90-Day Report for Marine Mammal Monitoring and Mitigation during the BPXA North Prudhoe Bay 3D OBS Seismic Survey Beaufort Sea, Alaska

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July-August 2014

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Cover Photo: Swimming spotted seal (*Phoca largha*) photographed by Mark Cotter on 22 July 2014.

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Acronyms and Abbreviations

3D	three-dimensional
AEWC	Alaska Eskimo Whaling Commission
AKDT	Alaska Daylight Time
ASAMM	Aerial Surveys of Arctic Marine Mammals
ASL	Above Sea Level
Bf	Beaufort sea state
BO	Biological Opinion
BPXA	BP Exploration (Alaska), Inc.
CAA	Conflict Avoidance Agreement
Com-Center	Communication Center
CPA	closest point of approach
dB	decibel(s)
dB re 1 µPa (rms)	decibels relative to 1 microPascal (rms)
DPS	Distinct Population Segment
ESA	Endangered Species Act
ft	feet
hr	hour(s)
hr/d	hour(s) per day
HSE	Health, Safety, and Environment
Hz	hertz
IC	Iñupiat Communicator
in^3	cubic inch(es)
IHA	Incidental Harassment Authorization
ITS	Incidental Take Statement
kHz	kilohertz
km	kilometer(s)
km^2	square kilometer(s)
km/hr	kilometers per hour
kt	knot(s)
LOA	Letter of Authorization
m	meter(s)
mi	mile(s)
mi^2	square mile(s)
min	minute(s)
MMPA	Marine Mammal Protection Act
n	number
N	north
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPB	North Prudhoe Bay
NVD	night vision device(s)
OBS	ocean bottom sensor

PBU	Prudhoe Bay Unit
psi	pounds per square inch
PSO	protected species observer
QA/QC	quality assessment / quality check
rms	root mean square
R/V	research vessel
SAE	SAExploration
SDI	Satellite Drilling Island
sec	second(s)
SPL	sound pressure level(s)
SSV	sound source verification
™	Trademark
Unid	unidentified
U.S.	United States
USFWS	U.S. Fish and Wildlife Service
W	west

1. Introduction

BP Exploration (Alaska), Inc. (BPXA) conducted a three-dimensional (3D) ocean bottom sensor (OBS) seismic survey with a transition zone component on state and private lands, and federal and state waters in the North Prudhoe Bay (NPB) area during the 2014 open-water season, hereafter referred to as the *2014 NPB 3D OBS Survey*. Timing of survey events are summarized in Table 1. Timeline of *2014 NPB 3D OBS Survey*. The survey location was in the Beaufort Sea, Alaska between Endeavour Island, east of Prudhoe Bay, and Egg Island, at the eastern side of Gwydyr Bay (Figure A). Vessel and equipment preparation in Prudhoe Bay began on 2 July with airgun operations commencing 24 July and ending midnight of 25 August. The survey was fully demobilized and all operations complete on 19 September 2014 (Table 1).

Numerous species of marine mammals are known to occur in the Beaufort Sea and are likely to be encountered in or near the *2014 NPB 3D OBS Survey* area, including three cetacean (beluga whale, bowhead whale and gray whale), three pinniped (ringed seal, spotted seal, and bearded seal) and one marine fissiped species (the polar bear). An additional seven marine mammal species (Pacific walrus, ribbon seal, narwhal, killer whale, harbor porpoise, minke whale and humpback whale) may occur in the Beaufort Sea but are considered rare or extralimital to the project area and, with the exception of the Pacific walrus, are not further addressed herein.

Species considered most likely to be encountered in the *2014 NPB 3D OBS Survey* area are ringed seals, bearded and spotted seals. Polar bears also frequent the project area. Though possible, beluga, bowhead and gray whale occurrence is considered very limited given the shallow (< 10 meters [m]) water depths in the survey area combined with the barrier islands that separate the survey area from the offshore Beaufort Sea (Figure B). Most bowhead whales occur farther offshore during July or August, although some have been observed nearshore in the past few years (Clarke et al. 2014; 2013, 2014 Aerial Surveys of Arctic Marine Mammals (ASAMM) daily flight summaries). Three species known to occur regularly in the Beaufort Sea are listed under the U.S. Endangered Species Act (ESA): the endangered bowhead whale (District Population Segment [DPS]), the threatened Arctic ringed seal, and the threatened polar bear.

Marine seismic surveys emitting sound energy into the water have the potential to affect marine mammals, given their reported auditory and behavioral sensitivity to underwater sounds (e.g., Richardson et al. 1995). Behavioral or auditory effects (if they occur) could constitute a “take” under provisions of the Marine Mammal Protection Act (MMPA) and the ESA. The National Marine Fisheries Service (NMFS) has jurisdiction over whale and seal species that were likely to be encountered during the survey. Under the MMPA, BPXA applied for and, on 25 June 2014, received from NMFS an Incidental Harrassment Authorization (IHA) authorizing “take”, by Level B harassment, of a small number of marine mammals incidental to conducting the proposed open-water OBS survey (NMFS 2014a). This IHA provided authorization to conduct the seismic survey and identified associated monitoring, mitigation and reporting measures. The IHA included provisions to minimize the possibility that cetaceans and pinnipeds (excluding the Pacific walrus

managed by the United States Fish and Wildlife Service [USFWS]) would be exposed to potentially harmful airgun sounds and to reduce behavioral disturbances that could be considered "take" under the MMPA. In addition to the regularly occurring species mentioned above, BPXA also requested harassment authorization from NMFS for a few individual rare or extralimital whale species to cover potential incidental occurrences.

BPXA also requested and was issued two LOAs from the USFWS. LOA 14-10 authorized BPXA to take small numbers of polar bears and Pacific walrus incidental to project survey activities (USFWS 2014b) (Appendix A). LOA 14-INT-06 authorized BPXA to take by non-lethal harassment (deterrence activities) small numbers of polar bears for the protection of human life while conducting project survey activities (i.e., intentional take for deterrence) (USFWS 2014a) (Appendix A). These LOAs identified mitigation, monitoring, and reporting measures required specific to these species.

Regulations in the MMPA also require that IHA applicants planning activities in Arctic waters provide a Plan of Cooperation identifying measures to minimize adverse effects on the availability of marine mammals for subsistence purposes. BPXA met with representatives of the community of Nuiqsut, the Alaska Eskimo Whaling Commission (AEWC), the North Slope Borough, and others to discuss appropriate measures to be implemented during the *2014 NPB 3D OBS Survey* to avoid potential conflicts with subsistence hunts. In addition, BPXA agreed to follow applicable measures identified in the Conflict Avoidance Agreement (CAA) dated 02 April 2014 (AEWC 2014) (Appendix B).

Trained, NMFS-approved Protected Species Observers (PSOs) were present aboard the source vessel in compliance with the issued NMFS IHA and USFWS LOA (NMFS 2014a; USFWS 2014b). Some of these PSOs also performed a role as Iñupiat Communicators (IC). The main goal of the PSOs and ICs was to (1) avoid or minimize potential effects of the *2014 NPB 3D OBS Survey* activities on marine mammals, and (2) communicate with local subsistence communities. As required by the IHA, this included observing for marine mammals within or approaching the estimated safety radii (190 decibels [dB] relative to 1 microPascal [re 1 µPa] root mean square [rms] for pinnipeds and 180 dB re 1 µPa [rms] for cetaceans) and initiating an immediate power down or shutdown of the airguns, when needed.

To satisfy the monitoring requirements of the MMPA for the *2014 NPB 3D OBS Survey*, NMFS requested that BPXA conduct a fish and airgun sound monitoring program (Appendix C) as proposed in BPXA's IHA application and further refined in consultation with an expert panel. BPXA conducted this program during 2014, the preliminary results of which are summarized in Appendix C. More detailed results of this program will be submitted as a manuscript to NMFS and to a peer-reviewed journal simultaneously in 2015.

This 90-day report describes the methods and results of the *2014 NPB 3D OBS Survey* marine mammal mitigation and monitoring and addresses specific components required in the IHA and LOA. This includes (1) summarizing PSO effort and sighting data and

implemented mitigation measures, (2) estimating numbers of marine mammals potentially exposed to seismic pulses exceeding sound levels of 160 dB re 1 µPa (rms) and 170 dB re 1 µPa (rms), and (3) describing reactions (if any) of marine mammals potentially exposed to seismic sounds. Note that henceforth all sound pressure levels (SPL) relative to dB re 1 µPa (rms) will be expressed as dB (rms).

2. Summary of BPXA Activities during the 2014 NPB 3D OBS Survey

The *2014 NPB 3D OBS Survey* was conducted by SAExploration (SAE) for BPXA. Survey details are described in this section and include information on vessels, personnel, and equipment used during the survey. The IHA application (BPXA 2013) provides more in-depth information on some of these topics.

Table 1. Timeline of *2014 NPB 3D OBS Survey*

2014 Date	Main Activity
19 June to 8 July	Transportation of project vessels to Prudhoe Bay area via roadways.
2 July	Transition zone (surf-zone) node deployment begins.
8 July	Terrestrial zone node deployment begins.
22 July	Marine zone node deployment begins.
24 July	Testing of seismic airguns begins.
25 August	Source acquisition ends.
19 September	Survey is fully demobilized.

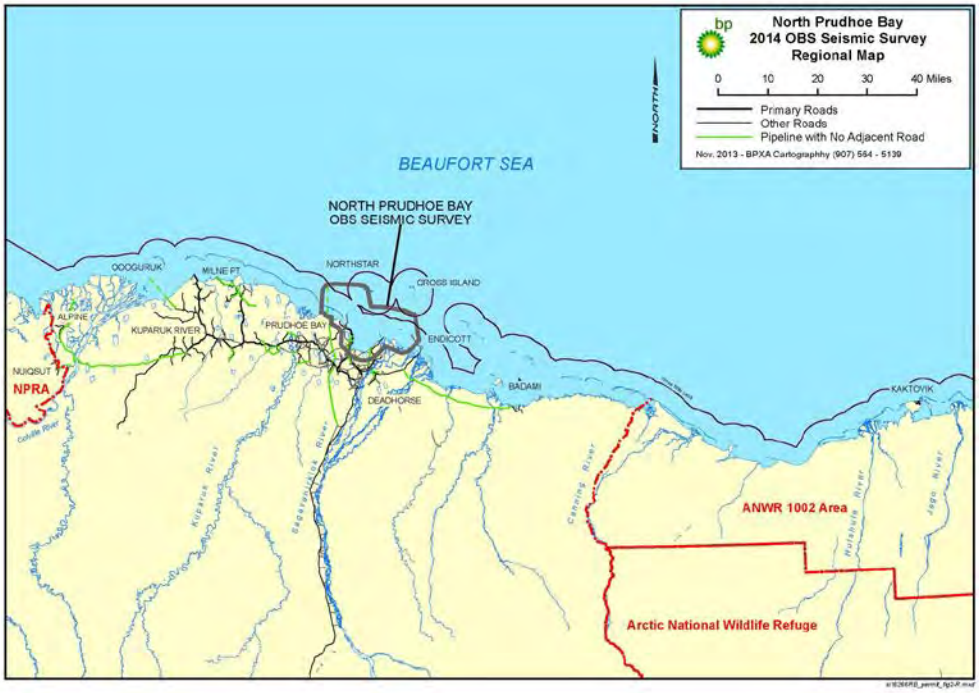

Figure A. 2014 North Prudhoe Bay 3D Survey Area Regional Map

2.1. Purpose

The purpose of the *2014 NPB 3D OBS Survey* was for BPXA to obtain current, high-resolution seismic data to image existing reservoirs allowing for more effective reservoir management. These data will increase BPXA's understanding of the reservoir, allowing more effective reservoir management.

2.2. Survey Area

The *2014 NPB 3D OBS Survey* area was located within the Prudhoe Bay Unit (PBU) of Prudhoe Bay and included portions of the Northstar, Dewline, and Duck Island Units as well as non-unit areas (BPXA 2013) (Figure A and Figure B). The survey area encompassed a total of approximately 190 square miles (mi²) as follows: 129 mi² in water depths ≥ 3 feet (ft), 28 mi² in waters < 3 ft deep within state and federal waters, and 33 mi² on state and private lands.

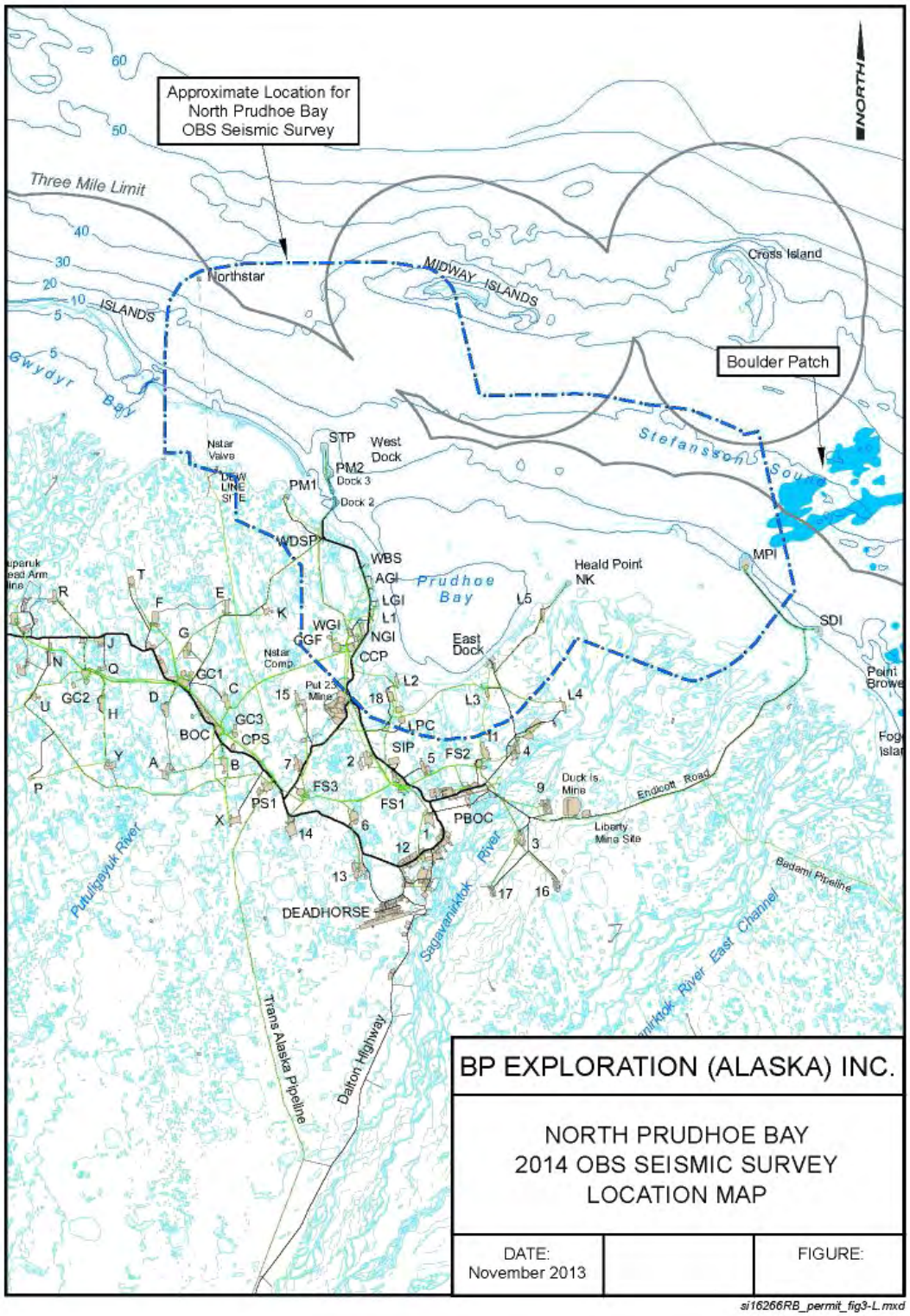

Figure B. 2014 NPB 3D OBS Survey area (Source: BPXA IHA Application [BPXA 2013]).

2.3. Survey Equipment

A total of 14 vessels were involved with the *2014 NPB 3D OBS Survey* (Table 2). This included two seismic source vessels (the Research Vessel [*R/V*] *Peregrine* [*Peregrine*] and *R/V Maxime [Maxime]*), four receiver vessels, two crew/support boats, and multiple vessels for shallow water and shoreline work. The *Peregrine* operated mostly in deeper water, while the *Maxime* operated in shallower waters. All vessels were operated by SAE in accordance with BPXA permit provisions. To deploy and retrieve receivers in water depths less than those accessible by the larger vessels (i.e., in the surf-zone), equipment such as Arktos™, and shallow water boats were used. Helicopters and trucks on roads were used for deployment of receiver units onshore. Equipment was transported to the North Slope by truck. Vessel preparation included assembly of navigation and source equipment, receiver node deployment and retrieval systems and safety equipment. Once assembled, vessels were launched at West Dock and East Dock. Deployment, retrieval, navigation, and source systems were then tested near West Dock or in the survey area prior to commencing seismic data acquisition.

Table 2. Summary of vessels used for the *2014 NPB 3D OBS Survey*.

Vessel Name	Vessel Type	No.	Dimension[a]	Main Activity	Frequency
	OFFSHORE AND SURF-ZONE				
R/V *Peregrine*	Source vessel: main	1	90 × 24 ft	Seismic data acquisition	24-hour (hr) operation (ops)
R/V *Maxime*	Source vessel: small	1	85 x 20 ft	Seismic data acquisition	24-hr ops
R/V *Miss Diane*, R/V *Mark Steven*	Receiver boats	2	85 x 24 ft 85 x 20 ft	Deploy and retrieve receivers in offshore zone	24-hr ops
R/V *Wingham* R/V *Sleep Robber*	Shallow water receiver boats	2	34 x 12 ft 32 x 14 ft	Deploy and retrieve receivers in shallow regions of offshore/surf zone	24-hr ops
Aubree Tara *Kimberlin's Cat*	Crew transport, HSE, and support vessels	2	42 × 14 ft 45 x 16 ft	Transport crew and supplies	Typically twice daily and as needed
	SURF-ZONE				
	ARKTOS™	2		Deploy and retrieve receivers in surf zone and non-	Intermittent 24-hr ops

Vessel Name	Vessel Type	No.	Dimension[a]	Main Activity	Frequency
				vegetated onshore areas	
	Shallow water boats (Omni)	2		Deploy and retrieve receivers in surf-zone	Intermittent 24-hr ops
	Zodiacs	Up to 4		Transport crew and supplies	Intermittent24-hr ops
	Northstar hovercraft	1		Demobilize equipment	Intermittent

[a] *Vessel sizes indicated in length and width in feet (ft).*

2.4. Source Arrays

A total of two airgun arrays were used during the survey, one from each source vessel (Table 3). Each airgun array consisted of eight airguns with a total discharge volume of 620 cubic inches (in^3). Although two arrays were initially planned to be used on the larger vessel (*Peregrine*) for a total volume of 1,240 in^3, operational constraints did not allow this to happen. The smallest airgun in the array (40 in^3) or a separate 10 in^3 airgun was used for mitigation purposes.

Source vessels traveled along pre-determined survey lines at an average speed of 5 knots (kt). Source vessels operated simultaneously in ping-pong mode, with each source vessel firing a maximum of 16 seconds (sec) interval, resulting in 8-sec shot timing. When operating individually source firing timing was 12-14 seconds. When weather and operational conditions allowed, seismic data acquisition was conducted 24 hour (hr)/day (d).

Table 3. Airgun array configuration and source signatures as predicted by the Gundalf Airgun Array Model for 2 meter depth (Both source vessels towed the same airgun array).

Array Specifics	Description
Total Array Volume - *Peregrine*	620 in^3
Total Array Volume - *Maxime*	620 in^3
Number of guns	Eight 2000 psi sleeve airguns in one array (2 x 110, 2 x 90, 2 x 70, and 2 x 40 in^3)
Zero to peak	237 dB re µPa @ 1 m
Peak to peak	243 dB re µPa @ 1 m

Array Specifics	Description
rms pressure (source level)	218 dB re µPa @ 1 m
Dominant frequencies	Typically less than 1 kHz
Towing distances	16.2 m (R/V *Peregrine*), 17.7 m (R/V *Maxime*)
Towing depths	1.9 m (R/V *Peregrine*), 1.4 m (R/V *Maxime*)

Source: IHA Application for this project (BPXA 2013)
Notes: dB re 1µPa @1 m= decibels relative to 1 microPascal at one meter, in^3=cubic inch (es), psi=pounds per square inch, kHz=kilohertz, rms = root mean square

2.5. Receivers

The *2014 NPB 3D OBS Survey* utilized three different types of receivers for different habitats as follows: (1) "onshore" (from the coastline inland), (2) "surf-zone" (0 to 6 ft water depth along the onshore coastline), and (3) "offshore" (depths ≥ 3 ft). This resulted in a zone with depths between 3 and 6 ft that was categorized as both surf and offshore zones.

Marine nodes were used for the offshore zone, subsurface receivers with autonomous nodes held above the water were used for the surf-zone, and inserted geophones with autonomous surface-laying nodes were used for the onshore zone. The IHA application (BPXA 2013) describes receivers in more detail.

2.6. Navigation Data Collection and Management

Seismic receivers were placed along north-south oriented lines with a minimum line spacing of 1,320 ft (See Appendix D). The sound sources (submerged compressed airgun arrays towed behind source vessels) were towed perpendicular to receiver lines with typical minimum line spacing of 550 ft.

2.7. Housing and Logistics

Mobilization, demobilization, and support activities occurred at West Dock and East Dock. Approximately 220 personnel were involved in the *2014 NPB 3D OBS Survey* including the seismic crew, management, mechanics, and PSOs. Some offshore crew was housed on vessels, but most crew was accommodated at a BPXA-operated camp near West Dock or at housing in Deadhorse. For protection from weather, vessels anchored near West Dock on several occasions. Onshore travel was via trucks, buses and helicopter. Vessels identified in Table 2 were used in in the offshore and surf-zones.

3. Safety/Disturbance Radii

Safety radii and disturbance radii were identified in the NMFS-issued IHA and the USFWS-issued LOA for the *2014 NPB 3D OBS Survey* (NMFS 2014a; USFWS 2014a,b). These radii are based on current NMFS guidelines (e.g., 65 FR 16374) indicating that the "safety radii" for marine mammals around airgun arrays are customarily defined as the distances within which received SPLs are ≥ 180 dB (rms) for cetaceans and ≥ 190 dB (rms) for pinnipeds. The USFWS-issued LOA identified a ≥ 180 dB (rms) safety radius for walrus and a ≥ 190 dB (rms) safety radius for polar bears in water. The NMFS criteria assume that pulsed sounds at lower received levels will not injure these animals or impair their hearing ability, but that higher received levels could potentially have such effects. In addition, NMFS assumes that marine mammals exposed to ≥ 160 dB (rms) are potentially subject to behavioral disturbance.

As summarized in the *2014 NPB 3D OBS Survey* IHA application (BPXA 2013) there is poor agreement between modeled and measured distances to received SPLs; this is due to natural variability in the marine environment, application of precautionary correction factors, and data interpretation in the generation of circular isopleths (Aerts et al. 2013). Thus, for the 620 in^3 array used for the *2014 NPB 3D OBS Survey*, the average distance of combined 640 - 880 in^3 SSV measurements was applied to establish distances to mitigation radii associated with received SPLs of 190, 180, and 160 dB (rms) (BPXA 2013). Distances derived from existing single airguns were also applied for the single 40 in^3 and 10 in^3 mitigation airguns used during the *2014 NPB 3D OBS Survey* (see BPXA 2013). These radii were applied during the survey and were also identified in the project's NMFS-issued IHA and USFWS-issued LOA (NMFS 2014a; USFWS 2014b). The applied safety zone radii are shown in Table 4.

Table 4. Safety and disturbance radii distance in meters applied during the *2014 NPB 3D OBS Survey.**

	Distance (meters)		
Airgun Discharge Volume (in^3)	**190 dB (rms)**	**180 dB (rms)**	**160 dB (rms)**
620	300	600	2,000
40	70	200	1,000
10	20	50	500

**190 dB root mean square (rms): seals and polar bears in water; 180 dB (rms): cetaceans and walrus; 160 dB (rms): any marine mammal without permitted "takes" from NMFS.*

4. Marine Mammal Mitigation and Monitoring Program

This section describes the mitigation, monitoring and measures implemented to address requirements specified in the NMFS-issued IHA and USFWS-issued LOA for the *2014 NPB 3D OBS Survey* (NMFS 2014a; USFWS 2014b). Data analyses, methods, and results for this program are provided in Section 5. The main purpose of the monitoring program was to ensure compliance with provisions of the issued IHA and LOA. These provisions and guidelines aimed to minimize and document potential project-related effects on marine mammals. The IHA application noted that where necessary, human safety took precedence over mitigation measures related to avoidance, disturbance, and harassment of marine mammals; this situation was not encountered on the project. PSOs on board the vessels had two primary areas of responsibility:

1. **Monitoring:** Record numbers, behavior and locations of marine mammals at all times during daylight conditions both during and in absence of airgun activity and document their reactions (where applicable). In addition, document selected environmental variables that may affect the ability to detect marine mammals.

2. **Mitigation:** Detect marine mammals within, or approaching, the applicable safety radii and initiate immediate shutdown or power down of the airguns. Use visual monitoring to estimate the number of marine mammals potentially exposed to airgun sounds at specified levels.

4.1. Mitigation Measures

Mitigation measures implemented during the *2014 NPB 3D OBS Survey* consisted of the following three groups as discussed in ensuing subsections and Appendix E:

1. **General mitigation measures:** These applied to all vessels involved in the survey.
2. **Seismic survey mitigation measures:** These applied only to the source vessels that operated the airguns.
3. **Mitigation measures for subsistence activities:** These applied to all vessels involved in the survey.

