duration of the aircrafts presence. All effects on marine mammal habitat from the planned surveys are expected to be negligible and confined to very small areas within the Chukchi and Beaufort Seas.

The primary effect of the sound energy generated by ice overflight survey activities on marine mammal habitat will be the ensonification of the water column and air at the surface. Sound energy can also affect invertebrates and fish that are marine mammal prey, and thereby indirectly impact the marine mammals.

Levels and duration of sounds received by marine mammals underwater from a passing helicopter or fixed-wing aircraft are a function of the type of aircraft, orientation and altitude of the aircraft, depth of the animal, and water depth. Aircraft sounds are detectable underwater at greater distances when the receiver is in shallow rather than deep water. Generally, sound levels received underwater decrease as the altitude of the aircraft increases (Richardson et al. 1995a). The nature of sounds produced by aircraft activities does not pose a direct threat to the underwater marine mammal habitat or prey.

Aircraft sounds are audible for much greater distances in air than in water. Under calm conditions, rotor and engine sounds are coupled into the water within a 260 cone beneath the aircraft. Some of the sound will transmit beyond the immediate area, and some sound will enter the water outside the 26 degree area when the sea surface is rough. However, scattering and

absorption will limit lateral propagation in shallow water. Dominant tones in noise spectra from helicopters are generally below 500 Hz (Greene and Moore 1995). Because of Doppler shift effects, the frequencies of tones received at a stationary site diminish when an aircraft passes overhead. The apparent frequency is increased while the aircraft approaches and is reduced while it moves away. Sounds generated underwater from aircraft flyovers are of short duration.

Helicopters will generally maintain straight-line routes, thereby limiting the sound levels at and below the surface. Given the timing and location of the proposed ice overflight activities, as well as the mitigation measures that will be implemented as a part of the program, any impacts from aircraft traffic on marine mammal habitat or prey will be localized and temporary with no anticipated population level effects.

4.1.3 Effects on Subsistence

4.1.3.1 Subsistence Activities in the Action Area

NMFS has defined “unmitigable adverse impact” in 50 CFR 216.103 as: “an impact resulting from the specified activity: (1) That is likely to reduce the availability of the species to a level insufficient for a harvest to meet subsistence needs by: (i) Causing the marine mammals to abandon or avoid hunting areas; (ii) Directly displacing subsistence users; or (iii) Placing physical barriers between the marine mammals and the subsistence hunters; and (2) That cannot be sufficiently mitigated by other measures to increase the availability of marine mammals to allow subsistence needs to be met.

Noise and general activity during Shell’s proposed ice overflight surveys have the potential to impact marine mammals hunted by Native Alaskans. The most common reaction to anthropogenic sounds behavioral modification and startleness from aircraft noise. Aircraft activity also has the potential to disturb cetaceans and pinnipeds by causing them to vacate the area.

Plan of Cooperation or Measures to Minimize Impacts to Subsistence Hunts

Regulations at 50 CFR 216.104(a)(12) require IHA applicants for activities that take place in Arctic waters to provide a Plan of Cooperation (POC) or information that identifies what measures have been taken and/or will be taken to minimize adverse effects on the availability of marine mammals for subsistence purposes.

Shell will implement a POC in accordance NMFS’ regulations. The POC relies upon the Chukchi Sea Communication Plans to identify the measures that Shell has developed in consultation with North Slope subsistence communities and will implement during its planned 2015/2016 ice overflight surveys to minimize any adverse effects on the availability of marine mammals for subsistence uses. In addition, the POC will detail Shell’s communications and consultations with local subsistence communities concerning its planned 2015/2016 program, potential conflicts with subsistence activities, and means of resolving any such conflicts (50 CFR §216.104(a) (12) (i), (ii), (iv)). Shell continues to document its contacts with the North Slope subsistence communities, as well as the substance of its communications with subsistence stakeholder groups.

The POC identifies and documents potential conflicts and associated measures that will be taken to minimize any adverse effects on the availability of marine mammals for subsistence use. Outcomes of POC meetings are typically included in updates attached to the POC as addenda and distributed to federal, state, and local agencies as well as local stakeholder groups that either adjudicate or influence mitigation approaches for Shell's activities.

Shell has been engaged with the villages potentially impacted by the 2015/2016 ice overflight surveys in the Chukchi and Beaufort Seas. Meetings were held in Barrow and Point Lay in early November 2014 and additional engagements were scheduled with other villages in early 2015. Throughout 2015 and 2016 Shell anticipates continued engagement with the marine mammal scientists and committees active in the subsistence harvests and marine mammal research.

Following the 2015/2016 season, Shell intends to have a post-season co-management meeting with the commissioners and committee heads to discuss results of mitigation measures and outcomes of the preceding season. The goal of the post-season meeting is to build upon the knowledge base, discuss successful or unsuccessful outcomes of mitigation measures, and possibly refine plans or mitigation measures if necessary.

In addition to the POC, the following subsistence mitigation measures will be implemented for Shell's proposed ice overflight surveys.

(1) Communications

- Shell has developed a Communication Plan and will implement this plan before initiating ice overflight survey operations to coordinate activities with local subsistence users, as well as Village Whaling Captains' Associations, to minimize the risk of interfering with subsistence hunting activities, and keep current as to the timing and status of the bowhead whale hunt and other subsistence hunts.
- Shell will employ local CLOs and/or SAs from the Chukchi Sea villages that are potentially impacted by Shell's ice overflight surveys. The CLOs and SAs will provide consultation and guidance regarding the whale migration and subsistence activities. There will be one per village. The CLO and/or SA will use local knowledge (Traditional Knowledge) to gather data on the subsistence lifestyle within the community and provide advice on ways to minimize and mitigate potential negative impacts to subsistence resources during the survey season. Responsibilities include reporting any subsistence concerns or conflicts; coordinating with subsistence users; reporting subsistence-related comments, concerns, and information; and advising how to avoid subsistence conflicts.