4.1.1. General Mitigation Measures

The general mitigation measures (Appendix E), as identified in the NMFS-issued IHA and USFWS-issued LOA, were implemented where applicable by the captains and crew of all Prudhoe Bay project vessels and aircraft during the duration of the survey. These general measures were designed to help avoid disturbance to marine mammals and birds.

The two source vessels operated under an additional set of specific mitigation measures during airgun operations.

4.1.2. Seismic Survey Mitigation Measures

Four standard seismic-related mitigation measures were implemented for marine mammal sightings during the seismic program: ramp-up, power down, shutdown, and operation of a single 10 in^3 or 40 in^3 airgun (i.e., mitigation airgun). These mitigation measures are defined in Appendix E, with further information found in the issued IHA (NMFS 2014a). Safety and disturbance radii distances are summarized in Table 3. These safety radii were monitored by PSOs on the source vessel at all times during all airgun activities. Power down or shutdown procedures were implemented when a marine mammal was sighted within or approaching the applicable radii when any airguns operated.

An additional mitigation measure to standard seismic mitigation measures required that airguns be shut down for the first bowhead whale observed within the 160 dB (rms) zone. (The project was allowed a single exposure of a bowhead whale to airgun sounds ≥ 160 dB (rms)). No bowhead whales were observed during the project, so this mitigation was never implemented. In addition, the IHA stipulated that if any marine mammal species not listed on the IHA were encountered during seismic survey operations and were likely to be exposed to SPLs ≥ 160 dB (rms) for impulse sources, then BPXA was required to shut down the sound source to avoid a "take". As no such species were seen, this procedure did not need to be implemented.

Specific procedures were also implemented for poor visibility conditions, defined as periods when the full 180 dB (rms) safety radii was not visible, such as during foggy or low-light conditions (see Appendix E). Ramp-up of the airguns from a full shutdown (longer than 10 min) was not allowed at these times. However, if only one airgun (i.e., the mitigation airgun) was active at the onset of poor visibility conditions, a ramp-up could be initiated even though the safety radius was not visible. This is because the operating airgun is thought to have influenced marine mammals to leave the area of seismic operations.

During the project, 24-hr airgun operations occurred as possible, except during adverse weather conditions, equipment maintenance, and marine mammal mitigation periods. PSOs were on the bridge for all hours of operation; even though visual observations had limited effectiveness in low light (low light conditions are defined in Section 5 Data Definitions, Table 5). Night vision devices (NVDs) were available but were not used by PSOs during low light based on communications between BPXA and NMFS determining they were not needed (were not useful) under the survey conditions (see Appendix F).

4.1.3. Mitigation Measures for Subsistence Activities

Two PSOs were present on the source vessels during each 12-hr shift. One of these PSOs was an IC, as specified in the CAA (Appendix B). An IC is an Alaska Native resident

who is knowledgeable about Arctic marine mammals and the subsistence hunt. Since duties of ICs were identical to PSOs, "PSO" here-in refers to both ICs and non-IC PSOs. No airgun operations were conducted after approximately 2300 hr on 25 August 2014 in accordance with the IHA and CAA.

In accordance with the CAA, Iñupiat-speaking PSOs on both source vessels communicated with the Deadhorse Communication Center (Com-Center) beginning 18 August. Four calls per day were attempted (midnight, 0600, noon, 1800), but not all calls received a response. It was discovered that the Com-Center was not open for the midnight call and so three calls per day were attempted. Information reported to the Com-Center included PSO name and vessel name, position, speed and planned activity for the next 6 hr. Calls were recorded in a bound log book provided by the company in charge of coordinating the Com-Center.

4.2. Mitigation Monitoring Procedures

The visual monitoring protocol implemented during the project was designed in accordance with the IHA and LOA provisions (NMFS 2014a; USFWS 2014b). Prior to the survey's start, all PSOs (including ICs) participated in a two-day PSO training course taught by PSO project managers or field leaders highly experienced (over 5 years) in implementing seismic mitigation for marine mammals. This training served to familiarize PSOs with the monitoring protocol, identification and differentiation of Arctic marine mammals, and operational procedures. In addition, PSOs participated in approximately one week of training which included: BPXA orientation seminar, Cold Water Survival training, NSTC training, and Health, Safety, and Environment (HSE) training required by the contractor, SAE. During these trainings, all PSOs were informed of operational and HSE procedures and expectations.

A total of seven PSOs (including ICs) and one land-based PSO Supervisor worked on site during the *2014 NPB 3D OBS Survey*. Three vessel-based PSOs (on the *Peregrine*) worked a schedule such that no shifts exceeded 2 hr in duration and there was always a second PSO on call to assist. Four land-based PSOs rotated from their housing camp near West Dock to the source vessel (the *Maxime*) approximately every 12 hr, working 2-hr rotations on the vessel (although crew transfer logistics often caused a workday to extend to 14 hr).

PSOs were on-watch during all vessel activities (24 hr/d), including times when vessels were stationary (at the dock, anchored or drifting) and during low-light conditions. The only exception was during a severe storm 7-17 August.

PSOs used *Mysticetus System*^{TM} (*Mysticetus*) software to record all data systematically onto a laptop PC. *Mysticetus* software increased efficiency and accuracy of observations by instantly displaying positions and distances to marine mammal sightings when the PSO entered a binocular reticle or estimated visual distance. In addition, *Mysticetus*

displayed vessel and sighting locations in real-time relative to the safety and disturbance zone distances based on the seismic source location. All data parameters identified as required in the NMFS-issued IHA were recorded along with supplemental data into a customized *Mysticetus* data form (with dropdown menus) as follows:

Effort and Vessel Activity Data	Date, time, airgun activity (i.e., seismic or non-seismic periods), array volume, Beaufort sea state (Bf), visibility, glare, cloud cover, and sea-ice percentage, as well as the location, speed, and activity of the vessel. These data were recorded at least every 30 min, or whenever conditions changed significantly.
Seismic Period	The time any airguns were operating. This included ramp-up, mitigation airgun activity, and times when the full airgun array was operational.
Non-seismic Period	Periods when no airguns were operational, including transits.
Marine Mammal Sighting Data	Whenever marine mammal(s) were sighted, the following data were recorded: date, time, species, total number of individuals, number of juveniles, clock-face bearing of the sighting relative to vessel's heading (e.g., 10:00), direction of movement relative to the vessel, initial distance from the vessel, closest point of approach (CPA) to the vessel, behavior state when sighted, secondary behavior, whether the animal was in the water or hauled out on ice or land, pace (i.e., animal's speed of movement), vessel position, water depth, number and location of other vessels within a 5-km radius, and the time that mitigation measures were requested and implemented (if necessary). Juvenile beluga whales were identified by their off-white color. Juvenile seals were identified by their smaller size relative to adults.

Mysticetus did not allow entry of nonsensical data (e.g., misspellings), which increased data accuracy and assisted with quality assurance/quality check (QA/QC). Data were checked by PSOs at the start and end of each watch shift. This provided multiple reviews of data, as PSOs looked at both their and their watch partner's entries. The PSO Supervisor checked the data the following day and ensured any additional QA/QC issues were resolved.

The ASAMM website was reviewed to monitor if any bowhead whales were seen near or approaching the survey area in general and area of current airgun operations.

5. Analyses and Results

This section describes data analysis methods and the results of the PSO monitoring during the *2014 NPB 3D OBS Survey*. The minimum and maximum estimated numbers of marine mammals potentially exposed to ≥ 160 dB re 1 µPa (rms) during the seismic survey operations is also provided as a proxy for level B harassment. Numeric values in this section are presented in metric units only unless conventional use dictates imperial units (e.g., in^3). Definitions of terms used in the rest of this document are presented in **Table 5**.

Table 5. Definitions of data collection and analysis terminology

Off-watch Period	Periods when Protective Species Observers (PSOs) were not on active watch duty and thus were not consistently looking for marine mammals. Any sightings made during these periods were considered opportunistic. For example, when PSOs were sitting in the bridge and occasionally looking for marine mammals, or were taking a break on or off the bridge but made a sighting.
On-watch Period	Periods when at least one PSO was on active watch duty and dedicated to looking for marine mammals.
Seismic Period	Periods when at least one PSO was on-watch while airguns were operating from the source vessels. This included ramp-ups, power downs, and when the single mitigation airgun was operating. PSOs were on-watch during all hours (hr) of airgun operation.
Non-Seismic Period	When no airguns were operating from the source vessels.
Nautical Twilight (Low Light)	The phase of twilight when the sun is less than 6° below the horizon based on the rotation of the earth. Nautical twilight began 16 August; increasing through the last survey day on 25 August from 0.5 to 4.5 hr. Darkness/night did not occur during the project. From 16-25 August nautical twilight occurred each night increasing from 0.5 to 4.5 hr.
Visibility	Visibility refers to the clarity of the atmosphere between the observer's position and the horizon and is adversely affected by such environmental conditions as fog, rain, snow, haze, and low light. Average observer eye height was ~4.6 meter (m) above sea level (ASL) on the *Peregrine* and ~ 6.0 m ASL on the *Maxime*. However, the effective viewing distance with unobscured visibility was considered to be ~3.9 kilometer (km) equivalent to 0.1 binocular reticle down from the horizon, due to earth curvature effects beyond that distance. For data analysis purposes, visibility was categorized as **unobscured** (≥ 1 km and ≤ 3.9 km) or **obscured** (< 1 km). PSOs on the *Peregrine* had a limited view directly behind the vessel (approximately 20° was not visible), and observers on the *Maxime* observed from a station on the starboard side of the vessel and generally did not move around the

	bridge due to crowded conditions, thus restricting their view from the port beam to astern.
Beaufort sea state (Bf)	Beaufort sea state is a widely used descriptive scale based on observation of ocean surface characteristics (e.g., frequency of white caps, foam) rather than accurate measurement (Stewart 2008). The scale ranges from 0 to 12 (whole numbers only), with 0 for "no wind" up to higher scales for gales, hurricanes, etc.
Group (i.e., sighting)	One or more individuals seen close together and coordinated in a similar manner (e.g., coordinated surfacings, orientation, etc.).
Sighting Rate	The number of marine mammal groups (or individuals) seen per hour of "useable" PSO effort
Useable Effort	PSO effort limited to specific viewing conditions to facilitate comparison of sighting rates under standardized sighting conditions. Useable data were limited to periods when PSOs were on-watch under the following conditions: vessel speed ≥ 2 knots; visibility >1 km; daylight; Beaufort sea state (Bf) < 5; glare <60° within the forward 180° of the vessel.

5.1. Analysis Methods

5.1.1. Seismic Activity

To distinguish potential differences in reported parameters with project activity, data were separated into two categories based on airgun status. These separations characterized all data taken for this survey.

- **Seismic Period**. These data were collected from source vessels while airguns were operating, such as during ramp-ups, power downs, and periods when only a single (mitigation) airgun (40 or 10 in^3) was active. Sometimes, this mitigation airgun was active while the vessel was anchored.
- **Non-seismic Period**. These data were obtained from the source vessels when the airguns were deactivated (i.e., not operating), such as during transit or much of the time while at anchor.

5.1.2. Observer Effort and Sightings

Mysticetus software was used throughout the project to collect field data, run daily, weekly, monthly and final summaries of effort and sightings, and plot sightings on bathymetric maps relative to radii zones in real-time during data collection and post-project analyses. For example, daily summaries were produced with the touch of a few buttons and reported totals for user-selected variables and units. At the end of the field

project, daily data were merged into one "master" database, which could then be filtered and analyzed. Herein, we summarize PSO effort based on both the number of hr and km that PSOs were on-watch. PSO effort was further summarized by selected project activities (e.g., seismic and non-seismic periods), environmental conditions (e.g., Bf, visibility), and other factors (e.g., number of PSOs simultaneously on-watch, project phase, date). This section provides summaries of report parameters requested in the IHA and Incidental Take Statement (ITS) and includes additional summary data as applicable.

General summaries of effort and data included all sightings and effort. In other words, effort totals were not filtered or restricted by environmental conditions in the general summaries presented in graphs and figures. However, for sighting rates, these data were filtered to certain "useable" conditions to standardize comparisons and estimated exposures as described in Section 5.1.6.

Data on the number of marine mammal sightings are presented to the species level whenever possible in species summary tables. However, some sightings were not identified to species or genus because identification was not possible or confirmed (e.g., because of poor environmental conditions, or an animal was only briefly at the surface), as instructed to do during the PSO training conducted prior to the project start. Environmental factors including high Bf, poor visibility, ice coverage, distance from the observer, observer eye height above sea level (ASL), and glare can limit the ability to identify marine mammals to species. During the project, pinnipeds in particular could not always be identified to species with a high level of certainty. Distinguishing ringed seals from spotted seals is especially challenging; therefore, this survey included a ringed/spotted seal category. PSOs labeled animals as "unidentified" when unsure of species identification.

After totaling sightings by species and unidentified categories, all pinnipeds were combined for analysis purposes. This was done to increase sample size, facilitating more meaningful comparisons across selected observation conditions. No walrus were seen on the project, thus pinnipeds only included seals. Beluga whales were the only cetacean seen during the project and were analyzed separately from pinnipeds. Polar bear sightings from project vessels are summarized in Section 5.2.4 relative to USFWS LOA stipulations. Addressing both IHA and LOA reporting requirements within this same report follows summary analyses done in other 90-day reports submitted to NMFS and USFWS (e.g., Smultea et al. 2004; Aerts et al. 2008; Hartin et al. 2011; Blees et al. 2010; Lomac-MacNair et al. 2013; Cate et al. 2014; Smultea et al. 2014).

5.1.3. Pinniped and Beluga Whale Sightings

Distribution of sightings around the source vessel was assessed relative to several variables. These included bearing from the PSO to the sighting, initial and subsequent resight distances of the sighting from the PSO, and CPA of the animal(s). Bearing was recorded as a clock-face value (with the direction of the vessel's bow representing the 12:00 position). In the field, sighting distances and locations relative to the source vessel and NMFS- and USFWS-regulated sound isopleths were instantly calculated and

displayed on a map on the PC screen by *Mysticetus*. After the field season, these calculated data were used for analysis purposes.

5.1.4. Polar Bear and Walrus Sightings

Only polar bears seen from survey vessels operating under LOA 14-10 and LOA 14-INT-06 issued to BPXA are reported under results in this document (USFWS 2014a,b). Polar bears sighted on land or from land or by air-based seismic crews will be summarized in a letter report to USFWS by 31 December 2014. No walruses were sighted.

Polar bears observed by non-seismic personnel are reported to USFWS in accordance with BPXA's field-wide LOAs 11-21 (USFWS 2011) and 13-INT-02 (USFWS 2013), and will be reported by BPXA under separate cover.

5.1.5. Pinniped and Beluga Whale Behavior

Movement relative to the vessel and initial and secondary behaviors were recorded marine mammal sighting based on pre-defined protocol and ethograms provided to the PSOs during training and available on the project vessels. Movements included swim away, swim towards, swim parallel, no movement, and unknown. Initial behaviors included swim, look, dive, sink, rest, surface active, mill, and unknown/other. These parameters followed those presented in numerous other 90-day reports associated with seismic operations (e.g., Aerts et al. 2008; Blees et al. 2010).

The terms "reaction" vs. "no reaction" *per se* were not recorded by PSOs. This was due to the difficulty in standardizing the interpretation of a reaction across multiple observers with a wide range of experiences. Instead, PSOs were instructed to record any unusual or sudden changes in behavior as a secondary behavior and/or in the notes field of *Mysticetus*.

5.1.6. Sighting Rates based on Useable Data

Sighting rates of pinnipeds and beluga whales were calculated as the number of groups seen per hr of "useable" effort as defined in **Table 5**. Sighting rates were based on hr of effort because the same individuals could be observed more than once due to close line spacing and relatively small area of coverage (Figure B).

5.1.7. Estimated Number of Exposures

NMFS considers exposures of cetaceans and pinnipeds to anthropogenic received sound levels ≥ 160 dB to be a "take by harassment" (Level B harassment) that could potentially result in disturbance of these animals (NMFS 2005; 71 FR 50027). For polar bears in

water, USFWS applied a 190 dB safety radius isopleth per the LOA (USFWS 2014b). For polar bears on land or ice USFWS requested a distance of 0.5 mi (~ 800 m).

Given the nature of the survey design, it was not reasonable to apply standard survey density data to estimate exposures as reported in other seismic surveys (e.g., Richardson 1998; Funk et al. 2008). The project design involved repeated coverage of closely spaced data acquisition lines within the same small approximately 200 km^2 area over approximately four and a half weeks. The seismic source line length and spacing was designed to meet data acquisition goals and doesn't necessarily meet the basic assumption of marine mammal line-transect sampling requiring independence of sightings (i.e., no repeated sighting of the same individual during a survey) (Buckland et al. 2001). For example, it is highly likely that seals were re-sighted from adjacent closely-spaced data acquisition lines and also during periods when the source vessel was docked or moving at slow speed (< 2 kt).When animals dive for several min and resurface several hundred m away, it is not possible to confirm whether or not it is the same animal.

The minimum and maximum number of marine mammals potentially exposed to received seismic sound levels ≥ 160 dB (rms) was estimated, following Aerts et al. (2008). Further, all airgun sound other than that produced by the single mitigation airgun was conservatively assumed to be a full array. Thus, ramp-up periods with less than eight airguns operating were treated as if the full array was operating.

Methods for estimating the potential minimum and maximum number of exposures to airgun sounds ≥ 160 dB (rms) were as follows:

1. The estimated **minimum** number of exposures was based on direct observations/counts of beluga whales and pinnipeds during seismic periods. This approach has been applied previously by various seismic monitoring studies in the Chukchi and Beaufort seas (e.g., Aerts et al. 2008; Blees et al. 2010), as well as other oceans around the world (e.g., Smultea et al. 2004, 2005; MacLean and Koski 2005).

2. The estimated **maximum** number of exposures was calculated using marine mammal sighting rates (sightings/hr) calculated for non-seismic daylight hr during the project period. This approach assumes that the non-seismic sighting rate represents the number of animals that would have been seen had there been no airguns operating (similar to previous 90-day reports cited above). This non-seismic sighting rate was then multiplied by the total hours of airgun operations. The resulting number of animals was considered the maximum number of potentially exposed individuals. Separate sighting rates were calculated for cetaceans and pinnipeds.

In addition, for ESA-listed pinniped species, NMFS stipulated in the ITS that the number of exposures to airgun sounds ≥ 170 dB (rms) be provided (NMFS 2014b). For the *2014 NPB 3D OBS Survey* the latter requirement applied to bowhead whales, bearded seals and

ringed seals. However, only the ringed seal is currently relevant for this report. The Beringia DPS of bearded seals (the stock that occurs in the project area) was listed as threatened at the time of the IHA request (BPXA 2013) and issuance of the ITS, but the listing was vacated by the Ninth Circuit Court in July 2014. Although the Beringia DPS of bearded seal is not currently listed as threatened under the ESA it was listed during the first week of seismic operations, thus BPXA is including potential exposure numbers to NMFS. It is worth noting the exposure numbers are based on the entire duration of the project, as opposed to the one week when the bearded seal was listed and seismic operations were occurring. Because bowhead whales were not observed on the project they will not be further discussed in regard to ITS requirements.

This request to identify potential exposures to airgun sounds ≥ 170 dB (rms) was identified under "Terms and Conditions" to implement reasonable and prudent measures in Section 10.2 of the NMFS Biological Opinion (BO) and ITS (NMFS 2014b) and in email correspondence from NMFS to BPXA dated 24 April and 20 June 2014 (available from BPXA upon request). Specifically, NMFS requested that both the known number exposed (based on visual observation) and the estimated number of these species that may have been exposed to airgun sounds ≥ 170 dB (rms) be compared with the number of such exposures authorized in the ITS (NMFS 2014b). NMFS indicated in the BO / ITS (NMFS 2014b) that they would not anticipate responses by ringed or bearded seals to impulsive seismic sound at received levels between 120 - 169 dB (rms) to rise to the level of "take" as defined under the ESA. However, NMFS requested the number of exposures to airgun sounds ≥ 170 dB (rms) to ensure consistency with the MMPA authorization's more precautionary threshold for harassment at received levels ≥ 160 dB (rms).

The estimated distance to the 170 dB isopleth for airgun sounds produced by the *2014 NPB OBS Survey* 620 in^3 array is approximately 1,500 m. The latter distance was based on an average of 10 existing measured values for other similarly sized arrays of 620 - 1,240 in^3 as described in BPXA correspondence to NMFS dated 16 April 2014.

Methods for determining the visually observed **minimum** number and the estimated **maximum** number that may have been exposed (by species) to airgun sounds ≥ 170 dB (rms) were as follows:

1. The visually observed **minimum** number of exposures was based on direct observations/counts of individual ringed and bearded seals within the 170-dB (rms) isopleth estimated to be equivalent to a radial distance of 1,500 m for the full 620 in^3 array.

2. The estimated **maximum** number that may have been exposed was calculated using individual sighting rates of ringed and bearded seals within 1,500 m of the source vessels during non-seismic daylight hours during the project period. This approach assumes that the non-seismic sighting rate represents the number of animals that would have been seen had there been no airguns operations. This non-seismic sighting rate was then multiplied by the total hours of airgun operations. The resulting number of animals was considered

the maximum number of potentially exposed individuals. Separate sighting rates were calculated for ringed and bearded seals.

5.2. Results

In the following subsections, text is kept grouped together with figures and tables presented at the end of text for ease of reading.

5.2.1. Seismic Activity

The total duration of airgun operations was different for each of the source vessels (Table 6). The *Peregrine* began data acquisition at an earlier date than the *Maxime*, as reflected by the higher total hr with airgun operations on the *Peregrine*. Seismic data acquisition began on 24 July for the *Peregrine* and on 28 July for the *Maxime*. On both vessels, most seismic periods involved operations with one full array, followed by the 10 in^3 mitigation airgun, and the 40 in^3 mitigation airgun (Table 6) (see Table 3 for additional airgun specifications). Seismic lines acquired during the *2014 NPB 3D OBS Survey* are shown in Appendix D.

Table 6. Hours and percentages of airgun operations during the *2014 NPB 3D OBS Survey*

Source Vessel	Full 620 in^3 Array**	40 in^3 Mitigation Airgun	10 in^3 Mitigation Airgun	Total
Maxime				
Hours	207.9	12.4	9.2	**229.5**
Percent of Seismic Period Hours	90.5 %	5.4 %	4.0 %	**100 %**
Percent of Total Project Hours*	30.7 %	1.8 %	1.4 %	**33.9 %**
Peregrine				
Hours	282.3	1.6	33.7	**317.6**
Percent of Seismic Period Hours	89.5 %	0.5 %	10.0 %	**100 %**
Percent of Total Project Hours	35.3 %	0.2 %	4.0 %	**39.5 %**
Total Hours	***490.2***	***14.0***	***40.9***	***547.1***

**Note: Total project hours (i.e., total days in survey area with PSOs aboard, including inclement weather days) were 677.8 for Maxime and 799.7 for Peregrine, starting with first seismic activity.*

***Full array includes ramp-up, power down, and all volumes that were not used as a mitigation source.*

5.2.2. Observer Effort

Observer effort is reported in both hr and km of vessel travel and includes on-watch and off-watch periods (Table 5). PSOs observed from source vessels in the water beginning on 28 July from the *Maxime* and on 21 July from the *Peregrine*. PSOs observations continued from source vessels until the evening of 25 August. Overall, total PSO on-watch observation effort was somewhat higher from the *Peregrine* vs. the *Maxime* (Table 7). Total hr that PSOs were on-watch during seismic and non-seismic periods were similar. Off-watch periods consisted of opportunistic observation effort largely during poor weather when vessels were docked/stationary (Table 7).

During low light (i.e., nautical twilight) observations, PSOs remained on the bridge of the source vessels looking for marine mammals. No NVDs were used by PSOs during low light periods because of interference with vessel lights and other environmental factors. At least one PSO was on watch during the majority of on-watch periods on both vessels (Table 7). Two PSOs were considered to be on-watch (*Maxime:* 19 hr, *Peregrine:* 10 hr) only when the second observer was also actively searching for marine mammals (i.e., the second observer was not counted if they were concentrating on data recording or were not on dedicated watch) (Figure C). Off-watch periods occurred primarily during parts of two storms. At other times when the vessels were docked or anchored, at least one PSO was on-watch.

On-watch PSO effort occurred during Bf 0 to 7, with most effort occurring during Bf 3 on both source vessels (Figure D). Most seismic and non-seismic PSO effort on both vessels occurred during good visibility (≥ 3.5 km) (Figure E). Data acquisition from the *Maxime* occurred primarily in shallow water that was mostly free of ice (98.6 %). The *Peregrine* acquired data in the deeper part of the project area and regularly encountered ice floes (63.9 %), especially early in the season (Table 8). On 27 July, the *Peregrine* stopped collecting seismic data on a line due to 50 % ice cover. This was the only occurrence of high ice cover, with all other records ≤ 30 %.

Table 7. Protected Species Observer (PSO) effort by observation type during the *2014 NPB 3D OBS Survey

Source Vessel	Hours	Kilometers**
Maxime		
On-Watch	513.2	1,466
Seismic	229.5	1,161
Non-Seismic	283.7	305
Off-Watch	174.5	206
Non-Seismic	174.5	206
***Maxime* Total**	**687.7**	**1,672**
Peregrine		
On-Watch	587.9	2,263
Seismic	317.6	1,971
Non-Seismic	270.3	292
Off-Watch	253.5	8
Non-Seismic	253.5	8
***Peregrine* Total**	**841.4**	**2,271**
PROJECT TOTAL	**1,529.1**	**3,943**

**Note: There were no seismic off-watch periods. Total hours are greater than reported in Table 6 because PSO effort began before seismic operations.*
***These distances (in kilometers) are minimums calculated from latitude/longitude from each effort line.*

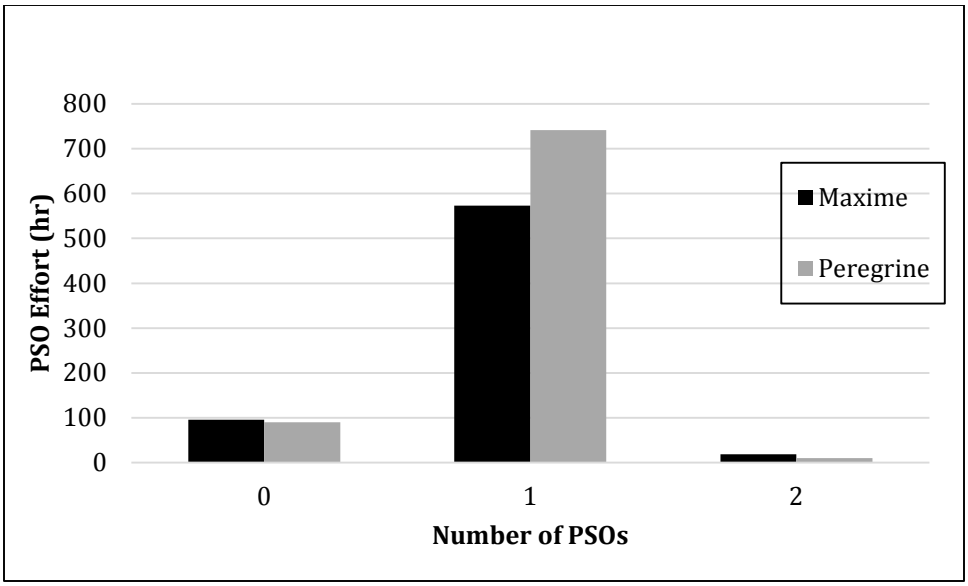

Figure C. Hours of PSO effort by number of observers on watch during the *2014 NPB 3D OBS Survey*

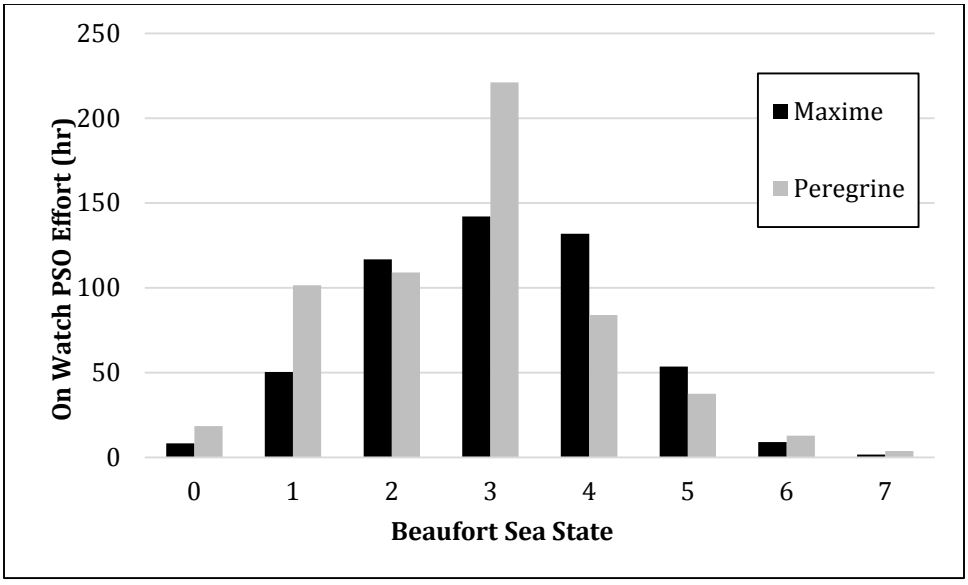

Figure D. PSO effort by Beaufort sea state for all on-watch periods during the *2014 NPB 3D OBS Survey*

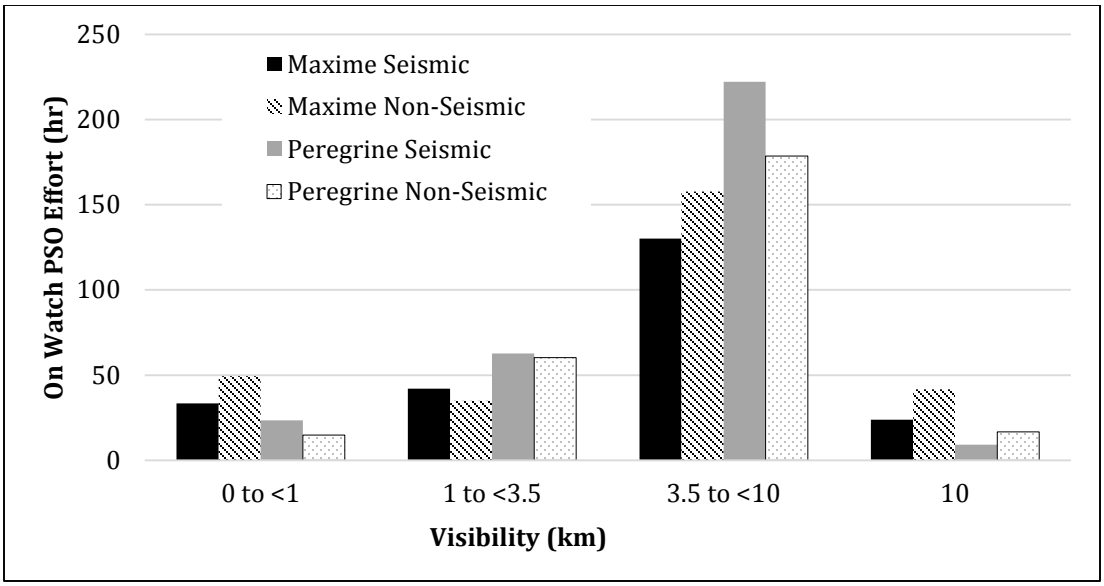

Figure E. PSO effort by visibility distance categories for all on-watch periods during the *2014 NPB 3D OBS Survey*

Table 8. PSO Effort (percent of total hours) in different ice cover percentages for the *2014 NPB 3D OBS Survey*.

Ice Cover %	*Maxime* (%)	*Peregrine* (%)
0	98.6	63.9
1 to < 5	1.2	8.9
5 to < 25	0.2	13.7
≥ 25	0	13.5
Total	**100**	**100**

Note: Ice cover was estimated out to 2 km from the vessel.

Table 9. Pinniped and beluga whale sightings (individuals in parentheses) made by PSOs from the crew transfer vessel.

Species	Date	Number of Sightings	Distance (meters)	Mitigation Action
Ringed Seal	8/22	1	25	Speed < 1 knot (kt)
Spotted Seal	8/22	2	35, 75	Speed < 1 kt
Subtotal Pinnipeds		***3***		
Beluga Whale	8/22	1(5)	100	Speed < 1 kt
Total		**4(8)**		

Note: All these sightings occurred at approximately 0634 at the northwest side of West Dock near the temporary dock structure deployed for this project. The crew transfer boat was traveling very slowly in a narrow channel away from the dock when the sightings occurred. Two of the beluga whales in the group were juveniles.

5.2.3. Pinniped and Beluga Whale Sightings

A total of 118 pinniped and beluga sightings (groups) of an estimated 130 individuals was seen by PSOs on the two source vessels during the *2014 NPB 3D OBS Survey* (Table 10, Figure F-Figure I, and Appendix G). Four marine mammal species were identified to species: the spotted seal, ringed seal, bearded seal, and beluga whale. The ringed/spotted seal was the most frequently observed species category (37 sightings or 31 %) followed by the spotted seal (36 groups or 31 %). Seven groups (6 %) of approximately 15 individual beluga whales were observed, including three calves (Figure H). When possible, juvenile pinnipeds and beluga whale calves were differentiated (Appendices G and H).

Of 111 pinniped sightings, only 37 % were identified to species. Seals were often difficult to confirm to species given similar physical characteristics and their typical behavior of spending only brief periods of time at the surface, usually with just the head exposed above the water surface. Ringed and spotted seals were especially difficult to tell apart and were often combined for sightings. Unidentified pinnipeds, rather than the combined category of ringed/spotted seal, accounted for 30 % (n = 33) of all pinniped sightings. Bearded seals (two groups or 2 %) were only seen by the *Peregrine* PSOs, possibly because this species prefers deeper water, which is also where the *Peregrine* tended to operate (Figure F). PSOs on the *Peregrine* observed 64 % of all marine mammal sightings (Table 11, Figure F).

At least 39 % of the total 130 individual seal and beluga whales were seen more than once (Table 10). It is important to note that the proportion of resights was likely higher than this, especially within or across days. Monitoring protocol and typical cryptic seal behavior (seals generally spend brief time at the water surface) were not conducive to

quantitatively documenting the number of resights. PSOs were trained to focus on monitoring the entire safety zone rather than concentrating on resights of individual animals. When resights were recorded, it was because the animal was sighted closer to the vessel than initially observed in order to note the CPA. Thus, the total number of different individual seals within the survey area is likely considerably lower than the total sightings reported herein. The latter assumption is based on the small size of the project area, repeated transits within the same area over the approximate four and a half week project period, closely spaced survey lines, and considerable PSO effort expended while the vessel was docked or moving very slowly (< 2 kt). Although these conditions likely contributed to a high number of resights, it is not possible to further quantify this number given the above protocol limitations combined with the difficulty of identifying individual animals at distance.

Only five juveniles or calves were identified during the survey: 2 different sightings of juvenile spotted seals (one seismic and one non-seismic) and one beluga whale calf (non-seismic) by PSOs on the *Maxime*, and 2 beluga whale calves (seismic) by PSOs on the *Peregrine* (Table 11).

In addition to sightings from source vessels, marine mammals were seen by PSOs while aboard the crew transfer boat, *Aubree Tara*, on 22 August as the boat was leaving the dock to head to the *Maxime* (Table 9). At the time of the sighting, the *Maxime* was approximately 20 km away with airguns operating and the *Peregrine* was approximately 16 km away with airguns operating. Note these sightings are not included in the total sightings summary and further analyses.

Two separate ringed seal carcasses were found in the *2014 NPB 3D OBS Survey* area. Both carcasses were discovered prior to the start of airgun testing or operations on 24 July. There were no indications on either carcass to believe that the cause of death was due to project activities. Although these seal deaths were not considered project-related, BPXA was obligated to report the carcasses to NMFS as node deployment activities began on July 2 and the conditions of the IHA were in effect. Details of the two carcasses are as follows:

1. On 13 July, a dead 0.9 m ringed seal was sighted near the temporary floating dock at West Dock and reported to NMFS by BPXA via phone and email on 13 July. Photographs were taken of the carcass and provided to NMFS. The seal had an apparent puncture wound near the left shoulder and its eyes were pecked out.

2. On 19 July, a second dead ringed seal carcass was found on the shoreline at West Beach State and near a fish sampling location for the fyke net study. The carcass was reported by BPXA to NMFS via email that same day. This seal carcass was a male young-of-the-year (standard body length of 0.77 m), with apparent scavenge/predation marks on its head and abdomen. Photographs were taken of the seal and provided to NMFS and the carcass was sent to Dr. Raphaela Stimmelmayr of the North Slope Borough Department of Wildlife

Management in Barrow, Alaska, for necropsy. The carcass was not recent and there were no indications that the seal's death was project related.

These were the only marine mammal carcasses seen during the *2014 NPB 3D OBS Survey*. These two seals are not included in the overall sightings count in Table 10.

Bowheads were occasionally observed during the ASAMM surveys in the general Beaufort Sea region beyond the survey area. Due to poor weather, only three ASAMM survey days flown near the Prudhoe Bay area overlapped in time with the *2014 NPB 3D OBS Survey*: 26 July, 31 July, and 17 August. On 26 July, low ceilings prevented survey efforts (2014 ASAMM reports). On 31 July, the closest marine mammal sighting was approximately 40 km NNW of West Dock (a single beluga whale). On 17 August, a single beluga whale was sighted just north of Reindeer Island; multiple other bowhead and beluga whale sightings were made further from the BPXA survey area.

As per the IHA, PSOs recorded the location of other vessels within a 5-km radius of marine mammal sightings. In practice, PSOs on the *Maxime* did this for 74 % of all vessel sightings and 84 % of all vessel sightings made from the *Peregrine*. Most vessels encountered within a 5-km radius were other *2014 NPB 3D OBS Survey* vessels (e.g., receiver boats, crew transfer boat). The mean number of other project vessels within 5 km per sighting was 1.6 and 1.9 for the *Maxime* and *Peregrine*, respectively.

Table 10. Summary of all pinnipeds and beluga whales seen from source vessels during the *2014 NPB 3D OBS Survey

	No. Groups	No. Estimated Individuals
Pinnipeds	***111***	***115***
Ringed/Spotted	37	39
Spotted Seal	36	37
Unidentified Pinniped	33	34
Ringed Seal	3	3
Bearded Seal	2	2
Cetaceans	***7***	***15***
Beluga Whale	7	15
Total	**118**	**130**

**Does not include the 4 sightings seen from the crew transfer vessel (Table 9), the polar bear sightings (Table 12), or any resights of the 51 individual seals and whales seen more than one time.*

Table 11. Number of pinniped and beluga whale groups (individuals in parentheses) observed by seismic and non-seismic periods during the *2014 NPB 3D OBS Survey

	Maxime			*Peregrine*			**Total**
Species	**Seismic**	**Non-Seismic**	**Off-Effort**	**Seismic**	**Non-Seismic**	**Off-Effort**	
Ringed Seal	2	0	0	1	0	0	**3**
Spotted Seal	8	4	8	3	7 (8)	6	**36 (37)**
Ringed/ Spotted Seal	10	4 (5)	0	7	7 (8)	9	**37 (39)**
Bearded Seal	0	0	0	1	1	0	**2**
Unidentified Pinniped	1	0	1	19 (20)	10	2	**33 (34)**
Subtotal Pinnipeds	***21***	***8 (9)***	***9***	***31 (32)***	***25 (27)***	***17***	***111 (115)***
Beluga Whale	3	1 (2)	0	2(8)	1 (2)	0	***7 (15)***
Total:	***24 (24)***	***9 (11)***	***9 (9)***	***33 (40)***	***26 (29)***	***17 (17)***	***118 (130)***

**Note: Due to the relatively small size of the survey area, animals may have been counted more than once. Off-effort sightings were made opportunistically only from the Maxime. The sightings in the table are not corrected for effort and thus contain sightings at all efforts.*

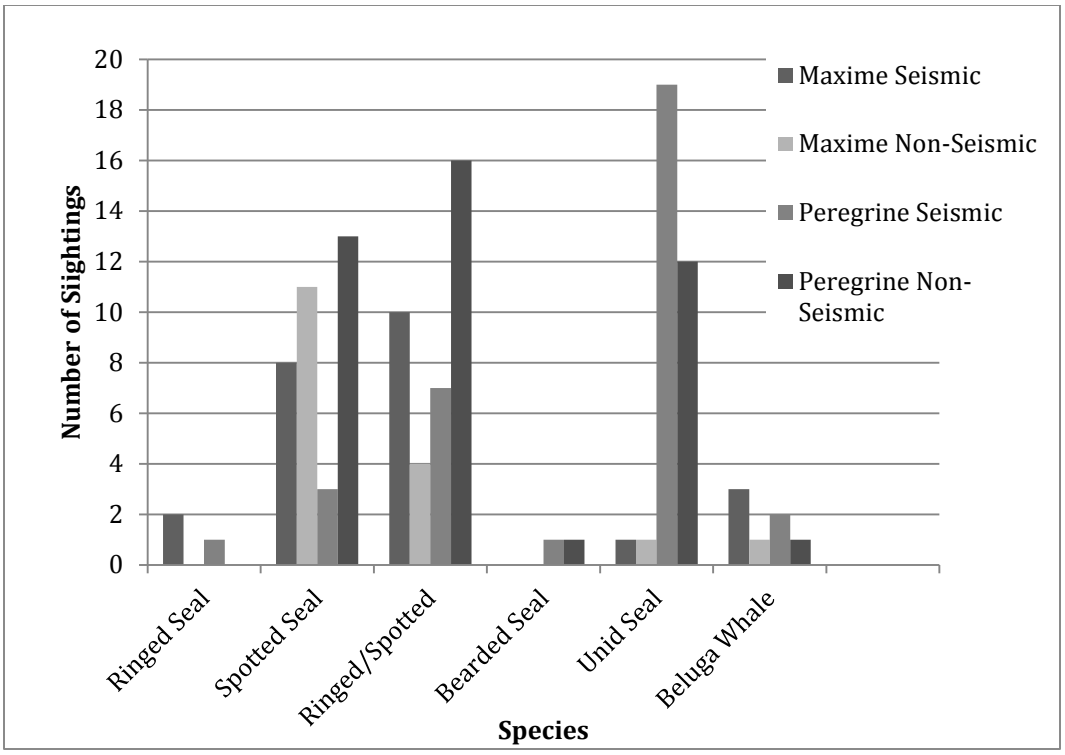

Figure F. Number of pinnipeds and beluga whale groups sighted from the seismic vessels *Maxime* and *Peregrine* by seismic status during the *2014 NPB 3D OBS Survey*. The sightings in the graph are not corrected for effort and thus contain all sightings at all efforts

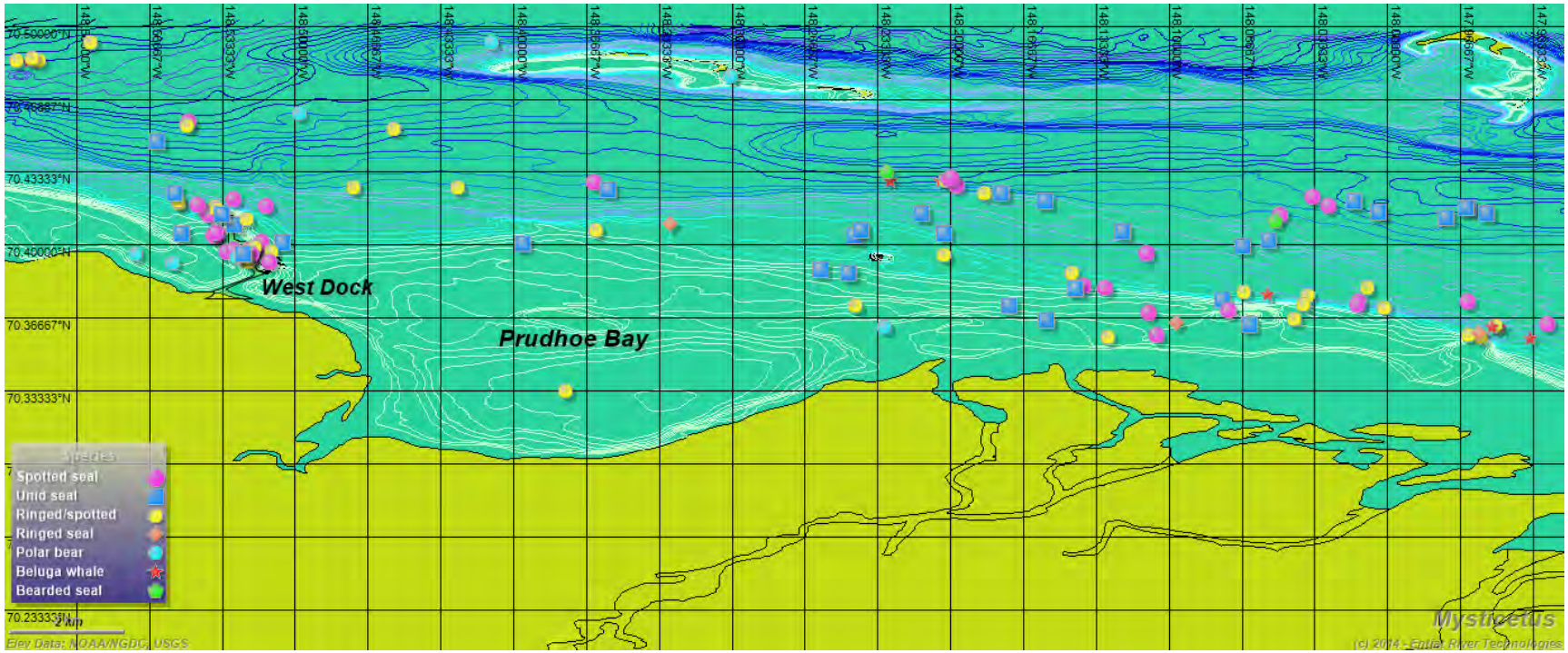

Figure G. Locations of all pinniped and beluga whale groups seen by PSOs during seismic and non-seismic periods during the *2014 NPB 3D OBS Survey*.

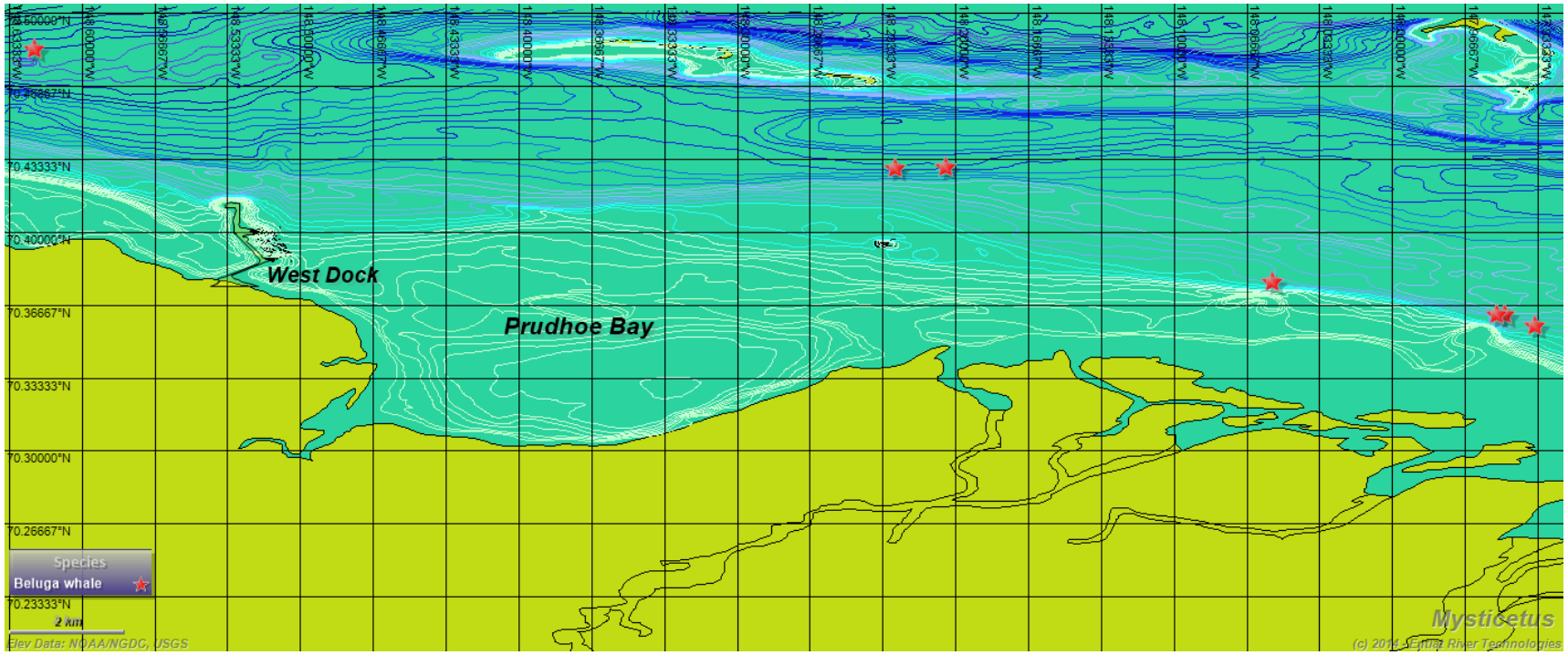

Figure H. Locations of beluga whale groups seen by PSOs during seismic and non-seismic periods during the *2014 NPB 3D OBS survey*.