(2) Aircraft Travel

- The aircraft will maintain a 1 mi (1.6 km) radius when flying over areas where seals appear to be concentrated in groups of ≥ 5 individuals.
- The aircraft will not land on ice within 0.5 mi (805 m) of hauled out pinnipeds.

- The aircraft will avoid flying over polynyas and along adjacent ice margins as much as possible to minimize potential disturbance to cetaceans.
- Aircraft shall not operate below 1,500 ft (457 m) in areas of active whale hunting; such areas to be identified through communications with the Com Centers and SAs.
- Shell will routinely engage with local communities and subsistence groups to ensure no disturbance of whaling or other subsistence activities.

4.2 Effects of Alternative 2—No Action Alternative

Under the No Action Alternative, NMFS would not issue an IHA to Shell for the proposed ice overflight surveys in the Chukchi and Beaufort Seas. Therefore, the No Action Alternative would effectively preclude Shell from engaging in ice overflight surveys in the U.S. Chukchi and Beaufort Seas in 2015/2016, as any takes of marine mammals under such activities would be violation of the MMPA. If this alternative were selected, the impact on the environment and to Shell from not conducting the proposed ice overflight surveys in 2015/2016 means that:

- 1) Adverse impacts on marine mammals would not be expected as the associated noise generated by aircraft overflight would not exist; and
- 2) Adverse impacts on the Inupiat subsistence hunts would not occur as marine mammals (especially pinnipeds hauled out) would not be affected and would not have cause to temporarily vacate the area due to overflight;

4.3 Estimation of Takes

The number of takes considered for the authorizations is developed via the MMPA process, and the analysis in this Final EA provides a summary of the anticipated numbers that would be authorized to give a relative sense of the nature of impact of NMFS' proposed action. The methods to estimate take by harassment and present estimates of the numbers of marine mammals that might be affected during Shell's proposed ice overflight surveyss are described in detail in Shell's IHA applications and the *Federal Register* notice of proposed IHA, which can be accessed at NMFS website at: <http://www.nmfs.noaa.gov/pr/permits/incidental/oilgas.htm>.

Estimates of the average number of individual seals that may be disturbed are shown by season in Table 2. Ringed seal is by far the most abundant species expected to be encountered during the planned ice overflights. The best (average) estimate of the numbers of ringed seals potentially disturbed during ice overflights is 793 individuals, which still represents a small proportion of the estimated population of ringed seals in the Chukchi and Beaufort Seas. Fewer individuals of other pinniped species are estimated to be encountered during ice overflights, also representing very small proportions of their populations.

Table 2. The total number of potential exposures of marine mammals during the Shell's proposed ice overflight surveys in the Chukchi and Beaufort Seas, Alaska, 2015-2016. Estimates are also shown as a percent of each population

Species	Abundance	Number potential exposure	% Estimated population
Bearded seal	155,000	11	0.007
Ribbon seal	49,000	1	0.002

Ringed seal	300,000	793	0.264
Spotted seal	141,479	7	0.005

4.4 Cumulative Effects

Cumulative effect is defined as “the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-federal) or person undertakes such other actions” (40 CFR §1508.7). Cumulative impacts may occur when there is a relationship between a proposed action and other actions expected to occur in a similar location or during a similar time period, or when past or future actions may result in impacts that would additively or synergistically affect a resource of concern. In other words, the analysis takes into account the incremental impact of the proposed action when added to other past, present, and reasonably foreseeable future actions (40 CFR §1508.7). These relationships may or may not be obvious. Actions overlapping within close proximity to the proposed action can reasonably be expected to have more potential for cumulative effects on “shared resources” than actions that may be geographically separated. Similarly, actions that coincide temporally will tend to offer a higher potential for cumulative effects.

Actions that might permanently remove a resource would be expected to have a potential to act additively or synergistically if they affected the same population, even if the effects were separated geographically or temporally. Note that the proposed action considered here would not be expected to result in the removal of individual cetaceans or pinnipeds from the population or to result in harassment levels that might cause animals to permanently abandon preferred feeding areas or other habitat locations, so concerns related to removal of viable members of the populations are not implicated by the proposed action. This cumulative effects analysis considers these potential impacts, but more appropriately focuses on those activities that may temporally or geographically overlap with the proposed activity such that repeat harassment effects warrant consideration for potential cumulative impacts to the potentially affected 4 marine mammal species and their habitats.

Cumulative effects may result in significant effects even when the Federal action under review is insignificant when considered by itself. The CEQ guidelines recognize that it is not practical to analyze the cumulative effects of an action on the universe but to focus on those effects that are truly meaningful. This section analyzes the addition of the effects of the proposed action (i.e., the issuance of an IHA to Shell for the take of marine mammals incidental to conducting an offshore ice overflight surveys in the U.S. Chukchi Seas) to the potential direct and indirect effects of other factors that may, in combination with the proposed action, result in greater effects on the environment than those resulting solely from the proposed action. Cumulative effects on affected resources that may result from the following activities—seismic survey activities, vessel and air traffic, oil and gas exploration and development in Federal and state waters, subsistence harvest activities, military activities, industrial development, community development, and climate change—within the proposed EA project area are discussed in the following subsections.