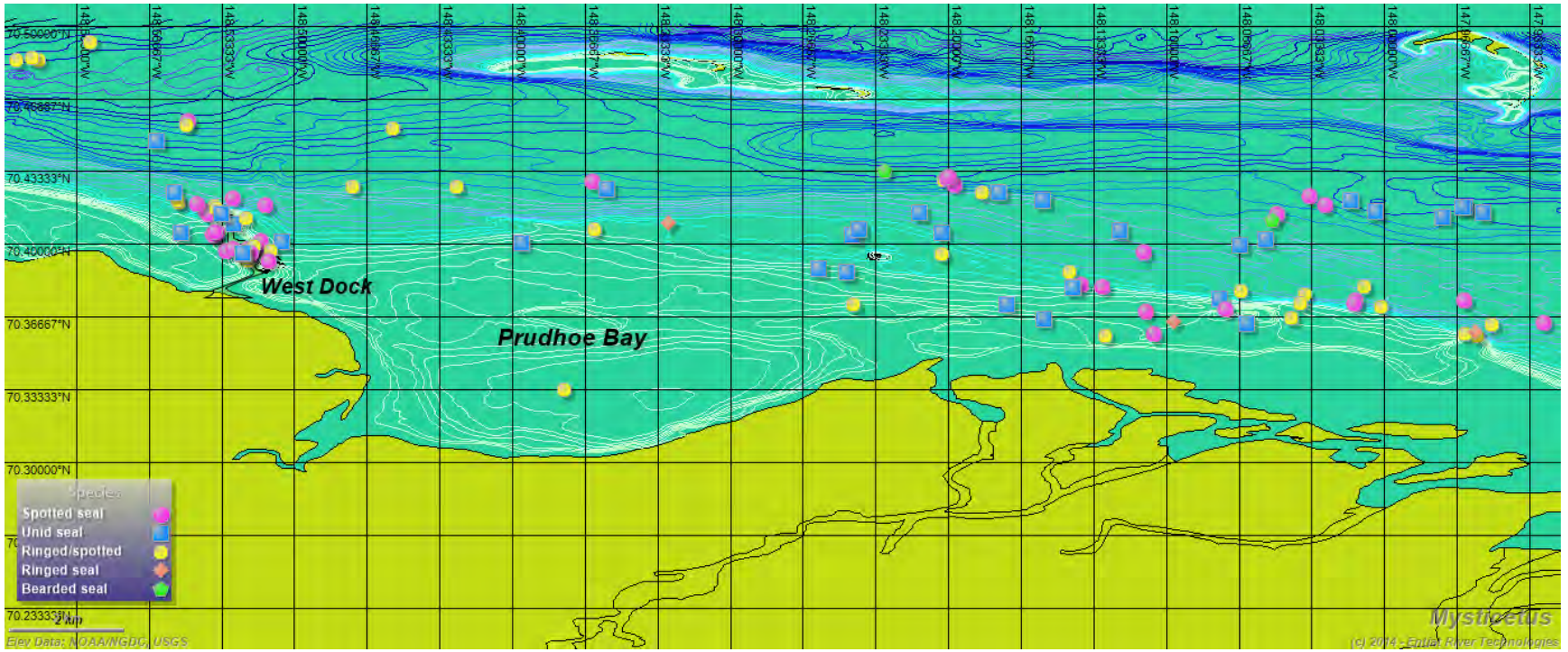

Figure I. Locations of pinniped groups seen by PSOs during seismic and non-seismic periods during the *2014 NPB 3D OBS Survey*.

5.2.4. Polar Bear and Walrus Sightings

Eleven sightings for a total of 18 bears (including three cubs) were seen or recorded by PSOs from the project vessels and others at distances ranging from 100 to approximately 3,000 m (Table 12, Figure J). This total includes a duplicate sighting on 20 August of a sow with two cubs on Niakuk Island (Table 12). Polar bears were seen in the seismic survey area from 11 August until after the end of seismic operations. Of the 11 sightings, bear groups were documented either resting or walking (n = 7) and/or swimming (n = 4). None of the bears appeared to exhibit any sudden change in behavior that was suggestive of a reaction to the survey operations. The first sighting of a sow and two cubs on Niakuk Island was first seen walking away at the same time as the vessel was moving away (Table 12).

Only bears observed by PSOs from the project vessels and others are reported herein using the LOA issued for the *2014 NPB OBS Survey*. A summary of all *2014 NP OBS Survey* polar bear sightings, including bears sighted on land or water, from land or by air-based seismic crews in the survey area, will be reported by BPXA document under separate cover to USFWS. No walrus were seen during the survey period.

Environmental conditions such as Bf, visibility, and light can affect the ability to detect animals; however, with appropriate training and proper communication, polar bears and walrus were detected to the best of the PSOs ability. The relatively small sample size limits the ability to meaningfully interpret factors influencing detectability during project operations. However, Bf and visibility (in km) are shown for each polar bear sighting in Table 12, indicating that polar bears were seen during Bf 1 – 5 conditions.

Table 12. Summary of polar bear sightings recorded by PSOs on project vessels and others reported on LOA 14-10 and 14-INT-06 for the *2014 NPB 3D OBS Survey*

2014 Date	Time	Group Size (# of cubs)	Location	Behavior	Distance from Observer (meters)	Beaufort Sea State	Visibility in kilometers	Mitigation Action
16-Aug	0:50	1	West Dock	Swimming	100	Unknown	Unknown	None: Bear was sighted from a boat at dock. Security notified.
19-Aug	16:05	5	Cross Island	Resting / Walking	400	1	Unknown	Observing boat maintained course and sped past the island but due to ice turned around and passed the island at 500-700 m from the shore.
20-Aug	7:29	3 (2)	Niakuk Island	Resting / Walking	2,800	2	7	Moved away: when bears were sighted, boat was moving away.
20-Aug*	15:40	3 (2)	Niakuk Island	Resting / Walking	500	3	Unknown	Moved away: when bears were sighted, boat moved away. This is a resight of the above sighting,
24-Aug	6:58	1	Stump Island	Walking	2,000	3	6	None: Security notified.
24-Aug**	16:52	1	West Dock	Swimming	600	2	5	None: Bear was sighted from an anchored vessel. Security notified.
25-Aug	6:04	1	Stump Island	Walking	2,000	3	5	None: Security notified.
25-Aug	14:23	1	Reindeer Island	Walking	3,000	3	7	None: Security notified.
25-Aug	18:43	1	Between Reindeer Island and West Dock	Swimming	400	5	5	Vessel slowed but bear paralleled their course. Vessel turned away to give bear room. Security notified.
25-Aug	20:50	2	Reindeer Island	Walking / Looking	1,500	5	5	None: Security notified.
27-Aug	8:30	2 (1)	Niakuk Island	Swimming / Walking	100	Unknown	Unknown	Omni boat did not see bears until close to shore. Diverted course.

PROJECT TOTAL: 11 sightings (1 resight*) for a total of 18 individual bears recorded

***This bear was seen underneath the West Dock Bridge*

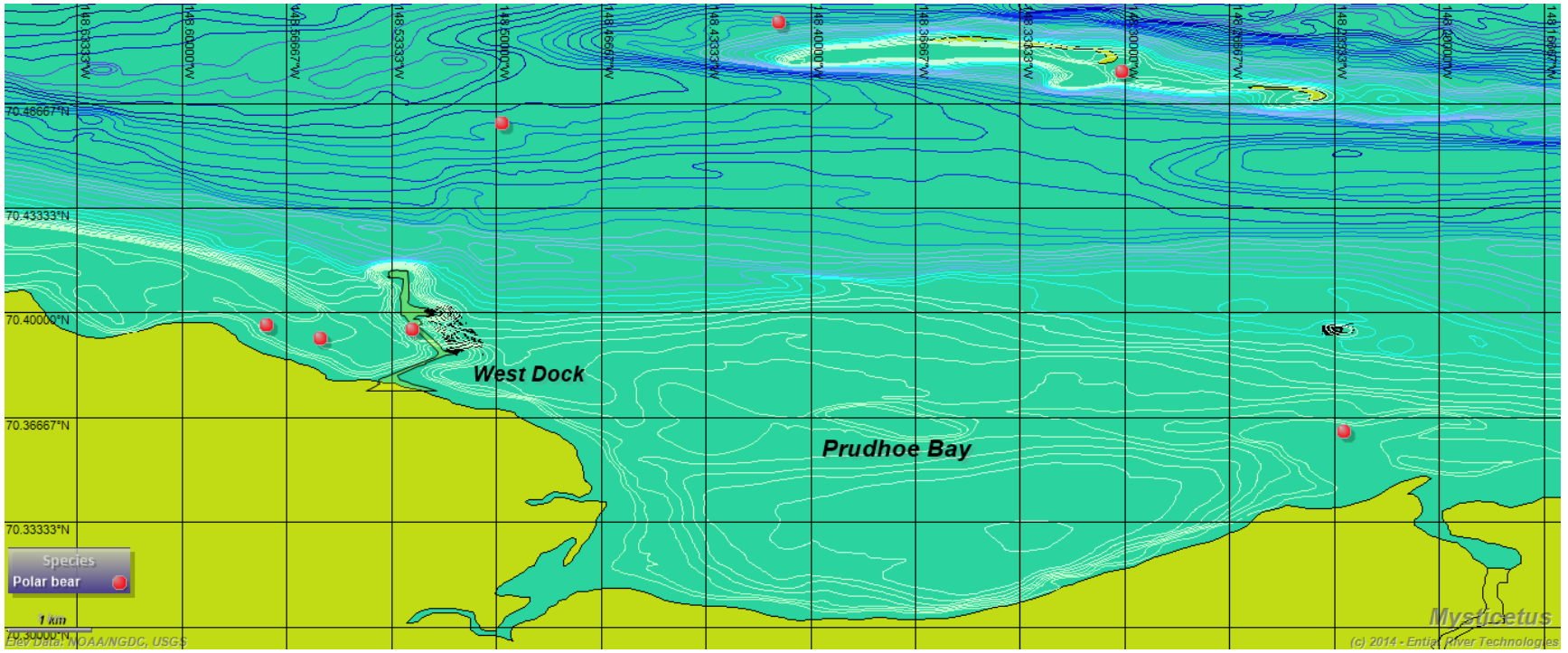

Figure J. Locations of polar bear sightings recorded by PSOs from source vessels and others during the *2014 NPB 3D OBS Survey*. Only 7 of the 10 sightings are depicted on this map

5.2.5. Sighting Rates Based On Useable Data

Calculations of sighting rates were based on useable data for effort and sightings as described in Table 5 to facilitate comparison of sighting rates under standardized sighting conditions. Useable data were limited to periods when PSOs were on-watch under the following conditions: vessel speed ≥ 2 knots; visibility > 1 km; daylight; Bf < 5; glare < 60° within the forward 180° of the vessel. A total of 66 sightings were considered useable and thus used to calculate sighting rates, consisting of 5 beluga groups and 61 pinniped groups (Table 13). Most sightings that did not meet useable conditions occurred while the vessels were anchored or at the dock (vessel speed < 2 kt condition) rather than due to poor sighting conditions.

About 67 % of *Maxime* PSO seismic effort (hr) and 79 % of *Peregrine* PSO seismic effort (hr) met useable criteria. Of non-seismic effort (hr), 74 % for the *Maxime* and 83 % for the *Peregrine* met useable criteria.

Table 13. Number of useable pinniped and beluga whale groups observed (individuals in parentheses) by vessel and seismic status.

	Maxime		***Peregrine***		**Total**
Species	**Seismic**	**Non-Seismic**	**Seismic**	**Non-Seismic**	
Ringed Seal	2	0	0	0	**2**
Spotted Seal	8	2	2	2	**14**
Ringed/Spotted Seal	9	3 (4)	5	5	**22 (23)**
Bearded Seal	0	0	0	1	**1**
Unidentified Seal	1		18 (19)	3	**22 (23)**
Subtotal Pinniped	***20***	***5 (6)***	***25 (26)***	***11***	***61 (63)***
Beluga Whale	3	1 (2)	0	1 (2)	**5 (7)**
Total	**23**	**6 (8)**	**25 (26)**	**12 (13)**	**66 (70)**

Notes: Due to the relatively small size of the survey area animals may have been counted more than once. Useable data are those restricted for sighting rate analysis.

5.2.6. Seismic and Non-seismic Sighting Rates

Overall sighting rates during seismic and non-seismic periods by vessel and by both source vessels combined are shown in Table 14. Based on 66 pinniped and beluga whale groups, sighting rates were approximately twice as high during non-seismic (0.2 groups/hr) vs. seismic periods (0.12/hr) (Table 14). Sighting rates by vessel were similar during seismic periods but were higher from the *Peregrine* than the *Maxime* during non-

seismic periods. Pinniped sighting rates from the *Maxime* were similar during seismic and non-seismic periods. In contrast, from the *Peregrine*, pinnipeds sighting rates were over two times higher during non-seismic vs. seismic periods. Sample sizes were too small to compare sightings rates for beluga whales across seismic and non-seismic period.

The daily sighting rate of marine mammals may have increased near the end of the survey period after the severe storm of 7-17 August based on data from both seismic vessels (Figure K). In particular, sighting rates were highest during seismic periods as observed from the *Maxime* at this time (which tended to stay in shallower water than the *Peregrine*) (Figure K). However, due to large gaps across multiple days associated with inclement weather, this cannot be ascertained. Furthermore, it is unknown if the apparent increase in seal numbers near the end of the project period was related to changes in food supply, behavior, or a combination of factors, including environmental influence. Regardless, seal sighting rates were higher during seismic periods near the end of the survey period (Figure K).

Table 14. Pinniped and beluga whale sighting rates (sightings [i.e. groups]/hr) during different seismic activities based on useable data during the *2014 NPB 3D OBS Survey*

	Seismic			Non-seismic		
	Useable Effort (hr)	**Number of Groups**	**Sighting Rate (groups/hr)**	**Useable Effort (hr)**	**Number of Groups**	**Sighting Rate (groups/hr)**
Beluga whale						
Maxime	153.5	3	0.02	52.9	1	0.02
Peregrine	251.7	0	0	38.8	1	0.03
Subtotal	***405.2***	***3***	***0.007***	***91.7***	***2***	***0.02***
Pinniped						
Maxime	153.5	20	0.13	52.9	5	0.09
Peregrine	251.7	25	0.1	38.8	11	0.3
Subtotal	***405.2***	***45***	***0.11***	***91.7***	***16***	***0.17***
Total	**405.2**	**48**	**0.12**	**91.7**	**18**	**0.2**

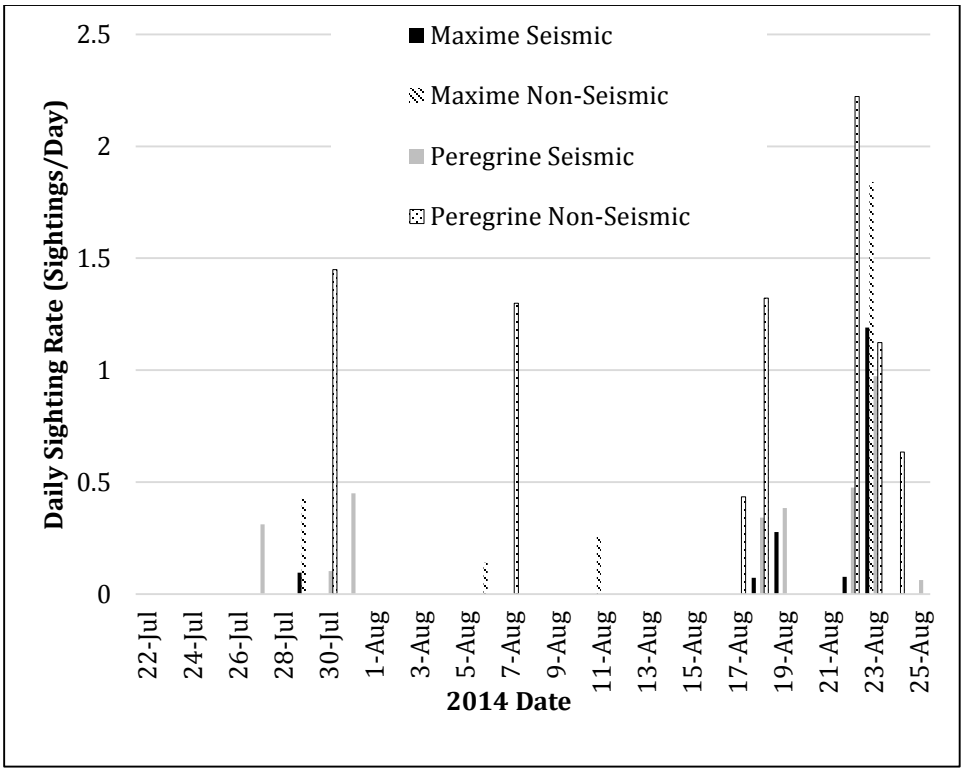

Figure K. Daily sighting rates of pinniped and beluga whale groups seen from the two source vessels based on date during the *2014 NPB 3D OBS Survey*. No PSO observation effort occurred 8-10 August and 12-16 August due to severe storms

5.2.7. Sighting Rates/Sightings and Environmental Conditions

Sighting rates (based on useable effort) were compared across various environmental conditions to identify factors potentially influencing the occurrence of or the ability to see marine mammals. During both seismic and non-seismic conditions, as expected, sighting rates of pinnipeds generally decreased with increasing Bf (Figure L). Sighting rates during flat seas (Bf 0 - 1) were typically at least two to five times higher than in Bf 2 - 4. Also as would be expected sighting rates for pinnipeds generally increased with better visibility conditions (Figure M).

Water depths within the project area were very shallow, ranging only to approximately 10 m in depth. Pinniped sightings were seen throughout these waters depths (Figure N), but most sightings occurred where water depth was 2 – 6 m deep. This was not standardized by effort and water depth. Thus, these patterns likely simply reflect that most effort occurred over these water depths and/or most of the project area waters were at this depth. The fact that the *Peregrine* operated in deeper waters than the *Maxime*, may have influenced sighting rates (Figure N).

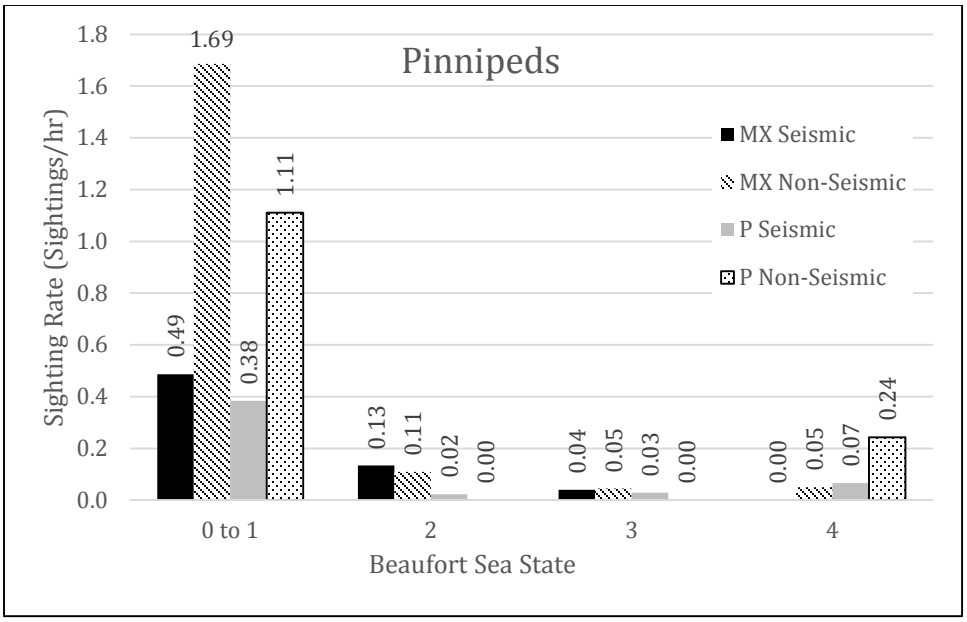

Figure L. Pinniped sighting rates by Beaufort sea state for grouped pinnipeds (upper) from seismic vessels *Maxime* (MX) and *Peregrine* (P) during the *2014 NPB 3D OBS Survey*

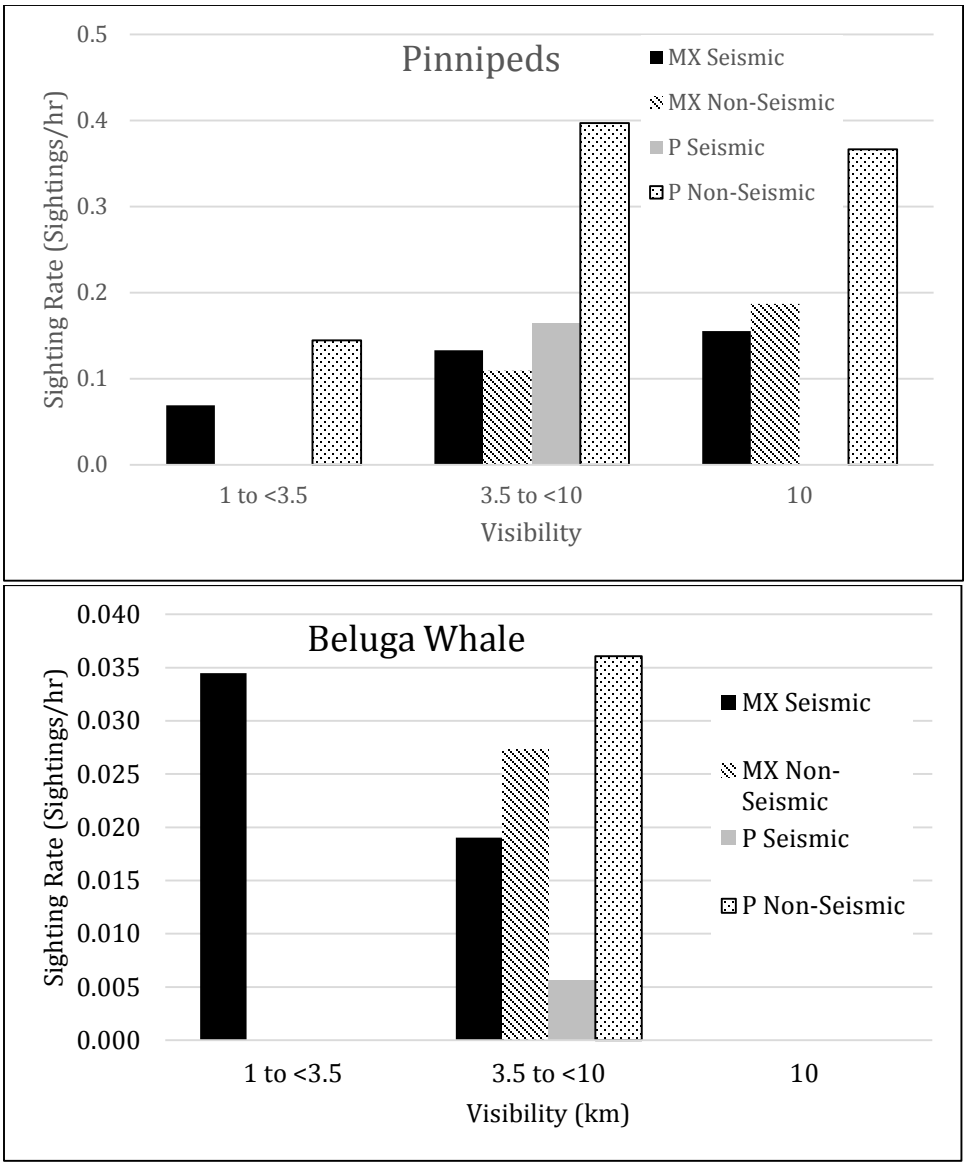

Figure M. Pinniped and beluga whale sighting rates by visibility (km) for grouped pinnipeds (upper) and beluga whales (lower) from seismic vessels *Maxime* (MX) and *Peregrine* (P) during the *2014 NPB 3D OBS Survey*. Rates not displayed on the lower chart represent zero values due to no sightings in the useable data

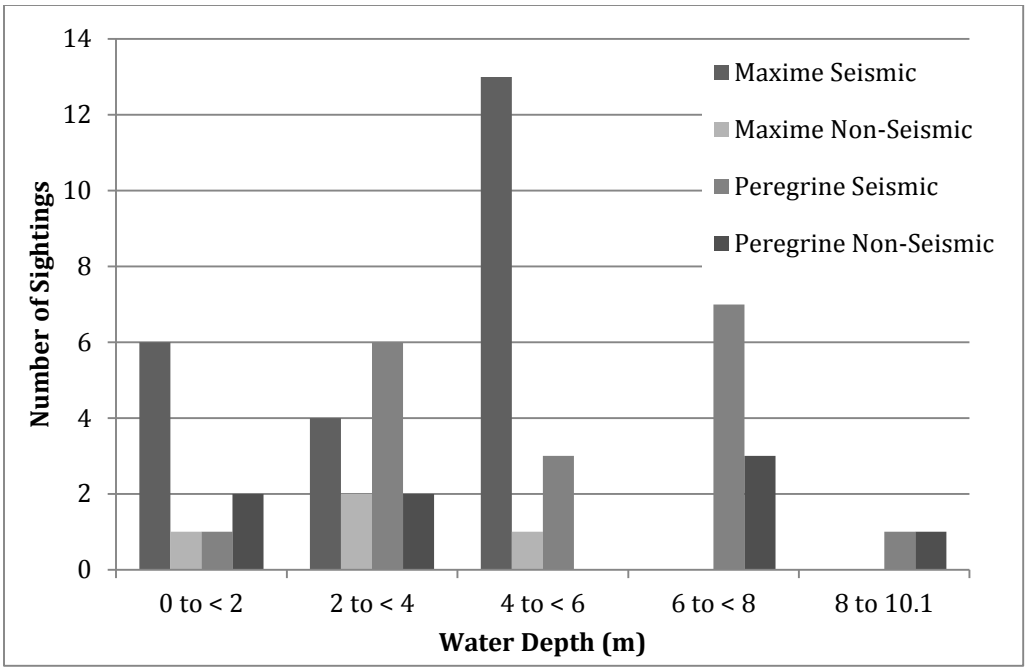

Figure N. Pinniped and beluga whale groups sighted by depth ranges and seismic condition during the *2014 NPB 3D OBS Survey*. Depth values represent the water depth at the vessel location and not at the marine mammal location

5.2.8. Pinniped and Beluga Whale Behavior

All sightings (including non-useable data) were summarized for initial behaviors (Table 15). This was done because behavior was assumed to be unaffected by sightability as well as to increase sample size. In total, initial behavior was recorded for 56 marine mammal groups during seismic and 62 sightings during non-seismic periods from both source vessels (Table 15).

Beluga sightings were too few to allow meaningful interpretation of behavior during seismic (n = 5 groups) and non-seismic periods (n = 2 groups). Five of the seven beluga groups were swimming during seismic activity (71 %), and two during non-seismic periods (Table 16). Four of seven groups (57 %) were observed swimming away from the vessel (three during seismic periods) (Table 16). Details of all seven beluga sightings are summarized in Appendix H.

Among 111 pinniped groups, the most commonly recorded initial behaviors were look (42 %) and swim (33 %), followed by rest (9 %) (Table 15). There was minimal difference by seismic vs. non-seismic periods for look or swim behavior among pinnipeds, though look occurred more frequently during non-seismic (n = 26) vs. seismic periods (n = 21) as did swim behavior (Table 15). Movement relative to the vessel was noted for 62 % of 111 pinnipeds sightings (Table 15). Overall, most groups were first

observed moving away from the vessel, and the number moving away was very similar between seismic and non-seismic periods.

With respect to CPA, pinnipeds generally were seen closer to the source vessels during non-seismic vs. seismic periods (Figure O). Pinnipeds were six times more likely to be seen close (< 50 m) to the vessels during non-seismic vs. seismic periods. This difference was not apparent at distances of 51-250 m. However, most (81 %) of the 27 pinniped groups seen > 500 m away were seen during seismic periods. In summary, these results suggest that pinnipeds may have avoided waters very close to the operating airgun array. In addition, the overall trend during seismic periods was for pinnipeds to be seen further away.

Table 15. Initial behavior of pinnipeds and beluga whales (beluga whales shown in parentheses) when first observed for all sightings during the *2014 NPB 3D OBS Survey*

	Maxime		***Peregrine***		**Total**
Behavior	**Seismic**	**Non-Seismic**	**Seismic**	**Non-Seismic**	**Pinnipeds (Beluga Whales)**
Swim	4(3)	7	11(2)	15	**37(5)**
Look	8	8	13	18	**47**
Dive	1	1	2	3	**7**
Sink	2	1(1)	2	0	**5(1)**
Rest	6	0	1	3	**10**
Surface Active	0	0	1	2	**3**
Mill	0	0	0	2(1)	**2(1)**
Subtotal Pinnipeds	***21***	***17***	***30***	***43***	***111***
Subtotal Beluga	***3***	***1***	***2***	***1***	***7***
Total	**24**	**18**	**32**	**44**	**118**

Notes: Due to the relatively small size of the survey area, animals may have been counted more than once. One seal noted as "bottling" was reclassified as resting.

Table 16. Pinniped and beluga whale movement relative to the vessel for pinnipeds and beluga whales (beluga whales shown in parentheses) for all sightings during the *2014 NPB 3D OBS Survey*

	Maxime		*Peregrine*		Total
Movement	**Seismic**	**Non-Seismic**	**Seismic**	**Non-Seismic**	**Pinnipeds (Beluga Whales)**
Swim Away	9(2)	5	3(1)	10(1)	**27(4)**
Swim Toward	1	(1)	2	5	**8(1)**
Swim Parallel	3	3	3(1)	6	**15(1)**
Swim Perpendicular	2(1)	5	2	3	**12(1)**
Subtotal Pinnipeds	***15***	***13***	***10***	***24***	***62***
Subtotal Beluga	***3***	***1***	***2***	***1***	***7***
Total	**18**	**14**	**12**	**25**	**69**

Notes: Due to the relatively small size of the survey area of the survey, animals may have been counted more than once. No movement and Unknown movement classifications are omitted from this table.

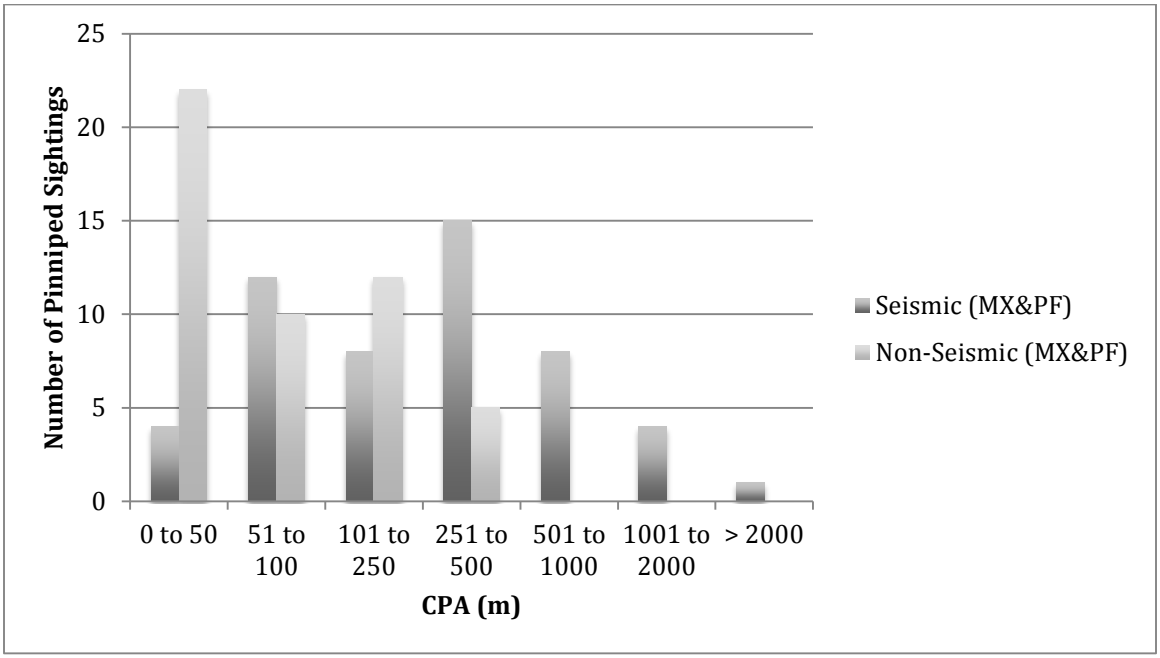

Figure O. Approximate CPA of pinniped sightings from the vessels during seismic and non-seismic periods (*Maxime* [MX] and *Peregrine* [PF] combined)

5.2.9. Summary

In summary, sample sizes during seismic periods among beluga whales were too small to allow meaningful interpretation of potential effects of project activities (airgun sounds and vessel movements) on their behavior. However, the 111 pinniped groups seen with fairly equal numbers during seismic (n = 56) and non-seismic periods (n = 62) provide a reasonable sample size from which to identify potential trends. These trends suggest that seals may have avoided waters within 50 m of the operating airgun array. In addition, sighting rates of pinniped groups were notably lower during seismic vs. non-seismic periods. However, seals were likely to look at the vessels regardless of whether the airguns were operating or not. These results support similar studies indicating short-term displacement of ringed seals in close proximity to an operating full array of 8-11 120 in^3 airguns in the Alaskan Beaufort Sea (e.g., Richardson et al. 1995; Harris et al. 2001).

5.3. Mitigation Measures Implemented

5.3.1. Seismic Survey Mitigation Measures

During the *2014 NPB 3D OBS Survey*, specific survey mitigation measures were implemented: five power downs and 26 shutdowns due to marine mammal observations that occurred from the two seismic vessels (Table 17). Of this total, 75 % occurred during only two days (19 and 23 August) for the *Maxime*, but those dates accounted for only 44 % of mitigation measures on the *Peregrine*. Marine mammal mitigation measures led to the airgun arrays being re-ramped up. Table 17 reports only those measures implemented for marine mammals: other power downs, shutdowns and ramp-ups occurred for equipment reasons.

During the seismic survey, there were two shutdowns that were inadvertently delayed. The first, on the *Maxime* on 31 July, led to two extra shots being fired after shutdown was requested. The second, on the *Peregrine* on 27 July, also led to two extra shots. NMFS was notified after these two shutdowns, and precautions were initiated at the time to determine the cause and find solutions to avoid further problems. Both of these shutdowns ultimately were traced to a communication failure or a gun programming error that were subsequently remedied. Further detail on these events is provided in Appendix I based on email correspondence between BPXA and NMFS.

Table 17. Detail of marine mammal mitigation measures implemented during the *2014 NPB 3D OBS Survey*

	Date/Time	Species	Distance to Source (km)	Initial Behavior	Count	Mitigation Measure	Mitigation Measure Time Requested	Mitigation Measure Time Implemented	PSO Notes	Array Volume
Maxime	07-31 02:08:05	Ringed/Spotted	0.055	Look	1	Shut Down	2:08:06	2:11:56	Guns operated for an additional ~2 minutes after PSO shutdown request despite navigator turning guns off. *Please see Section 5.3.1 of report for additional details.*	620
	08-19 06:35:33	Ringed/Spotted	0.250	Rest	1	Power Down	6:35:38	6:35:43		510
	08-19 08:55:17	Ringed/Spotted	0.080	Dive	1	Shut Down	8:55:22	8:55:28		620
	08-19 15:55:05	Ringed Seal	0.150	Swim	1	Shut Down	15:55:07	15:55:15		510
	08-19 16:27:52	Spotted Seal	0.200	Swim	1	Shut Down	16:27:54	16:27:55		620

	Date/Time	Species	Distance to Source (km)	Initial Behavior	Count	Mitigation Measure	Mitigation Measure Time Requested	Mitigation Measure Time Implemented	PSO Notes	Array Volume
	08-23 19:38:54	Spotted Seal	0.327	Look	1	Shut Down	19:38:57	19:39:00	Seal swimming towards vessel. Shutdown requested because of rate of vessel and seal movement.	510
	08-23 21:37:27	Spotted Seal	0.150	Look	1	Shut Down	21:37:30	21:37:33		510
	08-23 22:57:42	Ringed/Spotted	0.080	Sink	1	Power Down	22:58:48	22:58:49		510
	08-23 23:04:02	Beluga Whale	0.050	Swim	1	Shut Down	23:05:02	23:05:02		40
Peregrine	07-27 17:16:36	Ringed/Spotted	0.250	Look	1	Shut Down	17:16:36	17:16:48	PSO called shut down over main radio, no response due to navigator being away from his station.	620
	07-27 18:42:42	Ringed/Spotted	0.075	Look	1	Shut Down	18:42:42	18:42:58		620
	07-27 20:19:43	Ringed/Spotted	0.075	Look	1	Shut Down	20:19:43	20:19:50		620

	Date/Time	Species	Distance to Source (km)	Initial Behavior	Count	Mitigation Measure	Mitigation Measure Time Requested	Mitigation Measure Time Implemented	PSO Notes	Array Volume
	07-27 22:52:00	Ringed/Spotted	0.050	Look	1	Shut Down	22:52:00	22:52:12	Captain spotted seal first. Delay in shut down as gun team did not hear radio call clearly and radioed back for confirmation. *Please see Section 5.3.1 of report for additional details.*	620
	07-30 03:55:49	Ringed Seal	0.200	Dive	1	Shut Down	3:55:49	3:55:49		620
	07-31 05:20:16	Ringed/Spotted	0.075	Swim	1	Shut Down	5:20:16	5:20:26		620
	08-11 13:42:41	Spotted Seal	0.050	Look	1	Shut Down	13:42:41	13:42:59		620
	08-19 14:52:55	Unid Seal	0.151	Swim	1	Shut Down	14:52:55	14:53:18		620
	08-19 16:36:45	Beluga Whale	0.765	Swim	6	Power Down	16:36:45	16:37:24	Mother/calf pair, seen a large white individual and calf (dark gray) right next to	550

	Date/Time	Species	Distance to Source (km)	Initial Behavior	Count	Mitigation Measure	Mitigation Measure Time Requested	Mitigation Measure Time Implemented	PSO Notes	Array Volume
									her. Requested power down at 16:36:45	
	08-19 17:30:56	Unid Seal	0.150	Swim	1	Shut Down	17:30:12	17:30:30		620
	08-19 20:25:52	Ringed/Spotted	0.300	Swim	1	Shut Down	20:25:52	20:26:07		620
	08-19 21:13:32	Unid Seal	0.350	Swim	1	Power Down	21:13:32		Requested power down, did not see seal leave the zone, waited 15 minutes before initiating ramp up.	550
	08-21 18:30:52	Bearded Seal	0.060	Swim	1	Shut Down	18:30:52	18:31:11		620
	08-23 13:08:58	Spotted Seal	0.050	Mill	1	Shut Down	13:08:58	13:09:01		620
	08-23 13:53:41	Unid Seal	0.060	Swim	1	Shut Down	13:53:41	13:53:46		620
	08-23 14:12:34	Spotted Seal	0.060	Swim	1	Shut Down	14:12:34	14:12:44		40
	08-23 16:48:10	Spotted Seal	0.050	Rest	1	Shut Down	16:48:10	16:48:41		620
	08-23 21:59:16	Unid Seal	0.250	Look	1	Shut Down	21:59:16	21:59:29		620
	08-25 07:13:47	Ringed/Spotted	0.050	Look	1	Shut Down	7:13:47	7:13:56		620
	08-25 18:43:47	Polar Bear	0.400	Swimming	1	Shut Down	18:43:47	18:44:00	Sighted polar bear swimming. Slowed vessel to 2 knots. PSO requested that	620

	Date/Time	Species	Distance to Source (km)	Initial Behavior	Count	Mitigation Measure	Mitigation Measure Time Requested	Mitigation Measure Time Implemented	PSO Notes	Array Volume
									vessel switch to a priority line allowing for greater distance from polar bear and source vessel.	
	07-29 17:29:43	Spotted Seal	0.179	Swim	1	Shut Down	17:29:42	17:29:47		620
	08-23 15:16:18	Ringed/Spotted	0.569	Look	1	Power Down	15:16:18	15:16:26		40

Notes: Return to full power was allowed if within 10 minutes of shutdown or power down. RU = ramp-up, PD = power down.

5.3.2. Mitigation Measures for Subsistence Activities

Mitigation measures for subsistence activities, as agreed upon in the CAA (Appendix B) were correctly followed throughout the project and are discussed in further detail in Section 6.

5.4. Estimated Number of Potential Exposures

It is required under the IHA to provide estimates of the amount and nature of potential harassment of marine mammals. Meaningful estimates of the number of marine mammals potentially exposed to airgun sounds are difficult to obtain for several reasons:

- The relationship between numbers of marine mammals that are observed and the number actually present is uncertain;
- The distance to which a received sound level exceeds a specific criterion such as 190 dB (rms) and 180 dB (rms) is variable (Section 3; see also Greene 1998; Greene et al. 1998; Burgess and Greene 1999; Caldwell and Dragoset 2000; Tolstoy et al. 2004a,b);
- The sounds received by marine mammals vary depending on their depth in the water, and will be considerably reduced for animals near the surface (Greene and Richardson 1988; Tolstoy et al. 2004a,b); and,
- Behavioral responses due to sound exposure are uncertain and vary among different species and situations (e.g., Southall et al 2007; Ellison et al. 2012). In addition to these reasons, there were relatively few marine mammal sightings during the project and a potential for high numbers of resights, which further complicates the provision of meaningful estimates.

The method applied to estimate the number of marine mammals exposed to airgun sounds strong enough that they might have caused a disturbance or other potential impacts includes:

- Minimum estimates based on the direct observations of marine mammals by PSOs, and
- Maximum estimates based on pinniped and beluga whale sighting rates obtained during this survey.

The actual number of individuals exposed to, and potentially impacted by, strong seismic survey sounds likely was between the minimum and maximum estimates provided in the following sections and summarized in Table 18.

5.4.1. Minimum ≥ 160 dB (rms) Estimate

The actual number of marine mammals observed within the applicable safety zone of the source vessels during airgun operations provides a minimum estimate of the number potentially exposed to airgun sounds regulated by NMFS (Table 18). This likely underestimates the actual number potentially exposed because PSOs were likely unable to detect all marine mammals near the vessel. During daylight, animals are missed if they are below the surface when the vessel is nearby. Other marine mammals, even if they surface near the vessel, could be missed because of limited visibility due to conditions such as fog, rain, snow, haze, and darkness.

- **Minimum beluga whale exposures** — Five beluga whale sightings of a total of 11 individuals were made while airguns were operating including ramp-ups and mitigation airgun operations, and they were all within the 160 dB (rms) exposure radius (estimated at 2,000 m from the source).

  The minimum number of beluga whale exposures to ≥ 160 dB (rms) is therefore 11 (Table 18).

- **Minimum pinniped exposures** —52 sightings of 53 individuals were seen within the 160 dB (rms) exposure radius while airguns were operating, including ramp-ups and mitigation airgun operations.

  The minimum number of pinniped exposures to ≥ 160 dB (rms) is therefore 53 (Table 18).

5.4.2. Maximum ≥ 160 dB (rms) Estimate

The maximum number of potential pinniped and beluga whale exposures to ≥ 160 dB (rms) was calculated as listed below (Table 18). These exposure estimates were based on sighting rates during non-seismic periods because (1) the highest sighting rates occurred during non-seismic periods, and (2) non-seismic periods are considered the best estimate of numbers of animals that would have occurred during seismic periods if there had been no seismic operations during those periods.

Maximum number of exposures = Total duration of seismic operations (*Maxime* seismic hr + *Peregrine* seismic hr) (Table 6) x Average group size observed during survey (Table 13) x Non-seismic sighting rate (no. groups observed/hr during useable non-seismic conditions) (Table 14).

Beluga whale exposures —

- Total duration of seismic operations (hr) (*Maxime* seismic + *Peregrine* seismic) = = 229.5 hr (*Maxime*) + 317.6 hr (*Peregrine*) = 547.1 hr

- The average group size of beluga whales seen during this survey = 1.4
- The non-seismic sighting rate for beluga whales (no. groups observed/hr during useable non-seismic conditions) is 0.02 sightings/hr

Thus the maximum number of potential exposures = 547.1 hr x 1.4 individuals/sightings x 0.02 sightings/hr = 15.3 beluga whales (Table 18).

Pinniped exposures —

- Total duration of seismic operations (hr) (*Maxime* seismic + *Peregrine* seismic) = = 229.5 hr (*Maxime*) + 317.6 hr (*Peregrine*) = 547.1 hr
- The average group size of pinnipeds seen during this survey = 1.03
- The non-seismic sighting rate for pinnipeds (no. groups observed/hr during useable non-seismic conditions) is 0.17 sightings/hr

Thus the maximum number of potential exposures = 547.1 hr x 1.03 individuals/sighting x 0.17 sightings/hr = 95.7 seals (Table 18).

Table 18. Summary of minimum and estimated maximum number of potential individual pinniped and beluga whale exposures to airguns sounds ≥ 160 dB (rms) during the *2014 NPB 3D OBS Survey*

	Potential calculated exposures to ≥ 160 dB (rms)		Estimated maximum exposures to ≥ 160 dB (rms) authorized in IHA
	Minimum	**Maximum**	
Beluga whales	11	16 (15.3)	75
Pinnipeds	53	96 (95.7)	516
Total	64	111 (110.7)	591
Spotted seal	*11*	*84 (83.7)*	*23*
Bearded seal	*1*	*5 (4.6)*	*19*
Ringed seal	*3*	*7 (6.7)*	*71*

* A total of 42 individual pinnipeds in 41 groups were identified to species. Of these total 42 individuals, *n* = 37 were spotted seals (88.1 %), *n* = 2 were bearded seals (4.8 %), and *n* = 3 were ringed seals (7.1 %). These percentages were multiplied by the minimum (*n* = 64) and the maximum (*n* = 95) potential calculated pinniped exposures to ≥160 dB (rms) to estimate maximum exposure by species.
**All minimum and maximum potential calculated exposures (≥ 160 dB (rms)) were rounded up to the next highest whole number (i.e., 15.3 = 16). Actual calculation is shown parenthetically.

5.4.3. ESA-listed Estimated Exposures ≥ 170 dB (rms)

As required by NMFS in the BO / ITS (NMFS 2014b), the number of visually observed and estimated ESA-listed ringed and bearded seal exposures to airgun sounds ≥ 170 dB (rms) is presented in Table 19 (see Section 5.1.7 for methods). Methods were the same as those used to estimate exposures to airgun sounds ≥ 160 dB (rms) (see formula in Section

5.4.2 above) with one exception: for the potential maximum estimated exposures, the non-seismic sighting rate for the ≥ 170 dB (rms) isopleth was calculated based on the number of sightings within 1,500 m of the vessels rather than all sightings, as indicated below.

As discussed in Section 5.1.7 the decision to list the Beringia DPS of the bearded seal as threatened under the ESA was vacated in July 2014. Although the bearded seal is no longer listed under the ESA, the seal was still listed during the first week of airgun operations. It is worth noting that the bearded seal exposure estimates discussed below and in Table 19 represent bearded seals observed throughout the entire project period (i.e., they are not limited to numbers seen only during the first week of the project while the species was still ESA-listed and seismic operations were occurring).

Minimum visually observed bearded and ringed seal exposures ≥ 170 dB (rms)
The minimum number of individual bearded and ringed seals exposed to seismic sounds ≥ 170 dB (rms) was considered to be the number of observed seals visually confirmed as bearded or ringed seals within the associated 1,500-m isopleth.

- Two ringed seals and one bearded seal confirmed to species were visually observed within this 1,500 m radius while the airguns were operating (Table 19).

Maximum estimated potential bearded and ringed seal exposures ≥ 170 dB (rms)
Maximum estimated potential exposures ≥ 170 dB (rms) = Total duration of seismic operations (Maxime seismic hr + Peregrine seismic hr) (Table 6) x Average group size observed during survey (Table 13) x Non-seismic pinniped sighting rate within 1,500 m of source vessel (no. groups observed/hr during useable non-seismic conditions) (Table 14).

- Total duration of seismic operations (hr) = 547.1 hr
- The average group size of pinnipeds seen during this survey = 1.03
- The non-seismic sighting rate for pinnipeds (no. groups observed/hr during useable non-seismic conditions) within 1,500 m of the location of the source vessels was 0.16 sightings/hr.
  - This sighting rate was based on 15 useable pinniped sightings within 1,500 m of the vessels during 91.7 hr of useable non-seismic effort (all but one of the total 16 pinniped sightings shown in Table 13 during these conditions was seen within 1,500 m)
- Thus, the maximum number of potential seal exposures
  = 547.1 hr x 1.03 individuals/sighting x 0.16 sightings/hr
  = 90.2 seals.
- A total of 42 individual pinnipeds in 41 groups were identified to species. Of these total 42 individuals, *n* = 2 were bearded seals (4.8 %), and *n* = 3 were ringed seals (7.1 %). These percentages were multiplied by the maximum (*n* = 90.2) potential calculated seal exposures to ≥ 170 dB (rms) shown in Table 19 to estimate maximum exposures by bearded and ringed seals.
- Bearded seal estimate (4.8 %) x potential maximum seal exposures (90.2)

= 4.3 bearded seals

- Ringed seal estimate (7.1 %) x potential maximum seal exposures (90.2)
  = 6.4 ringed seals

Table 19. Summary of minimum and estimated maximum number of potential individual ESA-listed ringed and bearded seal exposures to airguns sounds ≥ 170 dB (rms) during the *2014 NPB 3D OBS Survey*

	Observed and potential estimated exposures to ≥ 170 dB (rms)*		Estimated maximum exposures to ≥ 170 dB (rms) authorized in ITS
	Minimum**	Maximum***	
Bearded seal	1	5 (4.3)	87
Ringed seal	2	7 (6.4)	324

* Radial distance to the 170 dB (rms) isopleth for the 620 in^3 airgun array was estimated to be 1,500 m (see Section 5.1.7).
** The minimum number of exposures by species was considered the number of individuals visually confirmed to species as a bearded or ringed seal.
*** The estimated maximum number of exposures of bearded and ringed seals was calculated by pro-rating the total maximum number of all pinniped exposures (*n* = 90.2, see bulleted text in this subsection) by the proportion of known visually confirmed bearded and ringed seals among all seals identified to species as follows. A total of 42 individual pinnipeds in 41 groups were identified to species. Of these total 42 individuals, *n* = 2 were bearded seals (4.8 %) and *n* = 3 were ringed seals (7.1 %). These percentages were multiplied by the maximum (*n* = 90.2) potential calculated pinniped exposures to ≥ 170 dB (rms) to estimate maximum exposure by species.
**** Maximum potential calculated exposures (≥ 170 dB (rms)) were rounded up to the next highest whole number (i.e., 4.3 = 5). Actual calculation is shown parenthetically.

6. Impact on Subsistence

The *2014 NPB 3D OBS Survey* started prior to the fall bowhead whale migration and the corresponding subsistence hunt by the village of Nuiqsut. Calls to the Deadhorse Com-Center were required to begin on 18 August and to continue through the end of the survey on 25 August. One IC was on board each source vessel at all times. Calls were made every 6 hr, primarily by the ICs and occasionally by a crew member. Each call to the Com-Center provided the position (latitude and longitude) of the seismic vessel and a brief description of planned activities. The first call was made at 0000 hr on 18 August and the last call was made at 0000 hr on 26 August to report that the seismic acquisition had been completed, but that vessel operations would continue as gear was retrieved from the project area. On 22 August, the Com-Center informed PSOs on the *Maxime* that whaling crews from Nuiqsut were likely heading to Cross Island on 28 August and that whaling was expected to begin 30 August. There is no indication that any of the North Prudhoe Bay survey activities resulted in an impact to the subsistence resources of the local community.

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APPENDIX A. PROJECT LETTERS OF AUTHORIZATIONS

United States Department of the Interior

FISH AND WILDLIFE SERVICE
1011 E. Tudor Road
Anchorage, Alaska 99503-6199

IN REPLY
REFER TO.

AFES/MMM

JAN 15 2013

Ms. Allison Erickson
Wildlife Compliance Authority
BP Exploration (Alaska) Inc.
900 East Benson Boulevard
P.O. Box 196612
Anchorage, Alaska 99519-6612

Dear Ms. Erickson:

We have received your October 9, 2012, request for a Letter of Authorization (LOA) from the U.S. Fish and Wildlife Service (Service), Marine Mammals Management Office (MMM) for the intentional take of polar bears while conducting North Slope-wide activities in polar bear habitat.