4.6.1 Subsistence Hunting

4.6.1.1 Ice Seals

The Division of Subsistence, Alaska Department of Fish and Game (ADF&G) maintains a database that provides additional information on the subsistence harvest of ice seals in different regions of Alaska (ADF&G 2000a,b). Information on subsistence harvest of bearded seals has been compiled for 129 villages from reports from the Division of Subsistence and a report from the Eskimo Walrus Commission (Sherrod, 1982). Data were lacking for 22 villages; their harvests were estimated using the annual per capita rates of subsistence harvest from a nearby village. As of August 2000, the subsistence harvest database indicated that the estimated number of bearded, ribbon, ringed, and spotted seals harvested for subsistence use per year are 6,788, 193, 9,567, and 244, respectively (Allen and Angliss, 2011).

At this time, there are no efforts to quantify the current level of harvest of bearded seals by all Alaska communities. However, the USFWS collects information on the level of ice seal harvest in five villages during their Walrus Harvest Monitoring Program. Results from this program indicate that an average of 239 bearded seals were harvested annually in Little Diomedé, Gambell, Savoonga, Shishmaref, and Wales from 2000 to 2004, 13 ribbon seals from 1999 to 2003, and 47 ringed seals from 1998 to 2003 (Allen and Angliss, 2010). Since 2005, harvest data are only available from St. Lawrence Island (Gambell and Savoonga) due to lack of walrus harvest monitoring in areas previously monitored. There were 21 bearded seals harvested during the walrus harvest monitoring period on St. Lawrence Island in 2005, 41 in 2006, and 82 in 2007. There were no ringed seals harvested on St. Lawrence Island in 2005, 1 in 2006, and 1 in 2007. The mean annual subsistence harvest of spotted seals in north Bristol Bay from this stock over the 5-year period from 2002 through 2006 was 166 seals per year. No ribbon seal was harvested between 2005 and 2007 (Allen and Angliss, 2010).

4.6.1.2 Contributions of the Alternatives to Cumulative Effects of Subsistence Hunting

Alternative 2 would not contribute any additional effects beyond those already analyzed to the cumulative effects from subsistence hunting, as the IHAs would not be issued. Alternative 1 would allow for the issuance of an IHA for the take of marine mammals incidental to conducting ice overflight surveys in the Beaufort and Chukchi Seas during the open-water season. However, Shell would shutdown prior to the fall whaling at Kaktovik and Nuiqsut and not operate until the hunts were completed, thus avoiding concurrent impacts. Additionally, the proposed action is not anticipated to result in serious injury or mortality of any marine mammals; therefore, there would not be additional deaths beyond those from subsistence hunting activities. In addition, no TTS or PTS is expected to occur in marine mammals. While both activities (i.e., the proposed action and subsistence hunting) can disturb marine mammals, NMFS considers the contribution of such disturbance to overall cumulative effects to be minimal because of the mitigation measures that would be required under the IHA, which are included to reduce impacts to the lowest level practicable (see Chapter 52).

4.6.2 Climate Change

Chapter 3 in BOEM's *Chukchi Sea Planning Area Oil and Gas Lease Sale 193 in the Chukchi Sea, Alaska, Final Second Supplemental Environmental Impact Statement* (BOEM 2014) and Section 3.1.4.4

in NMFS' *Draft EIS on the Effects of Oil and Gas Activities in the Arctic Ocean* (NMFS, 2011) describe changes to climate in the Arctic environment. That information is summarized here and incorporated herein by reference. Evidence of climate change in the Arctic has been identified and appear to generally agree with climate modeling scenarios of greenhouse gas warming. Such evidence suggests (NSIDC, 2011a):

- Air temperatures in the Arctic are increasing at an accelerated rate;
- Year-round sea ice extent and thickness has continually decreased over the past three decades;
- Water temperatures in the Arctic Ocean have increased;
- Changes have occurred to the salinity in the Arctic Ocean;
- Rising sea levels;
- Retreating glaciers;
- Increases in terrestrial precipitation;
- Warming permafrost in Alaska; and
- Northward migration of the treeline.

Concurrent with climate change is a change in ocean chemistry known as ocean acidification. This phenomenon is described in the IPCC Fourth Assessment Report (IPCC, 2007a), a 2005 synthesis report by members of the Royal Society of London (Raven et al., 2005), and an ongoing BOEM-funded study (Mathis, 2011). The greatest degree of ocean acidification worldwide is predicted to occur in the Arctic Ocean. This amplified scenario in the Arctic is due to the effects of increased freshwater input from melting snow and ice and from increased CO₂ uptake by the sea as a result of ice retreat (Fabry et al., 2009). Measurements in the Canada Basin of the Arctic Ocean demonstrate that over 11 years, melting sea ice forced changes in pH and the inorganic carbon equilibrium, resulting in decreased saturation of calcium carbonate in the seawater. At this time, we do not know the precise timeframe, or the series of events that would need to occur before an adverse population level effect on the marine mammals or other resources in the Arctic would be realized. However, this information is unobtainable at this time due to the fact that such conditions do not exist to conduct studies.

Bowhead and other Arctic whales are associated with and well adapted to ice-covered seas with leads, polynyas, open water areas, or thin ice that the whales can break through to breathe. Arctic coastal peoples have hunted bowheads for thousands of years, but the distribution of bowheads in relation to climate change and sea ice cover in the distant past is not known. It has been suggested that a cold period 500 years ago resulted in less ice-free water near Greenland, forcing bowheads to abandon the range, and that this in turn led to the disappearance of the Thule culture. However, it is not clear if larger expanses and longer periods of ice-free water would be beneficial to bowheads. The effect of warmer ocean temperatures on bowheads may depend more on how such climate changes affect the abundance and distribution of their planktonic prey rather than the bowheads' need for ice habitat itself.