In response, enclosed is an Intentional Take Authorization, LOA 13-INT-02, granting BPXA, and its representatives, authorization to take polar bears by harassment (deterrent activities) for the protection of human life and of polar bears while conducting activities in polar bear habitat. This LOA is issued specifically to BPXA who is responsible for ensuring that trained and qualified personnel are assigned the task to harass (deter) polar bears. It is the responsibility of BPXA personnel to report all polar bear harassment events to the Service, MMM within 24 hours. This LOA is effective for 2 years, from the date of issuance. An annual report detailing polar bear interactions will be required as part of this new procedure. Intentional take is authorized under sections 101(a)(4)(A), 109(h), and 112(c) of the Marine Mammal Protection Act (MMPA).

BPXA's *Polar Bear and Walrus Interaction Plan for BPXA Areas of Operation Document Number: UPS-US-AK-ALL-ALL-HSE-DOC-00495-2,* Revision Date: September 11, 2012, contains appropriate safeguards to limit human/bear interactions and is incorporated by reference. Full implementation of this plan is expected. If questions or concerns arise regarding

polar bears during the project period, Service, MMM biologists are available for consultation at the phone numbers listed below and noted in your Interaction Plan.

BPXA camps and personnel can limit encounters with polar bears by being observant of approaching animals (i.e., the use of polar bear guards) and breaking off interactions, if practicable, by allowing the animals to continue their travel. If a polar bear interaction escalates into a life threatening situation, section 101(c) of the MMPA allows, without specific authorization, the take (including lethal take) of a polar bear if such taking is imminently necessary for self-defense or to save the life of a person in immediate danger, and such taking is reported to the Service, MMM within 24 hours.

Further, the Service has completed intra-Service consultation under the Endangered Species Act of 1973, as amended (ESA), on the issuance of this LOA and has determined that the issuance this LOA is not likely to jeopardize the continuing existence of polar bears and is not likely to destroy or adversely modify polar bear critical habitat if designated. No additional authorization under the ESA is required.

If any changes develop in your projects during the 2013 or 2014 seasons, such as activities or location, please notify the Service, MMM prior to the planned operation. This will allow us to evaluate the activity and, if appropriate, amend your LOA. If you have any further questions, please contact Mr. Craig Perham, of the Service, MMM, at (907) 786-3800 or 786-3810.

Sincerely,

Acting Chief, Marine Mammals Management

Enclosures

cc: Mr. Richard Shicjeler, Alaska Department of Fish and Game (Email)

U.S. Fish and Wildlife Service, Fairbanks Fish and Wildlife Field Office

Fish and Wildlife Service, Office of Law Enforcement North Slope Borough, Department of Law

United States Department of the Interior

FISH AND WILDLIFE SERVICE

IN REPLY REFER TO:

AFES/
MMM

1011 E. Tudor Road
Anchorage, Alaska
99503-6199

U.S. Fish and Wildlife Service

AUTHORIZATION TO TAKE, BY HARASSMENT, POLAR BEARS 13-INT-02

ISSUED: January 15, 2013

EXPIRES: January 15, 2015

Under sections 101 (a)(4)(A), 109(h), and 112(c) of the Marine Mammal Protection Act of 1972, as amended (MMPA), BP Exploration (Alaska) Inc. (BPXA) is authorized to take, by harassment, polar bears during slope-wide activities in association with the BPXA-operated North Slope oil fields.

The purpose of authorizing taking by harassment, or deterrence, is to maintain human and bear safety and welfare in the North Slope oilfields. Authorizing Level B harassment take reduces the likelihood of death or injury of polar bears. For this reason, this authorization is guided by the following objectives:

- Prevent bears from associating food with humans and facilities.
- "Condition" bears to avoid people (avoidance conditioning).
- Allow bears to use travel routes (natural and man-made) to move along the coast.
- Prevent bears from extended use of areas around facilities.

- Prevent bears from entering the developed parts of the oilfield.

This harassment Letter of Authorization (LOA) is subject to the following conditions:

1. The Polar Bear Interaction Plan *(Polar Bear and Walrus Interaction Plan for BPXA Areas of Operation Document Number : UPS-US-AK-ALL-ALL-HSE-DOC-00495-2)*, Revision Date: September 11, 2012, is approved and all provisions, unless noted specifically, are incorporated into this LOA by reference. A copy of the Polar Bear Interaction Plan must be available on site for all personnel.

2. BPXA Operations Managers, or designates, must be fully aware of, understand, and be capable of implementing the conditions of this authorization.

3. This LOA is restricted to harassment activities and is valid only for those activities identified in the request for an LOA dated October 9, 2012, for the 2013 - 2014 slope-wide operating area.

- Any additional projects planned for the 2014 season not included in the current request will be presented to the U.S. Fish and Wildlife Service (Service), Marine Mammals Management Office (MMM) as an addendum prior to commencement to be included in the current authorization.

4. This authorization is issued specifically to BPXA who is responsible for ensuring **trained and qualified** personnel are assigned the task to harass (deter) polar bears. A list of trained personnel responsible for deterrence will be on file prior to initiation of activities with the Service Incidental Take Coordinator.

5. BPXA is solely responsible for ensuring that personnel operating under this authorization meet all Federal and State of Alaska laws and regulations regarding the use and carry of firearms should firearms be used for bear deterrence.

6. BPXA, or its designated agent, is responsible for documenting and reporting to the Service, MMM, at (907) 786-3800, all instances involving harassment activities as soon as possible and no later than 24 hours after the occurrence.

7. An annual report of all encounters and hazing events must be submitted

to the Service, MMM by the end of the calendar year of the first year. A final report of all encounters and hazing events during the 2 year duration must be submitted to the Service, MMM within 60 days from the expiration date of this LOA.

Hazing techniques must not cause the injury or death of a bear. Types of hazing techniques may include, but are not limited to:

- Bear Guards or Bear Monitors.
- Air horns.
- Electric fences.
- Chemical repellents.
- Acoustic recordings.
- Vehicles.

8. Prior to conducting a harassment activity, operators must:

- Make a reasonable effort to reduce or eliminate attractants.
- Secure site; notify supervisor; move personnel to safety.
- Ensure bear has escape route(s).

Ensure communication with all personnel.

9. When conducting a harassment activity, operators must:

- Choose the method that will have the least effect on the bear and increase the intensity of the method or use additional methods only if necessary.
- Shout at the bear before using a deterrent.
- Move bear in proper direction; continuing with minimally necessary deterrents to receive desired result.

11. After a harassment event has occurred, operators must:

- Monitor bear's movement (to ensure no return).
- Notify supervisor and personnel when it is safe to resume work.
- Fill out report to be sent to the Service as required above, (within 24 hours).

12. Any lethal take or injury of a polar bear must be reported to the Service immediately.

This Letter of Authorization is valid for the period indicated on this authorization, unless extended or terminated in writing by the U.S. Fish and Wildlife Service, Marine Mammals Management

Office.

JAN 15 2013

Acting Chief, Marine Mammals Management Date

United States Department of the Interior

IN REPLY REFER TO:

U.S. FISH AND WILDLIFE SERVICE 1011 East Tudor Road

Anchorage, Alaska 99503-6199

JUN 11 2014

AFES/MMM

Ms. Christina May

BPXA Wildlife Compliance Authority
BP Exploration (Alaska), Inc.

900 East Benson Boulevard

P.O. Box 196612

Anchorage, Alaska 99519-6612

Dear Ms. May:

This responds to your March 17, 2014, request for Letters of Authorizations (LOAs) for the incidental take of polar bears and Pacific walrus and the intentional take of polar bears in regards to the BP Exploration (Alaska), Inc. (BPXA) 2014 North Prudhoe Seismic Survey in the Beaufort Sea.

In response, and in accordance with regulations listed at 76 FR 47010, dated August 3, 2011, enclosed is LOA 14-10 that will allow BPXA to take small numbers of polar bears and Pacific walrus incidental to oil and gas industry activities at the location identified in your LOA request. In addition, Intentional Take Authorization, LOA 14-INT-06, as authorized under sections 101 (a)(4)(A), 109(h), and 112(c) of the Marine Mammal Protection Act (MMPA), is also enclosed for activities in association with the 2014 North Prudhoe Seismic Survey in the Beaufort Sea.

BPXA proposes to conduct a three-dimensional (3D) ocean bottom sensor (OBS) seismic survey with a transition zone component on state and private lands, and federal and state waters in the Prudhoe Bay area of the Beaufort Sea during the open-water season of 2014. The project area lies mainly within the Prudhoe Bay Unit (PBU) but includes portions of the Northstar, Dewline, and Duck Island Units as and non-unit areas. A full description of activities can be found in your request for letters of authorization dated March 17, 2014. The proposed start date for this project is early July 2014, with operations completed by the end of August 2014. All provisions contained within BPXA's *"Request for Letters of Authorization Pursuant to 50 CFR 18, Subpart J and Section 101(A)(S) and Sections 101 (a)(4)(A), 109(h), and 112(c) of the Marine Mammal Protection Act (MMPA) for Incidental Take of Polar Bears and the Pacific Walrus and Take by Harassment (Deterrent Activities) of Polar Bears during 2014 North Prudhoe CBS Seismic Survey."* are incorporated by reference into this LOA.

BPXA personnel may limit encounters of polar bears by being observant of approaching animals (i.e., the use of polar bear guards) and where practicable, by allowing the animals to pass unhindered. BPXA will also: 1) provide copies of the polar bear observation form to all contractors operating under the LOA; 2) report any polar bear sightings, or signs of polar bears, such as tracks or excavations, to this office by phone or using the polar bear observation report; and, 3) report any possible den locations that are found during work activities immediately to our office.

If a polar bear interaction escalates into a life threatening situation, section 101(c) of the MMPA allows, without specific authorization, the take (including lethal take) of a polar bear if such taking is imminently necessary for self-defense or to save the life of a person in immediate danger, and such taking is reported to the Service within 24 hours.

An additional requirement of this LOA is for BPXA to provide observational data of polar bears and Pacific walruses throughout the project and a complete report of all

observations at the conclusion of the project to document take. This final report must be provided to the Marine Mammals Management Office within 90 days after completion of the project.

Polar bear conservation has benefited from monitoring programs associated with the Incidental Take program since 1993. Monitoring serves to assess the effect of industrial activities on polar bears by evaluating bear encounter rates, take frequency, as well as the location and timing of encounters. If questions or concerns arise during the project period, Service biologists are available for consultation at the phone numbers listed below and noted in your Interaction Plan *(ATTACHMENT IL Polar Bear Interaction and Mitigation Plan for North Prudhoe OBS Seismic Survey)*.

If any changes develop in your project, such as activities or location, the Marine Mammals Management Office (MMM) must be notified prior to the planned operation. This will allow us to evaluate the activity and, if appropriate, amend the appropriate LOA(s).

Ms. Christina May 2

The Service has completed intra-Service consultation under the Endangered Species Act of 1973, as amended (ESA), and has determined that the issuance of these LOAs is not likely to jeopardize the continuing existence of polar bears. No additional authorization under the ESA is required.

If you have any further questions, please contact Mr. Craig Perham or Mr. Christopher Putnam of our Marine Mammals Management Office, at (907) 786-3810 or (907) 786-3844, respectively.

Sincerely,

Acting Chief, Marine Mammals Management

Enclosure

cc: Ms. Susan Banet, Bureau of Ocean Energy Management (via e-mail)

Mr. Richard Shideler, Alaska Department of Fish and Game (via e-mail) Fairbanks Fish and Wildlife Field Office

Office of Law Enforcement

North Slope Borough Department of Law (via e-mail)

United States Department of the Interior

U.S. FISH AND WILDLIFE SERVICE
1011 East Tudor Road
Anchorage, Alaska 99503-6199

IN REPLY REFER TO:

AFES/MMM

US Fish and Wildlife Service
LETTER OF AUTHORIZATION
Intentional Take
(14-INT-06)

ISSUED: June 15, 2014

EXPIRES: October 31, 2014

BP Exploration (Alaska), Inc. (BPXA) is authorized to take by harassment (deterrence activities) small numbers of polar bears *(Ursus maritimus)* associated with activities occurring during BPXA's 2014 North Prudhoe Seismic Survey in the Beaufort Sea in accordance with sections 101(a)(4)(A), 109(h) and 112(c) of the Marine Mammal Protection Act of 1972 (MMPA), as amended.

BPXA proposes to conduct a three-dimensional (3D) ocean bottom sensor (OBS) seismic survey with a transition zone component on state and private lands, and federal and state waters in the Prudhoe Bay area of the Beaufort Sea during the open-water season of 2014. The project area lies mainly within the Prudhoe Bay Unit (PBU) but includes portions of the Northstar, Dewline,

and Duck Island Units as and non-unit areas. A full description of activities can be found in your request for letters of authorization dated March 17, 2014. The proposed start date for this project is early July 2014, with operations completed by the end of August 2014.

Section 10l(a)(4)(A) of the MMPA states that, "Except as provided in subparagraphs (B) and (C), the provisions of this chapter shall not apply to the use of measures-

i. by the owner of fishing gear or catch, or an employee or agent of such owner, to deter a marine mammal from damaging the gear or catch;

ii. by the owner of other private property, or an agent, bailee, or employee of such owner, to deter a marine mammal from damaging private property;

iii. by any person, to deter a marine mammal from endangering personal safety; or

iv. by a government employee, to deter a marine mammal from damaging public property, so long as such measures do not result in the death or serious injury of a marine mammal."

Section 112(c) allows for the transfer of Federal authority "... as may be necessary to carry out the purposes of this title (Conservation and Protection of Marine Mammals) ... and on such terms as he deems appropriate with any Federal or State agency, public or private institution, or other person."

Section 109(h)(l) states that, "nothing in this title [Conservation and Protection of Marine Mammals] ... shall prevent a Federal, State, or local government official or employee or a person designated under section 112(c) from taking, in the course of his or her duties as an official, employee, or designee, a marine mammal in a humane manner (including euthanasia) if such taking is for-

A. the protection or welfare of the mammal,
B. the protection of the public health and welfare, or
C. the non-lethal removal of nuisance animals."

The purpose of authorizing taking by Level B non-lethal harassment, or deterrence, is to maintain human and bear safety and welfare in polar bear habitat. Authorizing Level B harassment take reduces the likelihood of death or injury of polar bears. This is accomplished by the following objectives:

- Prevent bears from associating food with humans and facilities.
- "Teach" bears to avoid people.
- Allow bears to use travel routes (natural and human made) to move along the coast.
- Prevent bears from extended use of areas around facilities.

This Letter of Authorization (LOA) is subject to the following conditions:

1. This LOA is restricted to Level B non-lethal harassment or deterrent activities.

2. The BPXA *"Polar Bear Interaction Plan for the Operating Units – Revision Date: September 26, 2011"* and *"ATTACHMENT II, Polar Bear (and Walrus) Interaction and Mitigation Plan for North Prudhoe OBS Seismic Survey"* are approved and all interaction, mitigation measures, and provisions must be complied with unless specifically noted otherwise in this LOA.

3. BPXA operations managers, or designates, must be fully aware, understand, and be capable of implementing the conditions of this authorization.

4. This authorization is valid only for those activities and locations identified in the request for a Letter of Authorization dated March 17, 2014, for the Beaufort Sea and described in the *"Request for Letters of Authorization Pursuant to 50 CFR 18, Subpart J and Section 101(A)(S) and Sections 101 (a)(4)(A), 109(h), and 112(c) of the Marine Mammal Protection Act (MMPA) for Incidental Take of Polar Bears and the Pacific Walrus and Take by Harassment (Deterrent Activities) of Polar Bears during 2014 North Prudhoe CBS Seismic Survey*.
5. This LOA is issued specifically to BPXA who is responsible for ensuring **trained and qualified** personnel are assigned the task to harass (deter) polar bears. A list

of trained personnel responsible for deterrence will be on file prior to initiation of activities with the Service Incidental Take Coordinator.

6. BPXA is solely responsible for ensuring that personnel operating under this authorization meet all Federal and State laws and regulations regarding the use and carry of firearms, should firearms be used for bear deterrence.

7. BPXA, or its designated agent, is responsible for documenting and reporting to the U.S. Fish and Wildlife Service (Service), Marine Mammals Management Office (MMM), at (907) 786- 3800, all instances involving harassment activities as soon as possible and no later than 24 hours after the occurrence.

8. Harassment or deterrence techniques must not cause injury or death of a bear. Types of harassment or deterrence techniques may include, but are not limited to:
   - Bear monitors.
   - Air homs.
   - Electric fences.
   - Chemical repellents.
   - Acoustic recordings.
   - Vehicles.
   - Projectiles, such as, cracker shells, bean bags, rubber bullets, and screamers.
9. Prior to conducting a harassment activity, operators must:

   - Make a reasonable effort to reduce or eliminate attractants.
   - Secure site, notify supervisor and move personnel to safety.
   - Ensure bear has escape route(s).
   - Ensure communication with all personnel.

10. When conducting a harassment activity, operators must:

    - Keep in mind that the safety and welfare of the bear is second only to the safety and welfare of humans in a harassment or deterrence situation.
    - Chose the method that will have the least effect on the bear and increase the intensity of the method or use additional methods only if necessary.
    - Shout at the bear before using projectiles or other methods (avoidance conditioning).
    - Move the bear in proper direction; continue with minimally necessary deterrents to receive desired result.
11. After a harassment event has occurred, operators must:

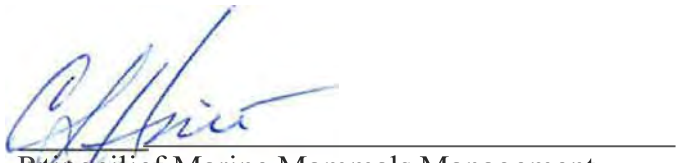
    - Monitor the bear's movement (to ensure no return).

- Notify the supervisor and personnel when it is safe to resume work.
- Fill out a report to be sent to the Service as required above (within 24 hours).

12. A final report of all encounters and harassment or deterrence events will be submitted to the Service, MMM no later than 60 days from the expiration date of this authorization.

13. Any lethal take or injury of a polar bear must be reported to the Service immediately.

This Letter of Authorization is valid for the period indicated on this authorization, unless extended or terminated in writing by U.S. Fish and Wildlife Service, Marine Mammals Management Office.



Rtingelief, Marine Mammals Management

JUN 1f 2014

Date

United States Department of the Interior

U.S. FISH AND WILDLIFE SERVICE
1011 East Tudor Road
Anchorage, Alaska 99503-6199

IN REPLY REFER TO:

AFES/MMM

RECEIVED
JUN 16 2014
BY:

JUN 11 2014

Ms. Christina May

BPXA Wildlife Compliance Authority
BP Exploration (Alaska), Inc.

900 East Benson Boulevard

P.O. Box 196612
Anchorage, Alaska 99519-6612

Dear Ms. May:

This responds to your March 17, 2014, request for Letters of Authorizations (LOAs) for the incidental take of polar bears and Pacific walrus and the intentional take of polar bears in regards to the BP Exploration (Alaska), Inc. (BPXA) 2014 North Prudhoe Seismic Survey in the Beaufort Sea.

In response, and in accordance with regulations listed at 76 FR 47010, dated August 3, 2011, enclosed is LOA 14-10 that will allow BPXA to take small numbers of polar bears and Pacific walrus incidental to oil and gas industry activities at the location identified in your LOA request. In addition, Intentional Take Authorization, LOA 14-INT-06, as authorized under sections 101 (a)(4)(A), 109(h), and 112(c) of the Marine Mammal Protection Act (MMPA), is also enclosed for activities in association with the 2014 North Prudhoe Seismic Survey in the Beaufort Sea.

BPXA proposes to conduct a three-dimensional (3D) ocean bottom sensor (OBS) seismic survey with a transition zone component on state and private lands, and federal and state waters in the Prudhoe Bay area of the Beaufort Sea during the open-water season of 2014.

The project area lies mainly within the Prudhoe Bay Unit (PBU) but includes portions of the Northstar, Dewline, and Duck Island Units as and non-unit areas.

A full description or activities can be found in your request for letters of authorization dated March 17, 2014. The proposed start date for this project is early July 2014, with operations completed by the end of August 2014. *All* provisions contained within BPXA's *"Request/or Letters of Authorization Pursuant to 50 CFR 18, Subpart J and Section 101(A)(S) and Sections 101 (a)(4)(JJ.), 109(h), and 112(c) of the Marine Mammal Protection Act (MMPA) for Incidental Take of Polar Bears and the Pacific Walrus and Take by Harassment (Deterrent Activities) of Polar Bears during 20 I 4 North Prudhoe CBS Seismic Survey."* are incorporated by reference into Hus LOA.

BPXA personnel may limit encounters of polar bears by being observant of approaching animals (i.e., the use of polar bear guards) and where practicable, by allowing the animals to pass unhindered. BPXA will also: 1) provide copies of the polar bear observation form to all contractors operating wider the LOA; 2) report any polar bear sightings, or signs of polar bears, such as tracks or excavations, to this office by phone or using the polar bear observation report; and, 3) report any possible den locations that are found during work activities immediately to our office.

If a polar bear interaction escalates into a life threatening situation, section 101(c) of the MMPA allows, without specific authorization ,the take (including lethal take) of a polar bear if such taking is imminently necessary for self-defense or to save the life of a person in immediate danger, and such taking is reported to the Service within 24 hours.

An additional requirement of this LOA is for BPXA to provide observational data of polar bears and Pacific walruses throughout the project and a complete report of all observations at the conclusion of the project to document take. This final report must be provided to the Marine Mammals Management Office within 90 days after completion of the project.

Polar bear conservation has benefited from monitoring programs associated with the Incidental Take program since 1993. Monitoring serves to assess the effect of industrial activities on polar bears by evaluating bear encounter rates, take frequency, as well as the location and timing of encounters. If questions or concerns arise during the project period, Service biologists are available for consultation at the phone numbers listed below and noted in your Interaction Plan *(ATI'ACHMENT II, Polar Bear Interaction and Mitigation Plan/or North Prudhoe OBS Seismic Survey).*

If any changes develop in your project, such as activities or location, the Marine Mammals Management Office (MMM) must be notified prior to the planned operation. This will allow us to evaluate the activity and, if appropriate, amend the appropriate LOA(s).

The Service has completed intra-Service consultation under the Endangered Species Act of 1973, as amended (ESA), and has determined that the issuance of these LOAs is not likely to

jeopardize the continuing existence of polar bears. No additional authorization under the ESA is required.

If you have any further questions, please contact Mr. Craig Perham or Mr. Christopher Putnam of our Marine Mammals Management Office, at (907) 786-3810 or (907) 786-3844, respectively.

Sincerely,

Acting Chief, Marine Mammals Management

Enclosure

cc: Ms. Susan Banet, Bureau of Ocean Energy Management (via e-mail)
Mr. Richard Shideler, Alaska Department of fish and Game (via e-mail) Fairbanks Fish and Wildlife Field Office
Office of Law Enforcement
North Slope Borough Department of Law (via e-mail)

United States Department of the Interior

U.S. FISH AND WILDLIFE SERVICE

1011 East Tudor Road
Anchorage, Alaska 99503-
6199

IN REPLY RlIfER TO:

AFES/MMM

RECEIVED
JUN 16 2014

BY= ---.-------

U.S. Fish and Wildlife Service

LETTER OF AUTHOIUZATION
(14-10)

ISSUED: June 15, 2014
EXPIRES: October 31, 2014

This U.S. Fish & Wildlife Service (Service) authorization and the required conditions below apply to all employees, contractors, and personnel performing BPXJ\-approved work under the scope of operations to be conducted. This authorization stipulates the following conditions:

1. BPXA operations managers, or designates ,must be fully aware, understand, and be capable of implementing the conditions of this authorization.

2. Intentional take of polar bears and walruses is prohibited under this authorization.

3. The BPXA *"Polar Bear Interaction Plan for the Operating Units-Revision Date: September 26, 201F'* and *"ATTACHMENT II, Polar Bear (and Walrus) Interaction and Mitigation Plan for North Prudhoe OBS Seismic Survey"* are approved and all interaction, mitigation measures, and provisions must be compiled with unless specifically noted otherwise in this LOA.

4. A copy of this LOA and the approved interaction, mitigation measures, and avoidance plans listed above must be posted and available for all personnel and in the possession of the operators of all vessels and aircraft e1 lgaging in the activities approved w1der the authority of this LOA.

5. This authorization is valid only for those activities and locations identified in the request for a Letter of Authorization dated March 17, 2014, for the Beaufort Sea and described in the *"Request for Letters of Authorization Pursuant to 50 CFR 18, Subpart J and Section 101 (A) (S) and Sections 101 (a)(4)(A}, 109(h), and 112(c) of the Marine Mammal Protection Act (MMPA)for Incidental Take of Polar Bears and the Pacific Walrus and Take by Harassment (Deterrent Activities) of Polar Bears during 2014 North Prudhoe CBS Seismic Survey."*

6. Polar bear and walrus monitoring, reporting, and survey activities must be conducted in accordance with 50 CFR Section 18.128 and must comply with the following monitoring, mitigation, and reporting requirements:

   a. BPXA must cooperate with the Service, and other designated Federal, State, or local agencies to monitor the impacts of oil and gas exploration activities on polar bears and walruses.

   b. If any changes develop in the project during the period approved w1der this LOA, such as activities, location or methods, notify the Service, Marine Mammals Management Office (MMM) prior to the implementation of such changes.

   c. Avoid concentrations or groups of walruses and individuals or groups of polar bears hauled out onto land or ice by all vessels under the management of BPXA. Operators of vessels should, at all times, conduct their activities at the maximum

distance possible from known or observed concentrations of marine mammals. Under no circumstances, other than an emergency, should vessels operate within 800 meters (0.5 mile) of walruses or polar bears observed on land or ice.

d. Take every precaution to avoid encroachment upon or harassment of walruses or polar bears in water when a vessel is operated near these animals. Maintain an 800 meter (0.5 mile) distance, when practicable. Vessels must reduce speed and steer around walruses or polar bears observed in water when able to do so. Vessels may not be operated in such a way as to separate members of a group of walruses or polar bears from other members of the group. Vessels will avoid multiple changes in direction and speed when walruses or polar bears are present.

e, Power-down procedures will be initiated if any walruses are observed on ice in the walrus disturbance zone of >/= 180 dB to limit impact to walruses in the water associated with the walruses on the ice.

f. Restricting or affecting walrus or polar bear movements, by any means, ln sea, on land or on ice, is prohibited. Separation distances *will* be enforced until animals have left the area of their own volition.

g. BPXA must designate a qualified individual or individuals as Marine Mammal Observers (MMO) to observe, record, and report the effects of project activities on polar bears and walruses to the Service, MMM within 24 hours of visual observation. All evidence of polar bears and walruses, such as tracks, carcasses, or haul out sites, if applicable, will also be reportc4.

h. For each walrus and polar bear sighting, an MMO or designated crew member will record at least the following:

I. a unique sighting identification number; LOA number

11. MMO's name and contact information (phone, email, etc.), company name, and vessel name;

iii. time, location (with latitude, longitude, and datum), heading, speed, activity, and identity of the observation vessel;

iv. action taken by vessel operator in response to sighting (describe);

v. for all other vessels visible within five km (approximately three miles) of the observation vessel, when polar bears or walruses are sighted, record the, identification, bearing, distance, heading, speed and activity of the other vessel(s);

VI. species (polar bear or walrus);

vi. group size (approximate number of individuals);

viii. age/size/sex categories (if determinable);

ix. behavior or activity of anin1als sighted (describe);

x. reaction of animal(s) to any vessel(s) (describe);

xi. substrate (water, ice, and/or land),

xii. heading (if determinable), bearing and distance from vessel of animal(s);

xiii. sighting cue (what caught MMOs attention);

xiv. environmental conditions including:

- weather;
- air temperature;
- visibility, provide; 1) distance (km, *mi*, or nm) 2) light/dark/twilight and 3) glare (none, little, moderate, severe);
- water depth (meters, feet or fathoms);
- sea state (Beaufort scale);
- ice condition, provide: 1) estimated % ice cover in vicinity of sighting (10% increments), 2) estimated distance to pack ice (Ian, mi, or nm);

xv. estimated range (m, km, mi, or run) at first sighting, estimated range (m, km, mi, or nm) at closest approach;

xvi. MMO comments or notes.

7. Any incidental lethal take or injury of a polar bears or walruses must be reported to the Service, MMM immediately.

8. At the discretion of the Service, BPXA must allow the Service to place an observer on site, including any facilities, vessels, aircraft or vehicles, to monitor the impacts of the activity on marine mammals, when requested.

9. BPXA must submit an annual monitoring report to the Service, MMM as required under 50 CFR 18.128(f), a draft of which will be received by MMM no later than 90 days after completion of the project. The report will describe in detail:

a. The operations that were conducted;
b. The methods, results, and interpretation pertaining to all monitoring tasks;
c. The results of the 2014 shipboard marine mammal monitoring;
d. Marine mammal sightings (species, numbers, dates, times and locations, age/size/gender, environmental con-elates, activities, associated survey activities);
e. Estimates of the amount and type of potential take (exposure) of walruses and polar bears (by species) to project activities;
f. An analysis of the effects of operations (e.g., on sighting rates, sighting distances, behaviors, movement patterns of walruses and polar bears);
g. An analysis of factors influencing detectability of walruses and polar bears during project operations;
h. Summaries of communications with hunters and potential effects on subsistence uses.

10. The draft report will be subject to review and comment by the Service. Any recommendations made by the Service must be addressed in the final report prior to acceptance by the Service. The draft report will be considered the final report for this activity under this LOA if the Service has not provided comments and recommendations within 90 days of receipt of the report.

11. Activities related to the monitoring described in this LOA do not require a separate scientific research permit issued under Section 104 of the Marine Mammal Protection Act.

12. A copy of this LOA and the Service-approved Polar Bear Interaction Plan must be in the possession of the operator of all vessels and aircraft engaging in the activity operating under the authority of this LOA.

The Service bas completed intra-Service consultation under the Endangered Species Act of 1973, as amended (BSA), and has determined that the issuance of these LOAs is not likely to jeopardize the continuing existence of polar bears. No additional authorization under the ESA is required .

This Letter of Authorization is valid for the period indicated on this authorization unless extended or terminated in writing by the U.S. Fish and Wildlife Service, Marine Mammals Management Office.

JUN' 1'1 2014

Acting Chief, Marine Mammals Management Date

APPENDIX B. CONFLICT AVOIDANCE AGREEMENT (CAA)

2014 CAA FINAL FOR SIGNATURE

2014 OPEN WATER SEASON
PROGRAMMATIC CONFLICT AVOIDANCE AGREEMENT

BETWEEN

BP EXPLORATION (ALASKA), INC.
ENI US OPERATING CO INC.
EXXON MOBIL CORPORATION
GX TECHNOLOGY CORP.
CAELUS ENERGY ALASKA
SAExploration
SHELL OFFSHORE, INC
TGS-NOPEC Geophysical Company

AND

THE ALASKA ESKIMO WHALING COMMISSION
THE BARROW WHALING CAPTAINS' ASSOCIATION
THE GAMBELL WHALING CAPTAINS' ASSOCIATION
THE KAKTOVIK WHALING CAPTAINS' ASSOCIATION
THE KIVALINA WHALING CAPTAINS' ASSOCIATION
THE LITTLE DIOMEDE WHALING CAPTAINS' ASSOCIATION
THE NUIQSUT WHALING CAPTAINS' ASSOCIATION
THE PT. HOPE WHALING CAPTAINS' ASSOCIATION
THE PT. LAY WHALING CAPTAINS' ASSOCIATION
THE SAVOONGA WHALING CAPTAINS' ASSOCIATION
THE WAINWRIGHT WHALING CAPTAINS' ASSOCIATION
THE WALES WHALING CAPTAINS' ASSOCIATION

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TABLE OF CONTENTS

TITLE I – GENERAL PROVISIONS

SECTION 101. APPLICATION.

Title I applies to all Participants, except as provided in Title VI.

Title II applies to all Participants, except as provided in Titles III or VI.

Title III applies to those Participants who operate barge or transit vessels in the Beaufort Sea or Chukchi Sea.

Titles IV and V apply only to those Participants who engage in oil and gas operations, except as provided in Title VI.

Title VI applies to those Participants who engage exclusively in geophysical activities that are conducted at least 5 miles or more from the Alaska coast in the Beaufort Sea or Chukchi Sea and begin on or after October 1, 2014.

Provisions that apply to a specific activity or are designated as specific to either the Beaufort Sea or Chukchi Sea apply only to Participants that engage in that activity or operate in that area, and provisions applicable to activities a Participant does not engage in or areas in which a Participant does not operate do not apply to that Participant.

SECTION 102. PURPOSE.

The purpose of this Agreement is to provide:

(1) Equipment and procedures for communications between Subsistence Participants and Industry Participants;

(2) Avoidance guidelines and other mitigation measures to be followed by the Industry Participants working in or transiting the vicinity of active subsistence hunters, in areas where subsistence hunters anticipate hunting, or in areas that are in sufficient proximity to areas expected to be used for subsistence hunting that the planned activities could potentially adversely affect the subsistence bowhead whale hunt through effects on bowhead whales;

(3) Measures to be taken in the event of an emergency occurring during the term of this Agreement; and

(4) Dispute resolution procedures.

SECTION 103. DEFINITIONS.

(a) Defined Terms.

For the purposes of this Agreement:

(1) The term "Agreement" means this 2014 Open Water Season Programmatic Conflict Avoidance Agreement and any attachments to such agreement.

(2) The term "at-sea oil and gas operations" does not include gravel islands or fixed platform developments located near shore (for example Northstar or Oooguruk) or Near Shore Operations Support Vessels.

(3) The term "barge" means a non-powered vessel that is pushed or towed, and the accompanying pushing or towing vessel, which is used solely to transport materials through the Beaufort Sea or Chukchi Sea. Such term does not include any vessel used to provide supplies or support to at-sea oil and gas operations or Near Shore Operations Support Vessels.

(4) The term "Com-Center" means a communications systems coordination center established under Section 203.

(5) The term "geophysical activity" means any activity the purpose of which is to gather data for imaging the marine subsurface environment, including but not limited to use of air guns, sonar, and other geophysical equipment used for seismic exploration or shallow hazard identification. "Geophysical activity" does not include support vessels that are not actively employing geophysical equipment, or other supporting activities that do not generate sound waves for the purposes of imaging the subsurface marine environment.

(6) The term "geophysical equipment" means equipment, such as air gun arrays over 300 cubic inches or sparker arrays over 20,000 kJ, employed on a vessel or a towed array, that generates sound waves for the purpose of imaging the subsurface marine environment for exploration and development purposes. The term does not include vessel engines, generators, or sources such as fathometers, fish finders, side-scan sonar, or other sources intended for engineering and /or transportation purposes.

(7) The term "Industry Participants" means all parties to this Agreement who are not Subsistence Participants.

(8) The term "Marine Mammal Observer / Inupiat Communicator" or "MMO/IC" means an observer hired by an Industry Participant for the purpose of spotting and identifying marine mammals in the area of that Industry Participant's operations during the Open Water Season. The MMO/IC also serves as the on-board Inupiat communicator who can communicate directly with whaling crews.[1]

(9) The term "Near Shore Operations Support Vessels" means vessels (including aircraft) used to support related activities (such as supply, re-supply, crew movement, and facility maintenance) for near shore oil and gas operations by an Industry Participant.

(10) The terms "NSB" and "NSB DWM" mean the North Slope Borough and the North Slope Borough Department of Wildlife Management, respectively.

(11) The term "oil and gas operations" means all oil and gas exploration, development, or production activities (including, but not limited to, geophysical activity, exploratory drilling, development activities (such as dredging or construction), production drilling, or production, and related activities (such as supply, re-supply, crew movements, and facility maintenance) by or for any Industry Participant, including aircraft and vessels of whatever kind used in support of such activities, occurring in the Beaufort Sea or Chukchi Sea, whether occurring near shore or offshore, but does not include barge traffic, transit vessel traffic, cable laying vessel traffic, or research vessel traffic (i.e. traffic by a vessel which is only conducting research and is not conducting any geophysical activities) by or for any Participant.

(12) The term "Open Water Season" means the period of the year when ice conditions permit navigation or oil and gas operations to occur in the Beaufort Sea or Chukchi Sea, as appropriate.

[1] Following the 2013 CAA meeting, a request was put in to change the title of MMO/IC to "Protected Species Observer," to make the term consistent with the terminology used by the National Science Foundation. The AEWC will raise this suggestion during the 2014 CAA meeting.

(13) The term "Participants" means all parties identified in this Agreement by name and whose representative(s) has signed the Agreement, and all contractors of such parties. When used alone the term includes both Industry Participants and Subsistence Participants.

(14) The term "Primary Sound Source Vessel" means a vessel owned or operated by or for an Industry Participant that (A) employs air gun arrays greater than 300 cubic inches or sparkers greater that 20,000 kJ, for imaging the subsurface environment, (B) is used to monitor any safety zone around a vessel described in subsection (A), (C) is engaged in ice-breaking, or (D) is the lead vessel in a group of barge or transit vessels.

(15) The term "sonar" means equipment, employed as hull mounted or towed array, intended for the active location of surface or underwater vessels. The term does not include vessel engines, generators, or sources such as fathometers, fish finders, side-scan sonar, or other sources intended for engineering, cable laying or routing, and/or transportation purposes.

(16) The term "Subsistence Participants" means the Alaska Eskimo Whaling Commission (AEWC) and its members, including the whaling captains' associations identified on the cover of this Agreement, as well as any individual members of those associations.

(17) The term "transit vessel" means a powered vessel that is used solely to transport materials through the Beaufort Sea or Chukchi Sea. Such term does not include a vessel used to provide supplies or other support to at-sea oil and gas operations or Near Shore Operations Support Vessels.

(b) Geographically Limited Terms.

For the purposes of this Agreement:

(1) The term "Beaufort Sea" means all waters off the northern coast of Alaska from Point Barrow to the Canadian border.

(2) The term "Chukchi Sea" means all waters off the western and northern coasts of Alaska from Cape Prince of Wales to Point Barrow.

SECTION 104. TERMS, SCOPE, AND LIMITATIONS.

(a) Term.

The term of this Agreement shall commence with the signing of this document by the Participants and shall terminate upon completion of the Nuiqsut, Kaktovik, Barrow, Wainwright, Pt Lay, and Pt. Hope Fall Bowhead Hunts or the Beaufort Sea Post Season Meeting required under Section 108(a) and Chukchi Sea Post-Season Meetings in Barrow, Wainwright, Pt. Lay, and Pt. Hope required under Section 108(b), whichever is later.

(b) Scope.

The Participants agree that, unless otherwise specified:

(1) The mitigation measures identified in this Agreement, which are intended to mitigate interference by oil and gas operations and barge and transit vessel traffic with the Alaskan Eskimo subsistence bowhead whale hunt, are designed to apply to all activities of each Participant during the 2014 Open Water Season, whether referenced specifically or by category, and to all vessels and locations covered by this Agreement, whether referenced specifically or by category.

(2) This Agreement is intended to apply to all oil and gas operations and barge and transit vessel traffic during the 2014 Open Water Season in the Beaufort Sea or Chukchi Sea.

(3) Vessels and locations covered by this Agreement include those identified in the Agreement, as well as any other vessels or locations that are employed by or for the Industry Participants in the Beaufort Sea or Chukchi Sea during the 2014 Open Water Season.

(c) Limitations of Obligations.

The following limitations apply to this Agreement.

(1) No cooperation among the Participants, other than that required by this Agreement, is intended or otherwise implied by their adherence to this Agreement. In no event shall the signatures of any representative of the Alaska Eskimo Whaling Commission (AEWC), or of the Barrow, Nuiqsut, Kaktovik, Wainwright, Pt. Hope, or Pt. Lay Whaling Captains' Associations, or of any other Whaling Captains' Association be taken as an endorsement of any Arctic operations or Beaufort Sea or Chukchi Sea OCS operations by any oil and/or gas operator or contractor.

(2) Adherence to the procedures and guidelines set forth in this Agreement does not in any way indicate that any Inupiat or Siberian Yupik whalers or the AEWC agree that industrial activities are not interfering with the bowhead whale migration or the bowhead whale subsistence hunt. Such adherence does not represent an admission on the part of the Industry Participants or their contractors that the activities covered by this Agreement will interfere with the bowhead whale migration or the bowhead whale subsistence hunt.

(3) No member of the oil and gas industry or any contractor has the authority to impose restrictions on the subsistence hunting of bowhead whales or associated activities of the AEWC, residents of the Villages of Nuiqsut, Kaktovik, Barrow, Wainwright, Pt. Lay, or Pt. Hope, or residents of any other village represented by the AEWC.

(4) In the event additional parties engage in oil and gas operations in the Beaufort Sea or Chukchi Sea during the summer or fall of 2014 the Participants shall exercise their good-faith efforts to encourage those parties to enter into this Agreement. Should additional parties enter into this Agreement at a date subsequent to the date of the signing of this document and before the termination of the 2014 bowhead whale subsistence hunting season, the AEWC will provide to all Participants a supplement to this document with the added signatures.

(5) No Participant is responsible for enlisting additional parties to adhere to the terms and conditions of the Agreement. Similarly, **THE AEWC IS NOT RESPONSIBLE FOR, OR A PARTY TO, ANY AGREEMENT AMONG THE INDUSTRY PARTICIPANTS** concerning the apportionment of expenses necessary for the implementation of this Agreement.

(6) In adhering to this Agreement, none of the Participants waives any rights existing at law. All Participants agree that the provisions of this document do not establish any precedent as between them or with any regulatory or permitting authority.

(7) **PARTICIPANTS' OBLIGATIONS SHALL BE SEPARABLE**: All Participants to this Agreement understand that each Participant represents a separate entity. The failure of any Participant to adhere to this Agreement or to abide by the terms and conditions of this Agreement shall not affect the obligation of other Participants to adhere to this Agreement and to proceed accordingly with all activities covered by this Agreement. Nor shall any Participant's adherence to this Agreement affect that Participant's duties, liabilities, or other obligations with respect to any other Participant beyond those stated in this Agreement. If an Industry Participant does not receive permit approvals from regulatory agencies to conduct its proposed activities, then that company may withdraw from this Agreement.

SECTION 105. REGULATORY COMPLIANCE.

(a) United States Coast Guard Requirements.

The Participants shall comply with all applicable United States Coast Guard requirements for safety, navigation, and notice.

(b) Environmental Regulations and Statutes.

The Participants shall comply with all applicable environmental regulations and statutes.

(c) Other Regulatory Requirements.

The Participants shall comply with all applicable federal, state, and local government requirements.

SECTION 106. DISPUTE RESOLUTION.

Subject to the terms of Section 104(c)(7) of this Agreement, all disputes arising between any Industry Participants and any Subsistence Participants shall be addressed as follows:

(1) The dispute shall first be addressed between the affected Participant(s) in consultation with the affected village Whaling Captains' Association and the Industry Participant(s)' Local Representative.

(2) If the dispute cannot be resolved to the satisfaction of all affected Participants, then the dispute shall be addressed with the affected Participants in consultation with the AEWC.

(3) If the dispute cannot be satisfactorily resolved in accordance with paragraphs (1) and (2) above, then the dispute shall be addressed with the AEWC and the affected Participants in consultation with representatives of NOAA Fisheries.

(4) All Participants shall seek to resolve any disputes in a timely manner, and shall work to ensure that requests for information or decisions are responded to promptly.

SECTON 107. EMERGENCY AND OTHER NECESSARY ASSISTANCE.

(a) Emergency Communications.

ALL VESSELS SHOULD NOTIFY THE APPROPRIATE COM-CENTER IMMEDIATELY IN THE EVENT OF AN EMERGENCY. The appropriate Com-Center operator will notify the nearest vessels and appropriate search and rescue authorities of the problem and advise them regarding necessary assistance. (See attached listing of local search and rescue organizations in Attachment I.)

(b) Emergency Assistance for Subsistence Whale Hunters.

Section 403 of Public Law 107-372 (16 U.S.C. 916c note) provides that "Notwithstanding any provision of law, the use of a vessel to tow a whale, taken in a traditional subsistence whale hunt permitted by Federal law and conducted in waters off the coast of Alaska is authorized, if such towing is performed upon a request for emergency assistance made by a subsistence whale hunting organization formally recognized by an agency of the United States government, or made by a member of such an organization, to prevent the loss of a whale." Industry Participants will advise their vessel captains that, under the circumstances described above, assistance to tow a whale is permitted under law when requested by a Subsistence Participant. Under the circumstances described above, Industry Participants will provide such assistance upon a request for emergency assistance from a Subsistence Participant, if conditions permit the Industry Participant's vessel to safely do so.

SECTION 108. POST-SEASON REVIEW / PRESEASON INTRODUCTION.

(a) Beaufort Sea Post-Season Joint Meeting.

Following the end of the fall 2014 bowhead whale subsistence hunt and prior to the 2015 Pre-Season Introduction Meetings, the Industry Participant that establishes the Deadhorse and Kaktovik Com Centers will offer to the AEWC Chairman to host a joint meeting with all whaling captains of the Villages of Nuiqsut, Kaktovik and Barrow, the Marine Mammal Observer / Inupiat Communicators stationed on the Industry Participants' vessels in the Beaufort Sea, and with the Chairman and Executive Director of the AEWC, at a mutually agreed upon time and place on the North Slope of Alaska, to review the results of the 2014 Beaufort Sea Open Water Season, unless it is agreed by all designated individuals or their representatives that such a meeting is not necessary.

(b) Chukchi Sea Post-Season Village Meetings.

Following the completion of the 2014 Chukchi Sea Open Water Season and prior to the 2015 Pre-Season Introduction Meetings, the Industry Participants involved, if requested by the AEWC or the Whaling Captain's Association of each village, will host a meeting in each of the following villages: Wainwright, Pt. Lay, Pt. Hope, Kivalina, Little Diomede, Wales, Savoonga, and Barrow (or a joint meeting of the whaling captains from all of these villages if the whaling captains agree to a joint meeting) to review the results of the 2014 operations and to discuss any concerns residents of those villages might have regarding the operations. The meetings will include the Marine Mammal Observer / Inupiat Communicators stationed on the Industry Participants' vessels in the Chukchi Sea. The Chairman and Executive Director of the AEWC will be invited to attend the meeting(s).

(c) Pre-season Introduction Meetings.

(1) Immediately following each of the above meetings, and at the same location, the Industry Participants will provide a brief introduction to their planned operations for the 2015 Open Water Season. Each Industry Participant should provide hand-outs explaining their planned activities that the whaling captains can review.

(2) Subsistence Participants understand that any planned operations discussed at these Pre-Season Introduction Meetings, and the corresponding maps, will represent the Industry Participant's best estimate at that time of its planned operations for the coming year, but that these planned operations are preliminary, and are subject to change prior to the 2015 Open Water Season Meeting.

(d) Map of Planned Industry Participant Activities.

As practicable, Industry Participants shall jointly prepare and provide the AEWC with a large-scale map of the Beaufort and Chukchi Seas showing the locations and types of oil and gas and barge and transit activities planned by each Industry Participant. This map will be for use by the AEWC and Industry Participants during the 2015 CAA Meeting.

SECTON 109. INDIVIDUAL NOTIFICATION.

In the event that any Industry Participant does not become a signatory to this Agreement, the local Whaling Captains' Associations shall be notified by the AEWC, no later than March 31, 2014, so that the local Whaling Captains' Associations can prepare to talk with the non-signatories to avoid conflict during that association's fall subsistence bowhead whaling season.

TITLE II -- OPEN WATER SEASON COMMUNICATIONS

SECTION 201. MARINE MAMMAL OBSERVERS / INUPIAT COMMUNICATORS.

(a) Marine Mammal Observer / Inupiat Communicator Required.

(1) In General. Each Industry Participant agrees to employ a Marine Mammal Observer / Inupiat Communicator (MMO/IC) on board each Primary Sound Source Vessel owned or operated by such Industry Participant in the Beaufort Sea or Chukchi Sea. Native residents of the eleven villages represented by the Alaska Eskimo Whaling Commission shall be given preference in hiring for MMO/IC positions.

(2) Special Rule for Inside Beaufort Sea Barrier Islands. Industry Participants whose seismic acquisition operations are limited to an area exclusively within the barrier islands need employ an MMO/IC on one Primary Sound Source Vessel only.

(3) Near Shore Operations Support Vessels. Industry Participants are not required to employ an MMO/IC on Near Shore Operations Support Vessels.

(4) Sealift Operations. For Industry Participants conducting sealift operations in which two tugs towing barges are accompanied within ½ mile by a third light tug at all times, a MMO/IC is required to be employed on the light tug only.

(b) Duties of Marine Mammal Observer / Inupiat Communicator.

(1) Each MMO/IC is to be employed as an observer and Inupiat communicator for the duration of the 2014 Open Water Season on the vessel on which he or she is stationed.

(2) As a member of the crew, the MMO/IC will be subject to the regular code of employee conduct on board the vessel and will be subject to discipline, termination, suspension, layoff, or firing under the same conditions as other employees of the vessel operator or appropriate contractor.

(3) Once the source vessel on which the MMO/IC is employed is in the vicinity of a whaling area and the whalers have launched their boats, the MMO/IC's primary duty will be to carry out the communications responsibilities set out in this Title.

(4) At all other times, the MMO/IC will be responsible for keeping a lookout for bowhead whales and/or other marine mammals in the vicinity of the vessel to assist the vessel captain in avoiding harm to the whales and other marine mammals.

(5) It is the MMO/IC's responsibility to call the appropriate Com-Center as set out in Sections 202 and 203.

(6) The MMO/IC will be responsible for all radio contacts between vessels owned or operated by each of the Industry Participants and whaling boats covered under Section 207 of this Agreement and shall interpret communications as needed to allow the vessel operator to take such action as may be necessary pursuant to this Agreement.

(7) The MMO/IC shall contact directly subsistence whaling boats that may be in the vicinity to ensure that conflicts are avoided to the greatest possible extent.

(8) The MMO/IC will maintain a record of his or her communications with each Com-Center and the subsistence whaling boats, as well as any marine mammal sightings by the MMO/IC.

SECTION 202. COM-CENTER GENERAL COMMUNICATIONS SCHEME.

(a) Reporting Positions for Vessels Owned or Operated by the Industry Participants.

(1) All vessels (other than vessels covered under sections 302 and 602) shall report to the appropriate Com-Center at least once every six hours commencing with a call at approximately 06:00 hours. Each call shall report the following information:

(A) Vessel name, operator of vessel, charter or owner of vessel, and the project the vessel is working on.

(B) Vessel location, speed, and direction.

C) Plans for vessel movement between the time of the call and the time of the next call. The final call of the day shall include a statement of the vessel's general area of expected operations for the following day, if known at that time.

EXAMPLE: This is the Arctic Endeavor, operated by _____ for _____ at Chukchi Sea prospect. We are currently at ___'___ north ___'___ west, proceeding SE at ____ knots. We will proceed on this course for ___ hours and will report location and direction at that time.