Climate change associated with Arctic warming may also result in regime change of the Arctic Ocean ecosystem. Sighting of humpback whales in the Chukchi Sea during the 2007 Shell seismic surveys (Funk et al., 2008), 2009 COMIDA aerial survey (Clarke et al., 2011c), and south of Point Hope in 2009 while transiting to Nome (Brueggeman, 2010) may indicate the

expansion of habitat by this species as a result of ecosystem regime shift in the Arctic. These species, in addition to minke and killer whales, and four pinniped species (harp, hooded, ribbon, and spotted seals) that seasonally occupy Arctic and subarctic habitats may be poised to encroach into more northern latitudes and to remain there longer, thereby competing with extant Arctic species (Moore and Huntington, 2008).

In the past decade, geographic displacement of marine mammal population distributions has coincided with a reduction in sea ice and an increase in air and ocean temperatures in the Bering Sea. Continued warming is likely to increase the occurrence and resident times of subarctic species such as spotted seals and bearded seals in the Beaufort Sea. The result of global warming would significantly reduce the extent of sea ice in at least some regions of the Arctic (ACIA, 2004).

Ringed seals, which are true Arctic species, depend on sea ice for their life functions, and give birth to and care for their pups on stable shorefast ice. The reductions in the extent and persistence of ice in the Beaufort Sea almost certainly could reduce their productivity (NRC, 2003b), but at the current stage, there are insufficient data to make reliable predictions of the effects of Arctic climate change on the Alaska ringed seal stock (Allen and Angliss, 2010). In addition, spotted seals and bearded seals would also be vulnerable to reductions in sea ice, although insufficient data exist to make reliable predictions of the effects of Arctic climate change on these two species (Allen and Angliss, 2010).

The implications of the trends of a changing climate for bowheads and other Arctic cetaceans are uncertain, but they may be beneficial, in contrast to affects on ice-obligate species such as ice seals, polar bears, and walrus (ACIA, 2004). There will be more open water and longer ice-free seasons in the arctic seas, which may allow them to expand their range as the population continues to recover from commercial whaling. However, this potential for beneficial effects on bowheads and other whales will depend on their ability to locate sufficient concentrations of planktonic crustaceans to allow efficient foraging. Since phytoplankton blooms may occur earlier or at different times of the season, or in different locations, the timing of zooplankton availability may also change from past patterns. Hence, the ability of bowheads to use these food sources may depend on their flexibility to adjust the timing of their own movements and to find food sources in different places (ACIA, 2004). In addition, it is hypothesized that some of the indirect effects of climate change on marine mammal health would likely include alterations in pathogen transmission due to a variety of factors, effects on body condition due to shifts in the prey base/food web, changes in toxicant exposures, and factors associated with increased human habitation in the Arctic.

With the large uncertainty of the degree of impact of climate change to Arctic marine mammals, NMFS recognizes that warming of this region which results in the diminishing of ice could be a concern to ice dependent seals, walrus, and polar bears. Nonetheless, NMFS considers the effects of the overflight activities on climate change are too remote and speculative to conclude definitively that the issuance of an MMPA IHA for the 2015/2016 proposed ice overflight surveys would contribute to climate change, and therefore a reduction in Arctic sea ice coverage. More research is needed to determine the magnitude of the impact of global warming to marine mammal species in the Arctic and subarctic regions. Finally, any future oil and gas activities that

may arise as a result of this year's open-water ice overflight surveys would likely need to undergo separate permit reviews and analyses.

4.6.3 Oil and Gas Exploration and Development

4.6.3.1 Marine and Seismic Surveys

BOEM-permitted seismic surveys have been conducted in the Federal waters of the Beaufort Sea since the late 1960's/early 1970's (MMS 2007a). For activities since July 2010, NMFS issued an IHA to Shell to take 8 species of marine mammals by Level B behavioral harassment incidental to conducting site clearance and shallow hazards surveys in the Beaufort and Chukchi Seas on August 6, 2010 (75 FR 49710; August 13, 2010). No seismic surveys were conducted in the Beaufort Sea in 2011. In 2012, NMFS issued an IHA to BP Exploration (Alaska), Inc. (BPXI) and ION Geophysical (ION) to take small numbers of marine mammals by harassment incidental to conducting open-water 3D OBC seismic surveys in the Simpson Lagoon of the Beaufort Sea (77 FR 40007; July 6, 2012) and in-ice 2D seismic surveys in the Beaufort and Chukchi Seas (77 FR 65060; October 24, 2012), respectively. In 2013, NMFS issued IHAs to Shell for its open-water marine surveys in the Chukchi Sea (78 FR 47496; August 5, 2013), and to ION for its 2D seismic survey in the Chukchi Seas (78 FR 51147; August 20, 2013). In 2014, NMFS issued IHAs to BP for its 3D seismic survey in the Beaufort Sea (79 FR 36730; June 30, 2014) and its geophazard survey in the Beaufort Sea (79 FR 36769; June 30, 2014), and to SAE for its marine seismic survey in the Beaufort Sea (79 FR 51963; September 2, 2014).

Given the growing interest of oil and gas companies to explore and develop oil and gas resources on the Arctic Ocean OCS, seismic surveys will continue in the Beaufort and Chukchi Seas into the near future and be dependent on: (1) the amount of data that is collected in recent years; and (2) what the data indicate about the subsurface geology. NMFS anticipates that future marine and seismic surveys will continue as the demands on oil and gas are expected to grow worldwide.

However, the proposed ice overflight survey by Shell would not generate as intense underwater noise as those from marine seismic and shallow hazard surveys. Noise sources from aircraft flights will not be directly generated underwater. In addition, ice overflight surveys (breakup surveys and freeze-up surveys) would occur in time when there are no open-water seismic surveys.

4.6.3.2 Oil and Gas Development and Production

Oil and gas exploration and production activities have occurred on the North Slope since the early 1900's, and production has occurred for more than 50 years. Since the discovery and development of the Prudhoe Bay and Kuparuk oil field, more recent fields generally have been developed not in the nearshore environment, but on land in areas adjacent to existing producing areas. Pioneer Natural Resources Co. is developing its North Slope Oooguruk field, which is in the shallow waters of the Beaufort Sea approximately 8 mi northwest of the Kuparuk River unit.

BPXA is currently producing oil from an offshore development in the Northstar Unit, which is located between 3.2 and 12.9 km (2 and 8 mi) offshore from Point Storkersen in the Beaufort Sea. This development is the first in the Beaufort Sea that makes use of a subsea pipeline to transport oil to shore and then into the Trans-Alaska Pipeline System. The Northstar facility was built in State of Alaska waters on the remnants of Seal Island ~9.5 km (6 mi) offshore from Point Storkersen, northwest of the Prudhoe Bay industrial complex, and 5 km (3 mi) seaward of the closest barrier island. The unit is adjacent to Prudhoe Bay, and is approximately 87 km (54 mi) northeast of Nuiqsut, an Inupiat community. To date, it is the only offshore oil production facility north of the barrier islands in the Beaufort Sea.

On November 6, 2009, BPXI submitted an application requesting NMFS issue regulations and subsequent LOAs governing the taking of marine mammals, by both Level B harassment and serious injury and mortality, incidental to operation of the Northstar development in the Beaufort Sea, Alaska. Construction of Northstar was completed in 2001. The activities for 2012-2017 include a continuation of drilling, production, and emergency training operations but no construction or activities of similar intensity to those conducted between 1999 and 2001. NMFS published a notice of proposed rulemaking in the *Federal Register* on July 6, 2011, requesting comments and information from the public (76 FR 39706). NMFS is currently working on the final rulemaking governing BP's marine mammal take authorizations for operating its Northstar facility.

In addition, Shell conducted two exploratory drilling activities at exploration wells in the Beaufort (77 FR 27284; May 9, 2012) and Chukchi (77 FR 27322; May 9, 2012) Seas, Alaska, during the 2012 Arctic open-water season (July through October). In December 2012, Shell submitted two additional IHA applications to take marine mammals incidental to its proposed exploratory drilling in Beaufort and Chukchi Seas during the 2013 open-water season. However, Shell withdrew its application in February 2013. Shell is planning another exploration drilling program in the Chukchi Sea in the 2015 Arctic open-water season and has submitted an IHA application.

However, the proposed ice overflight surveys by Shell would occur mostly outside drilling time during early spring and late fall.

4.6.4 Vessel Traffic and Movement

Vessel traffic in the Alaskan Arctic generally occurs within 12.4 mi (20 km) of the coast and usually is associated with fishing, hunting, cruise ships, icebreakers, Coast Guard activities, and supply ships and barges. No extensive maritime industry exists for transporting goods. Traffic in the Beaufort and Chukchi Seas, at present, is limited primarily to late spring, summer, and early autumn.

For cetaceans, the main potential for effects from vessel traffic is through vessel strikes and acoustic disturbance. Regarding sound produced from vessels, it is generally expected to be less in shallow waters (i.e., background noise only by 6.2 mi [10 km] away from vessel) and greater in deeper waters (traffic noise up to 2,480 mi [4,000 km] away may contribute to background noise levels) (Richardson et al., 1995). Aside from the drillships and other vessels associated with the drilling programs, seismic-survey vessels, barging associated with activities such as

onshore and limited offshore oil and gas activities, fuel and supply shipments, and other activities contribute to overall ambient noise levels in some regions of the Beaufort and Chukchi Seas. Whaling boats (usually aluminum skiffs with outboard motors) contribute noise during the fall whaling periods in the Alaskan Beaufort Sea. Fishing boats in coastal regions also contribute sound to the overall ambient noise. Sound produced by these smaller boats typically is at a higher frequency, around 300 Hz (Richardson et al., 1995a).

Overall, the level of vessel traffic in the Alaskan Arctic, either from oil and gas-related activities or other industrial, military, or subsistence activities, is expected to be greater than in the recent past. With increased ship traffic, there could potentially be deep water port construction in the region.

Ships using the newly opened waters in the Arctic likely will use leads and polynyas to avoid icebreaking and to reduce transit time. Leads and polynyas are important habitat for polar bears and belugas, especially during winter and spring, and heavy shipping traffic could disturb polar bears and belugas during these times.

The proposed ice overflight survey by Shell would not increase vessel traffic in the Alaskan Arctic. All flights would operate out of land-based airports in Barrow and Deadhorse, Alaska.

4.6.5 Conclusion

Based on the analyses provided in this section, NMFS has determined that the proposed Shell ice overflight surveys in the Chukchi and Beaufort Seas in 2015/2016 would not be expected to add significant impacts to overall cumulative effects on marine mammals from past, present, and future activities. The potential impacts to marine mammals and their habitat are expected to be minimal based on the limited noise footprint, and temporal or spatial separation from the activities analyzed above. In addition, mitigation and monitoring measures described in Chapter 2 are expected to further reduce any potential adverse effects.

Chapter 5 List of Preparers and Agencies Consulted

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No other persons or agencies were consulted in preparation of this EA.

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**FINDING OF NO SIGNIFICANT IMPACT
FOR THE ISSUANCE OF AN INCIDENTAL HARASSMENT AUTHORIZATION
TO SHELL GULF OF MEXICO INC. TO TAKE MARINE MAMMALS BY HARASSMENT INCIDENTAL
TO CONDUCTING ICE OVERFLIGHT SURVEYS
IN THE BEAUFORT AND CHUKCHI SEAS**

NATIONAL MARINE FISHERIES SERVICE

BACKGROUND

On December 2, 2014, the National Marine Fisheries Service (NMFS) received an application from Shell Gulf of Mexico Inc. (Shell) for the taking of marine mammals incidental to its ice overflight surveys in the Beaufort and Chukchi Seas from 2015 to 2016. After receiving comments and questions from NMFS, Shell revised its IHA application on January 13, 2015. In addition, NMFS received the marine mammal mitigation and monitoring plan (4MP) from Shell on January 14, 2015.

In response to receipt of the request from Shell, NMFS proposed to issue an IHA that authorized takes, by Level B harassment, of marine mammals, pursuant to section 101(a)(5)(D) of the Marine Mammal Protection Act of 1972, as amended (MMPA; 16 U.S.C. §§ 1361 *et seq.*), and the regulations governing the taking and importing of marine mammals (50 Code of Federal Regulations (CFR) Part 216). Pursuant to the MMPA, authorization for incidental taking shall be granted provided that NMFS: (1) determines that the action would have a negligible impact on the affected species or stocks of marine mammals; (2) finds the action would not have an unmitigable adverse impact on the availability of those species or stocks of marine mammals for taking for subsistence uses; and (3) sets forth, where applicable, the permissible methods of taking, other means of effecting the least practicable impact on affected species and stocks and their habitat, and requirements pertaining to the mitigation, monitoring, and reporting of such takes.

NMFS prepared a draft EA, along with a Federal Register (80 FR 11398; March 3, 2015) for the proposed IHA for public comment on the potential environmental impacts of our issuance of an IHA. During the 30-day public comment period, NMFS received comments from the Marine Mammal Commission; the Alaska Eskimo Whaling Commission; Shell; and a private citizen, Dr. Doreen Dupont. All comments will be addressed in the *Federal Register* notice announcing our final decision on the proposed issuance of the IHA.

In accordance with the National Environmental Policy Act of 1969 (NEPA; 42 U.S.C. §§ 4321 *et seq.*), NMFS prepared an Environmental Assessment (EA) titled, “*Environmental Assessment for the Issuance of an Incidental Harassment Authorization for the Take of Marine Mammals by Harassment Incidental to Conducting Ice Overflight Surveys in the U.S. Chukchi and Beaufort Seas*” (hereinafter, the EA). Based on the EA, NMFS proposed to issue the IHA to Shell with the initially proposed mitigation measures, as described in Alternative 1 of the EA.

The analyses in the EA, which is hereby incorporated by reference, support the analysis and determination below, and based on these, NMFS proposes to issue the IHA to Shell with the initially proposed mitigation measures, as described in Alternative 1 to the EA.

ANALYSIS

The National Oceanic and Atmospheric Administration Administrative Order (NAO) 216-6 contains criteria for determining the significance of the impacts of a proposed action. In addition, the Council on Environmental Quality (CEQ) regulations at 40 C.F.R. § 1508.27 state that the significance of an action should be analyzed both in terms of “context” and “intensity.” Each criterion listed below is relevant to making a finding of no significant impact and has been considered individually, as well as in combination with the others. The significance of this action is analyzed based on the NAO 216-6 criteria and CEQ’s context and intensity criteria. These include:

1) Can the proposed action reasonably be expected to cause substantial damage to the ocean and coastal habitats and/or essential fish habitat as defined under the Magnuson-Stevens Act and identified in Fishery Management Plans (FMP)?

Response: The proposed action (i.e., issuing an IHA to Shell as described in Alternative 1 of the EA) is not reasonably expected to cause substantial damage to the ocean or coastal habitats or essential fish habitat (EFH). The underlying action of Shell’s ice overflight surveys will involve fixed wing aircraft and helicopters flying over the survey area. The airborne noise transmitted into the water column is not likely to affect fish species in the water due to mismatching of acoustic impedance between air and water. Very little acoustic energy is expected to enter the water column. In addition, for the majority of fly route, the aircraft will be above 1,000 ft over the sea surface, and the survey will also focus on ice covered areas instead of open-water.

2) Can the proposed action be expected to have a substantial impact on biodiversity and/or ecosystem function within the affected area (e.g., benthic productivity, predator-prey relationships, etc.)?

Response: The proposed action is not expected to have a substantial impact on biodiversity and/or ecosystem functions in the vicinity of the proposed ice overflight survey areas in the Beaufort and Chukchi Seas because NMFS does not expect the issuance of the IHA to Shell or the underlying action to significantly (1) affect the susceptibility of any of the animals found in the vicinity of the project area to predation, (2) alter dietary preferences or foraging behavior, (3) change distribution or abundance of predators or prey, or (4) significantly disturb marine mammal behavior.

The impacts of the underlying action on marine mammals are limited to temporary disturbance of pinnipeds haul-out on ice from being exposed to aircraft overflight noise in the air. Shell will implement a variety of mitigation measures such as maintaining a 1 mi (1.6 km) radius when flying over areas where seals appear to be concentrated in groups of ≥ 5 individuals and not landing on ice within 0.5 mi (805 m) of hauled out pinnipeds. Neither serious injury nor mortality of marine mammals is anticipated and will not be authorized. These disturbances are not expected to result in substantial impacts to marine mammals or to their role in the ecosystem.

3) Can the proposed action reasonably be expected to have a substantial adverse impact on public health or safety?

Response: The proposed action is not reasonably expected to have a substantial adverse impact on public health or safety because neither issuance of the IHA nor the underlying authorized activity

poses a risk to public health or human safety. The taking of marine mammals poses no risk to public health or safety. The ice overflight surveys in the Beaufort and Chukchi Seas are part of routine oil and gas exploration activities that are performed by industry worldwide on a regular basis.

4) Can the proposed action reasonably be expected to adversely affect endangered or threatened species, their critical habitat, marine mammals, or other non-target species?

Response: The proposed action is not reasonably expected to adversely affect endangered or threatened species, their critical habitat, marine mammals, or other non-target species. The IHA will not authorize injury or mortality of marine mammals. The IHA will authorize some Level B harassments of small numbers of pinnipeds hauled out on ice incidental to Shell's ice overflight surveys, but NMFS Office of Protected Resources has determined that the take of marine mammals incidental to the ice overflight surveys would have a negligible impact on the species and stocks of marine mammals in the action area.

Further, NMFS Office of Protected Resources engaged in formal consultation with NMFS Alaska Regional Office in 2015 regarding potential impacts of issuance of the IHA on threatened and endangered species. In a biological opinion dated May 20, 2015, NMFS Alaska Regional Office concluded that the issuance of the IHA is: (1) not likely to jeopardize the continued existence of the ESA-listed ringed seal; and (2) not likely to adversely modify or destroy critical habitat, as the proposed ice overflight survey areas are neither within nor nearby designated critical habitat for ESA-listed species.

5) Are significant social or economic impacts interrelated with natural or physical environmental effects?

Response: NMFS does not expect the issuance of an IHA to Shell to result in significant social or economic impacts interrelated with natural or physical environmental effects. Natural or physical effects of the ice overflight surveys in the Beaufort and Chukchi Seas would be limited to short-term and geographically-limited disturbance and the short-term harassment of marine mammals, as authorized by the permit. Authorization of the proposed ice overflight surveys could result in a low level of economic benefit to the local economy, through employment opportunities and revenue. However, such impacts would likely be negligible and on a regional or local level.

Because of the limited nature of the survey, the activities authorized would not substantially impact use of the environment or use of natural or depletable resources, such as might be expected from large-scale oil and gas development or resource extraction activities. Further, issuance of the IHA would not result in inequitable distributions of environmental burdens or access to environmental goods.

NMFS has determined that issuance of the IHA will not adversely affect low-income or minority populations or subsistence uses of marine mammals. There are subsistence uses of marine mammals in or near the survey area, but there will be no unmitigable adverse impact resulting from the activity on the availability of the species or stocks of marine mammals for subsistence uses, as necessary mitigation measures would be implemented to eliminate any impacts that could have significant effects on the subsistence use of such resources. In addition, Shell has worked with, and will continue to work with, the native communities to further mitigate potential impacts to subsistence use of marine mammal resources. Shell has prepared a Plan of Cooperation (POC) that

identifies and documents potential conflicts and associated measures that will be taken to minimize any adverse effects on the availability of marine mammals for subsistence use. In addition, Shell has signed a Conflict Avoidance Agreement (CAA) with the Alaska native whaling communities in support of its 2015 activities in the Beaufort and Chukchi Seas, and NMFS has included appropriate measures identified in the CAA in the proposed IHA. With all of these measures in place, no significant social or economic impacts are expected as a result of the issuance of the IHA or the underlying activity.

6) Are the effects on the quality of the human environment likely to be highly controversial?

Response: The effects of issuing an IHA to Shell as described in Alternative 1 of the EA on the quality of the human environment are not likely to be highly controversial because: (1) there is no substantial dispute regarding the size, nature, or effect of the proposed action; and (2) there is no known scientific controversy over the potential impacts of the proposed action.

To allow other agencies and the public the opportunity to review and comment on the actions, NMFS published a notice of receipt of the Shell application and proposed IHA in the *Federal Register* on March 4, 2015 (80 FR 11398). This included notice of availability of and 30-day comment period on a draft EA, NMFS received comment letters from the Marine Mammal Commission (Commission), AEWC, Shell, and a private citizen. None of the Commission and AEWC's comments indicated that the potential effects of the proposed action are controversial. All comments will be addressed in the *Federal Register* notice for the issuance of the IHA.

7) Can the proposed action reasonably be expected to result in substantial impacts to unique areas, such as historic or cultural resources, park land, prime farmlands, wetlands, wild and scenic rivers, essential fish habitat, or ecologically critical areas?

Response: The proposed action is not reasonably expected to result in substantial impacts to unique areas, such as historic or cultural resources, park land, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas, because none of these are found in the project area. In addition, as described in the response to questions 1 and 4 above, no substantial impacts to EFH, designated critical habitat, or ecologically critical areas would be expected, as the proposed ice overflight surveys would have a limited footprint for a short duration.

8) Are the effects on the human environment likely to be highly uncertain or involve unique or unknown risks?

Response: The action of issuing an IHA to Shell for the incidental take, by Level B harassments, of small numbers of marine mammals from overflight surveys is not expected to have effects on the human environment that would be highly uncertain or involve unique or unknown risks. Similar aircraft overflight activities for a variety of purposes, including supporting offshore oil and gas exploration and development, in the Beaufort and Chukchi Seas, have been performed routinely and without incidence. There is nothing unique about Shell's survey that would create effects on the human environment that would be highly uncertain or involve unique or unknown risks.

While NMFS' judgments on impact thresholds for marine mammals in the vicinity of the project area are based on limited data, the risks are known and would involve the temporary harassment of marine mammals. No deaths or injuries to animals have been documented due to past open-water marine and ice overflight surveys using fixed wing aircraft and helicopters. The most common response to aircraft overflight is for hauled out pinnipeds to escape into water. NMFS expects

Shell's surveys to result in the same responses as other aircraft overflight, as there is nothing unique about Shell's survey that would be expected to create uncertainty or unique or unknown risks.

9) Is the proposed action related to other actions with individually insignificant, but cumulatively significant impacts?

Response: The proposed action to issue an IHA to Shell and the underlying action of Shell's ice overflight surveys are not related to other actions with individually insignificant, but cumulatively significant impacts. As analyzed in the EA, while other activities in the Beaufort and Chukchi Seas, including subsistence hunting, marine seismic survey activities, other oil and gas exploration activities, and vessel traffic, are expected to result in impacts on the environment, including limited harassment of marine mammals, none of these activities are related to Shell's surveys, and the addition of Shell's survey is not expected to individually or cumulatively cause any significant impacts.

10) Is the proposed action likely to adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or cause loss or destruction of significant scientific, cultural or historical resources?

Response: The issuance of an IHA is not expected to adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or cause loss or destruction of significant scientific, cultural or historical resources, because such resources do not exist within the areas in the Beaufort and Chukchi Seas where Shell's proposed ice overflight surveys is planned.

11) Can the proposed action reasonably be expected to result in the introduction or spread of a non-indigenous species?

Response: The issuance of an IHA to Shell and the underlying action are not reasonably expected to lead to the introduction or spread of any non-indigenous species into the environment, because the activities associated with the proposed project would only involve aircraft overflight surveys.

12) Is the proposed action likely to establish a precedent for future actions with significant effects or does it represent a decision in principle about a future consideration?

Response: The issuance of an IHA to Shell is not expected to set a precedent for future actions with significant effects nor represent a decision in principle regarding future considerations. To ensure compliance with statutory and regulatory standards, NMFS' actions under section 101(a)(5)(D) of the MMPA must be considered individually and be based on the best available information, which is continuously evolving. Issuance of an IHA to a specific individual or organization for a given activity does not guarantee or imply that NMFS will authorize future activities by that individual or organization or authorize others to conduct similar activities. Subsequent requests for incidental take authorizations would be evaluated upon their own merits, relative to the criteria established in the MMPA, ESA, and NMFS implementing regulations, on a case-by-case basis. Moreover, Shell's proposed ice overflight surveys have no unique aspect that would suggest it would be a precedent for any future actions. For these reasons, the issuance of an IHA to Shell to conduct the ice overflight surveys is not precedent setting and does not represent a decision in principle about any future considerations.

13) Can the proposed action reasonably be expected to violate any Federal, State, or local law or requirements imposed for the protection of the environment?

Response: The issuance of an IHA would not violate any federal, state, or local laws for environmental protection. NMFS has fulfilled its section 7 responsibilities under the ESA (see response to Question 4).

14) Can the proposed action reasonably be expected to result in cumulative adverse effects that could have a substantial effect on the target species or non-target species?

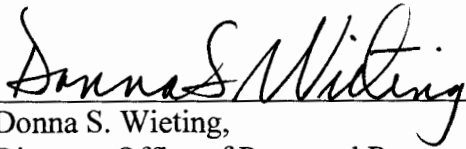
Response: Based on our analysis in the EA, the issuance of an IHA is not expected to result in any significant cumulative adverse effects that could have a substantial effect on target or non-target species. The stresses resulting from the ice overflight surveys in the Beaufort and Chukchi Seas will be minor, incremental, and temporary, and will have a limited geographic footprint, and thus the effects would be expected to be minimal, when considered separately and cumulatively, when added to other stresses experienced in the vicinity of the aircraft survey area.

Shell's proposed ice overflight surveys do not target any species. The proposed aircraft survey is expected to result in only short-term behavioral changes, but not long-term displacement or other impacts, to small numbers of pinnipeds hauled on ice. In addition, the mitigation measures Shell is required to implement will further reduce any potential impacts to marine mammals. While the marine mammals in the vicinity of Shell's ice overflight survey area have the potential to be impacted by other human activities in the Arctic Ocean, as described in the cumulative impacts analysis in the EA, these activities are generally separated both geographically and temporally from Shell's proposed aircraft survey. Any short-term stress experienced by the marine mammals in the vicinity of Shell's ice overflight survey area would be expected to be minimal, when considered separately and cumulatively, when added to other stresses experienced by the marine mammals in the vicinity of the survey area. Thus, NMFS concluded that the impacts of issuing an IHA to Shell for the incidental take, by Level B harassments only, of small numbers of marine mammals are expected to be no more than minor and short-term, and the proposed action is not expected to result in any cumulative adverse effects on any species.

DETERMINATION

In view of the information presented in this document and the analysis contained in the supporting Final Environmental Assessment titled, "*Environmental Assessment for the Issuance of an Incidental Harassment Authorization for the Take of Marine Mammals by Harassment Incidental to Conducting Ice Overflight Surveys in the U.S. Chukchi and Beaufort Seas*," prepared by NMFS, it is hereby determined that the issuance of an IHA for the take, by Level B harassments only, of small numbers of marine mammals incidental to Shell's proposed ice overflight surveys in the Beaufort and Chukchi Seas in 2015/2016, will not significantly impact the quality of the human environment, as described in this document and in the EA.

In addition, all beneficial and adverse impacts of the action have been addressed to reach the conclusion of no significant impacts. Accordingly, preparation of an Environmental Impact Statement for this action is not necessary.



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JUN 04 2015

Date