(2) The appropriate Com-Center shall be notified if there is any significant change in plans, such as an unannounced start-up of operations or significant deviations from announced course, and such Com-Center shall notify all whalers of such changes. A call to the appropriate Com-Center shall be made regarding any unsafe or unanticipated ice conditions.

(3) In the event that the Industry Participant's operation includes seismic data acquisition, the operator reserves the right to restrict exact vessel location information and provide more general location information.

(b) Reporting Positions for Subsistence Whale Hunting Crews.

(1) All subsistence whaling captains shall report to the appropriate Com-Center at the time they launch their boats from shore and again when they return to shore.

(2) All subsistence whaling captains shall report to such Com-Center the initial GPS co-ordinates of their whaling camps.

(3) Additional communications shall be made on an as needed basis.

(4) Each call shall report the following information:

(A) The crew's location and general direction of travel.

EXAMPLE: This is _____. We are just starting out. We will be traveling north-east from _____ to scout for whales. I will call if our plans change.

(B) The presence of any vessels or aircraft owned or operated by any of the Industry Participants, or their contractors, that are not observing the specified guidelines set forth in Title V on Avoiding Conflicts.

(C) The final call of the day shall include a statement of the whaling captain's general area of expected operations for the following day, if known at the time.

(5) Any subsistence whale hunter preparing to tow a caught whale shall report to the appropriate Com-Center before starting to tow.

EXAMPLE: This is Archie Ahkiviana. I am ___'___ north, ___'___ west. I have a whale and am towing it into _____.

(6) Each time a subsistence whaling camp is moved, it shall be reported promptly to the appropriate Com-Center, including the new GPS coordinates.

(7) Subsistence whale hunters shall notify the appropriate Com-Center promptly if, due to weather or any other unforeseen event, whaling is not going to take place that day.

(8) Subsistence whaling captains shall contact the appropriate Com-Center promptly and report any unexpected movements of their vessel.

(c) Responsibilities of Participants.

(1) Monitoring VHF Channel 16.

All vessels covered by Sections 207, 301, and 401 of this Agreement shall monitor marine VHF Channel 16 at all times.

(2) Avoidance of Whale Hunting Crews and Areas

It is the responsibility of each vessel owned or operated by any of the Industry Participants and covered by Sections 301 or 401 of this Agreement to determine the positions of all of their vessels and to exercise due care in avoiding any areas where subsistence whale hunting is active.

(3) Vessel-to-Vessel Communication

After any vessel owned or operated by any of the Industry Participants and covered by Sections 301 or 401 of this Agreement has been informed of or has determined the location of subsistence whale hunting boats in its vicinity, the MMO/IC shall contact those boats in order to coordinate movement and take necessary avoidance precautions.

SECTION 203. THE COMMUNICATIONS SYSTEM COORDINATION CENTERS (COM-CENTERS).

(a) Chukchi Lead System Included in Com-Center Coverage.

In addition to the Beaufort Sea and Chukchi Sea, the communications scheme shall apply in the Chukchi Sea lead system, as identified and excluded from leasing in the current MMS Five-Year Leasing Program, 2007-2012.

(b) Set Up and Operation.

(1) Subject to the terms of Section 104(c) and Section 601 of this Agreement, the Industry Participants conducting operations during the Com-Center operational window specified in Section 203(c) in:

(A) the Beaufort Sea jointly will arrange for the funding of Com-Centers in Deadhorse and Kaktovik; and

(B) the Chukchi Sea jointly will arrange for the funding of Com-Centers in Barrow, Wainwright, Pt. Lay, Pt. Hope, Kivalina, Wales, and St. Lawrence Island.

(2) All nine Com-Centers will be staffed by Inupiat operators. **GROUND TRANSPORTATION MUST BE PROVIDED FOR COM-CENTER OPERATIONS IN KAKTOVIK FOR POLAR BEAR AND BROWN BEAR SAFETY**. The Com-Centers will be operated 24 hours per day during the 2014 subsistence bowhead whale hunt. One Industry Participant in the Beaufort Sea and one Industry Participant in the Chukchi Sea, or their respective contractor, will be designated as the operator of the Com-Centers for that Sea, in consultation with the AEWC.

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(3) Each Industry Participant shall contribute to the funding of the Com-Centers covering the areas in which it conducts oil and gas operations. The level of funding for the Com-Centers provided by each of the Industry Participants is intended to be in proportion to the scale of their respective activities, and shall be mutually agreed by the Industry Participants.

(4) The procedures to be followed by the Com-Center operators are set forth in subsection (d) below.

(c) Staffing.

(1) Each Com-Center shall have an Inupiat operator ("Com-Center operator") on duty 24 hours per day from August 15, or one week before the start of the fall bowhead whale hunt in each respective village, until the end of the bowhead whale subsistence hunt in villages listed in subparagraphs (A) through (G) and until the completion of all Industry Participant vessel transits (other than a vessel covered under Title V) in villages listed in subparagraphs (G) through (I):

(A) Kaktovik for the Kaktovik Com-Center;

(B) Nuiqsut for the Deadhorse Com-Center;

(C) Barrow for the Barrow Com-Center;

(D) Wainwright for the Wainwright Com-Center.

(E) Pt. Lay for the Pt. Lay Com-Center, which will be located in the Pt. Lay Whaling Captains' Association building; and

(F) Pt. Hope for the Pt. Hope Com-Center, which will be located in the Pt. Hope Whaling Captains' Association building.

(G) Kivalina for the Kivalina Com-Center.

(H) Wales for the Wales Com-Center.

(I) Gambell or Savoonga for the St. Lawrence Island Com-Center.

(2) All Com-Center staff shall be local hire.

(d) Duties of the Com-Center Operators.

(1) The Com-Center operators shall be available to receive radio and telephone calls and to call vessels as described below. A record shall be made of all calls from every vessel covered by Sections 207, 301, and 401 of this Agreement. Information reported regarding whales struck, lost, landed, or the location of whales struck, lost, or landed, or the number of strikes remaining, shall be confidential and shall not be disclosed to anyone other than the AEWC or the local Whaling Captains' Association. The record of all reporting calls should contain the following information:

(A) Industry Participant Vessel:

(i) Name of caller and vessel.

(ii) Vessel location, speed, and direction.

(iii) Time of call.

(iv) Anticipated movements between this call and the next report.

(v) Reports of any industry or subsistence activities.

(B) Subsistence Whale Hunting Boat:

(i) Name of caller.

(ii) Location of boat or camp.

(iii) Time of call.

(iv) Plans for travel.

(v) Any special information such as caught whale, whale to be towed, or industry vessel conflicts with whale or whaler. Any report of the number of whales struck, lost, or landed, or of the number of strikes remaining, shall be kept confidential and shall not be disclosed by the Com-Center or any Com-Center operator to anyone other than the AEWC or the local Whaling Captains' Association. The location of whales struck, lost, or landed shall be kept confidential and shall not be disclosed except to the extent needed to avoid an Industry/Subsistence Whale Hunter conflict.

(2) Report of Industry/Subsistence Whale Hunter Conflict. In the event an industry/subsistence whale hunter conflict is reported, the appropriate Com-Center operator shall record:

(A) Name of industry vessel.

(B) Name of subsistence whaling captain.

(C) Location of vessels.

(D) Nature of conflict, data, and time.

(3) If all vessels and boats covered by Sections 207, 301, and 401 of this Agreement have not reported to the appropriate Com-Center within one hour of the recommended time, that Com-Center operator shall attempt to call all non-reporting vessels to determine the information set out above under the Duties of the Com-Center operator.

(4) As soon as location information is provided by a vessel covered by Sections 207, 301, or 401 of this Agreement, the appropriate Com-Center operator shall plot the location and area of probable operations on the large map provided at the Com-Center.

(5) If, in receiving information or plotting it, a Com-Center operator observes that operations by Industry Participants might conflict with subsistence whaling activities, such Com-Center operator shall contact the industry vessel involved and advise the Industry Participant's Local Representative(s) and the vessel operators of the potential conflict.

SECTION 204. STANDARDIZED LOG BOOKS.

The Industry Participants will provide the Com-Centers and Marine Mammal Observer / Inupiat Communicators with identical log books to assist in the standardization of record keeping associated with communications procedures required pursuant to this Agreement.

SECTION 205. COMMUNICATIONS EQUIPMENT.

(a) Communications Equipment to be Provided to Subsistence Whale Hunting Crews.

(1) In General. The Industry Participants will provide (or participate in the provision of) the communications equipment described in paragraphs (4) and (6) of this subsection and subsection (b) of this section.

(2) Beaufort Sea. The Industry Participants funding Com-Centers in Deadhorse and Kaktovik will fund the provision of communications equipment for the whaling captains of Kaktovik and Nuiqsut in the same proportion as they fund those Com-Centers.

(3) Chukchi Sea. The Industry participants conducting operations in the Chukchi Sea will coordinate with each other to participate in funding the provision of communications equipment for the whaling captains of Barrow, Wainwright, Pt. Hope, and Pt. Lay.

(4) All-Channel, Water-Resistant VHF Radios.

These VHF radios are specifically designed for marine use and allow monitoring of Channel 16 while using or listening to another channel.

(A) Kaktovik Subsistence Whaling Boats: 8

(B) Kaktovik Base and Search and Rescue: 2

(C) Nuiqsut Subsistence Whaling Boats: 12

(D) Nuiqsut Base and Search and Rescue: 3

(E) Barrow Base and Search and Rescue: 2

(F) Wainwright Base and Search and Rescue: 2

(G) Wainwright Subsistence Whaling Boats: 4

(H) Pt. Hope Base and Search and Rescue: 2

(I) Pt. Hope Subsistence Whaling Boats: 10

(J) Pt. Lay Base and Search and Rescue: 2

(K) Pt. Lay Subsistence Whaling Boats: 4

(5) Specific VHF Channels For Each Village.

The whaling boats from each of the villages have been assigned individual VHF channels for vessel-to-vessel and vessel-to-Com-Center communications as follows:

(A) Nuiqsut whaling crews will use Channel 68.

(B) Kaktovik whaling crews will use Channel 69.

(C) Barrow whaling crews will use Channel 72.

(D) Wainwright Whaling Crews will use Channel 12.

(E) Pt. Lay Whaling Crews will use Channel 72.

(F) Pt. Hope Whaling Crews will use Channel 68.

(6) Satellite Telephones.

The satellite telephones are to be used as backup for the VHF radios. The satellite telephones for use on subsistence whaling boats are for emergency use only and should be programmed for direct dial to the nearest Com-Center.

A. Kaktovik Base Phones: 2

B. Kaktovik Subsistence Whaling Boats: 8

C. Nuiqsut Base Phones: 2

D. Nuiqsut Subsistence Whaling Boats: 12

E. Barrow Subsistence Whaling Boats: 2

F. Wainwright Subsistence Whaling Boats: 4

G. Pt. Lay Subsistence Whaling Boats: 2

(7) Distribution and Return of Equipment.

The distribution of the VHF radios and satellite telephone equipment to whaling captains for use during the 2014 fall bowhead subsistence whale hunting season shall be completed no later than August 15, 2014. All such units and telephone equipment provided under this Agreement, whether in this section or otherwise, will be returned promptly by the Subsistence Participants to the Industry Participant or the person providing such units and equipment at the end of each Village's 2014 fall bowhead whale subsistence hunt.

(b) Communications Equipment on Vessels Owned or Operated by the Industry Participants and/or their Contractors.

The Marine Mammal Observer / Inupiat Communicators onboard source vessels owned or operated by the Industry Participants and/or their contractors will also be supplied with all-channel VHF radios. The MMO/ICs have been assigned Channel 7 for their exclusive use in communicating with the Com-Center. Such radios shall be returned upon the completion or termination of the MMO/IC's assignment.

(c) Radio Installation and User Training.

The Whaling Captains of Nuiqsut, Kaktovik, Wainwright, Pt. Lay, and Pt. Hope, with assistance from the Industry Participants, will be responsible for the installation of the VHF radio equipment. The Industry participants will provide (or participate in the provision of) on-site user training for the VHF and satellite telephone equipment on or before August 15, 2014, if requested and as scheduled by the Whaling Captains' Associations of Nuiqsut, Kaktovik, Barrow, Wainwright, Pt. Lay, and Pt. Hope, and the Industry Participant operating the Beaufort Sea Com-Centers or Chukchi Sea Com-Centers, as appropriate.

SECTION 206. INDIVIDUALS TO CONTACT.

Listed below are the primary contact names and phone numbers for each of the Participants.

(1) BP Exploration (Alaska), Inc.'s (BP) Local Representative

LOWRY BROTT will be BP's local representative on the North Slope during the Term of this Agreement and will be stationed at Northstar Island and will be available by telephone at (907) 670-3520 and when Mr. Brott is not available, his alternate, Jeff Carter, will be stationed at Northstar Island and will be available by telephone at the above number.

(2) Eni 's Local Representative

Robert Province: Robert.Province@enipetroleum.com 907-865-3350

(3) Exxon Mobil's Local Representative

Anthony Pennino: anthony.pennino@exxonmobil.com (907) 334-2929

Brien Reep: Brien.e.reep@exxonmobil.com (907) 564-3617

(4) GX Technology's Local Representative

Ed Nelson (832) 344-6852

(5) CAELUS Energy Alaska Local Representative

DALE HOFFMAN will be Caelus's local representative during the Term of this Agreement and will be stationed in Anchorage and will be available by telephone at (907) 343-2108.

(6) Shell Offshore Inc.'s (Shell) Local Representatives

CRAIG BLANCHARD and HOWARD HILL will be Shell's local representatives on the North Slope during the Term of this Agreement and will be stationed at Barrow during Chukchi Sea operations and at Deadhorse during Beaufort Sea operations and will be available by telephone at (907) 770-3700.

(7) STATOIL's Local Representative

Ella Ede: eede@statoil.com (907) 444-3473

(8) SAExploration, Inc.

Sue Simonds: ssimonds@saexploration.com (907)522-4499

(9) TGS-NOPEC Geophysical Company

Troy Nelson, 403-781-1448, Troy.Nelson@tgs.com

(10) The Village of Kaktovik

For purposes of this Agreement, the individuals to contact for the Village of Kaktovik will be: JOSEPH KALEAK at (907) 640-6213 or 640-6515, and CHRISTOPHER GORDON at (907) 640-0022.

(11) The Village of Nuiqsut

For purposes of this Agreement, the individuals to contact for the Village of Nuiqsut will be: ISAAC NUKAPIGAK at (907) 480-6220 (Work), (907) 480-2400 (Home); CARL BROWER at (907) 242 -1013.

(12) The Village of Barrow

For purposes of this Agreement, the individuals to contact for the Village of Barrow will be: HARRY BROWER, JR. at (907) 852-0350 (Work), and EUGENE BROWER at (907) 852-3601.

(13) The Village of Wainwright

For purposes of this Agreement, the individuals to contact for the Village of Wainwright will be: JOHN HOPSON JR. at (907) 231-9178 (cell), and WALTER NAYAKIK at (907)763-2915 (Work); OLIVER PEETOOK at (907) 763-0220, (907) 763-0295.

(14) The Village of Pt. Hope

For purposes of this Agreement, the individuals to contact for the Village of Pt. Hope will be: JOE OKTOLLIK. at (907) 368-2088 (Home), (907) 368-1430 (cell); CLARK LANE at (907) 368-2453, (907) 947-5190 (cell).

(15) The Village of Pt. Lay

For purposes of this Agreement, the individuals to contact for the Village of Pt. Lay will be: JULIUS REXFORD (907) 833-4592 (Home), (907) 833-2214 (Work), (907) 833-2320 (Fax), THOMAS NUKAPIAK (907) 833-0191 (Home).

(16) The Village of Kivilina

For the purposes of this Agreement, the individuals to contact for the Village of Kivilina will be: RAYMOND HAWLEY at (907) 645-2164 (Home); KALEB WESLEY at (907) 645-2150 (Home), (907) 444-8905 (cell).

(17) The Village of Little Diomede

For the purposes of this Agreement, the individuals to contact for the Village of LIttle Diomede will be: RONALD OZENNA at (907) 434-1436.

(18) The Village of Wales

For the purposes of this Agreement, the individuals to contact for the Village of Wales will be: RAYMOND SEETOOK at (907) 664-2356 (Home), (907) 634-0320 (cell); WINTON WEYAPUK at (907) 664-8139 (cell).

(19) The Village of Savoonga

For the purposes of this Agreement, the individuals to contact for the Village of Savoonga will be: GEORGE NOONGWOOK at (907) 984-2461 and THOMAS AKEYA at (907) 984-6649, (907) 984-6414 (Home).

(20) The Village of Gambell

For the purposes of this Agreement, the individuals to contact for the Village of Gambell will be: MERLIN KOONOOKA at (907) 985-5113 or (907) 434-1180 (cell), and BRUCE BOOLOWON at (907) 985-5212.

(21) The AEWC

For purposes of this Agreement, the individuals to contact for the AEWC shall be: PRICE LEAVITT at (907) 852-2392.

SECTION 207. SUBSISTENCE WHALE HUNTING BOATS.

The following is a list of the number of boats each of the Subsistence Participants plan to use:

(1) Boats Owned/Used by Whaling Captains of Nuiqsut (NWCA)

The subsistence whaling crews of the Village of Nuiqsut plan to use (16) twelve boats for subsistence whale hunting during the late summer and fall of 2014.

(2) Boats Owned/Used by Whaling Captains of Kaktovik (KWCA)

The subsistence whaling crews of the Village of Kaktovik plan to use (6) eight boats for subsistence whale hunting during the late summer and fall of 2014.

(3) Boats Owned/Used by Whaling Captains of Barrow (BWCA)

The subsistence whaling crews of the Village of Barrow plan to use (34) forty boats for subsistence whale hunting during the late summer and fall of 2014.

(4) Boats Owned/Used by Whaling Captains of Wainwright (WWCA)

The subsistence whaling crews of the Village of Wainwright plan to use (4) four boats for subsistence whale hunting during the fall of 2014.

(5) Boats Owned/Used by Whaling Captains of Pt. Hope (Pt. HWCA)

The subsistence whaling crews of the Village of Pt. Hope plan to use (14) ten boats for subsistence whale hunting during the late fall of 2014.

(6) Boats Owned/Used by Whaling Captains of Pt. Lay (Pt. LWCA)

The subsistence whaling crews of the Village of Pt. Lay plan to use (4) four boats for subsistence whale hunting during the fall of 2014.

If any additional boats are put in use by subsistence whaling crews, the Industry Participants will be notified promptly through the Com-Center.

TITLE III – BARGE AND TRANSIT VESSEL OPERATIONS

SECTION 301. IN GENERAL.

A Participant may employ barges or transit vessels to transport materials through the Beaufort Sea or Chukchi Sea during the term of this Agreement. Any Industry Participant who employs a barge or transit vessel to transport materials through the Beaufort Sea or Chukchi Sea during the term of this Agreement shall require the barge or transit vessel operator to comply with Sections 201, 205(b) and 302 of this Agreement while providing services to that Industry Participant.

SECTION 302. BARGE AND TRANSIT VESSEL OPERATIONS.

(a) Reporting Positions for Barge or Transit Vessels Owned or Operated by industry Participants.

(1) All barge, transit, or cable laying vessels shall report to the appropriate Com-Center at least once every six hours commencing with a call at approximately 06:00 hours. Each call shall report the following information:

(A) Barge, transit, or cable laying vessel name, operator of vessel, charterer or owner of vessel, and the project or entity the vessel is transporting materials for.

(B) Barge, transit, or cable laying vessel location, speed, and direction.

(C) Plans for barge, transit, or cable laying vessel movement between the time of the call and the time of the next call. The final call of the day shall include a statement of the barge or transit vessel's general area of expected operations for the following day, if known at that time.

EXAMPLE: This is the Arctic Endeavor, operated by _____ for _____ in the Chukchi Sea. We are currently at ___'___ north ___'___ west, proceeding SE at ____ knots. We will proceed on this course for ___ hours and will report location and direction at that time.

(2) The appropriate Com-Center also shall be notified if there is any significant change in plans, such as an unannounced start-up of operations or significant deviations from announced course, and such Com-Center shall notify all whalers of such changes. A call to the appropriate Com-Center shall be made regarding any unsafe or unanticipated ice conditions.

(b) Operator Duties.

All barge or transit vessel operators are responsible for the following requirements.

(1) Monitoring VHF Channel 16. All barge and transit vessel operators shall monitor marine VHF Channel 16 at all times.

(2) Avoidance of Whale Hunting Crews and Areas. It is the responsibility of each Industry Participant and barge or transit vessel operator to determine the positions of their barge or transit vessels and to exercise due care in avoiding any areas where subsistence whale hunting is active.

(3) Vessel-to-Vessel Communication. After any barge or transit vessel owned or operated by any Industry Participant has been informed of or has determined the location of subsistence whale hunting boats in its vicinity, the Marine Mammal Observer / Inupiat Communicator shall contact those boats in order to coordinate movement and take necessary avoidance precautions.

(c) Routing Barge and Transit Vessels.

(1) All barge or transit vessel routes shall be planned so as to minimize any potential conflict with bowhead whales or subsistence whaling activities. All barges and transit vessels shall avoid areas of active or anticipated whaling activity, as reported pursuant to Section 202.

(2) Beaufort Sea. Vessels transiting east of Bullen Point to the Canadian border should remain at least five (5) miles offshore during transit along the coast, provided ice and sea conditions allow.

(3) Chukchi Sea. Vessels should remain as far offshore as weather and ice conditions allow, and at all times at least five (5) miles offshore during transit.

(4) Safe Harbor / Loitering. Notwithstanding paragraphs 2 and 3, from August 31 to October 31 vessels in the Chukchi Sea or Beaufort Sea shall remain at least 20 miles offshore of the coast of Alaska from Icy Cape in the Chukchi Sea to Pitt Point on the east side of Smith Bay in the Beaufort Sea whether in transit or engaging in activities in support of oil and gas operations, unless ice conditions or an emergency that threatens the safety of the vessel or crew prevents compliance with this requirement. This paragraph shall not apply to vessels actively engaged in transit to or from a coastal community to conduct crew changes or logistical support operations.

(d) Vessel Speeds.

Barge and transit vessels shall be operated at speeds necessary to ensure no physical contact with whales occurs, and to make any other potential conflicts with bowhead whales or whalers unlikely. Vessel speeds shall be less than 10 knots in the proximity of feeding whales or whale aggregations.

(e) Vessels Operating in Proximity of Bowhead Whales.

If any barge or transit vessel inadvertently approaches within 1.6 kilometers (1 mile) of observed bowhead whales, except when providing emergency assistance to whalers or in other emergency situations, the vessel operator will take reasonable precautions to avoid potential interaction with the bowhead whales by taking one or more of the following actions, as appropriate:

(1) reducing vessel speed to less than 5 knots within 900 feet of the whale(s);

(2) steering around the whale(s) if possible;

(3) operating the vessel(s) in such a way as to avoid separating members of a group of whales from other members of the group;

(4) operating the vessel(s) to avoid causing a whale to make multiple changes in direction; and

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

(f) Marine Mammal Sighting Data.

Industry Participants whose operations are limited exclusively to barge or vessel traffic will submit to the AEWC and NSB DWM all marine mammal sighting data.

TITLE IV – VESSELS, TESTING, AND MONITORING

SECTION 401. INDUSTRY PARTICIPANT VESSELS AND EQUIPMENT.

(a) List of Vessels and Equipment Required.

Each Industry Participant engaged in oil and gas operations shall provide a list identifying all vessels or other equipment (including but not limited to boats, barges, aircraft, or similar craft) that are owned and/or operated by, or that are under contract to the Industry Participants, for use in the Beaufort Sea or Chukchi Sea for oil and gas operations or for implementation of such Industry Participant's monitoring plan. Vessels and equipment used for oil and gas operations shall be listed in Attachment II, and vessels and equipment used for monitoring plans shall be listed in Attachment III.

(b) Only Listed Vessels and Equipment (or Like Vessels and Like Equipment) May Be Used.

(1) **NONE OF THE INDUSTRY PARTICIPANTS INTENDS TO OPERATE ANY VESSEL OR EQUIPMENT (EXCEPT FOR LIKE VESSELS OR LIKE EQUIPMENT) NOT IDENTIFIED IN THE LISTS REQUIRED UNDER SUBSECTION (a) DURING THE TERM OF THIS AGREEMENT.**

(2) Notwithstanding paragraph 1, if any Industry Participant decides to use different vessels or equipment or additional vessels or equipment, such vessels and equipment shall be used only for purposes identified in Attachments II or III; and the AEWC and the whaling captains of Nuiqsut, Kaktovik, Barrow, Wainwright, Pt. Hope, and Pt. Lay shall be notified promptly through the appropriate Com-Center, as identified in Section 203 of this Agreement, and in writing, of their identity and their intended use, including location of use.

SECTION 402. SOUND SIGNATURE TESTS.

Unless the AEWC approves an alternate approach for providing sound source verification, the following testing shall be required:

(a) Sound Source Verification Testing.

(1) Geophysical Equipment. For purposes of obtaining a sound signature for Industry Participants' geophysical equipment, the Industry Participants shall have initiated a test of all geophysical equipment within 72 hours of initiating or having initiated operations in the Beaufort Sea or Chukchi Sea. Such tests shall be conducted as set forth in section 402(b).

(2) Vessels. For vessels engaged in geophysical activity, Industry Participants will conduct a sound source verification test for all geophysical equipment used for geophysical activity. Each Industry Participant shall establish a sound source verification range or Industry Participants may participate jointly in establishing a range for the Chukchi Sea and Beaufort Sea, or both. A separate range shall be used for the Chukchi Sea and Beaufort Sea, and vessels shall use the appropriate range for each sea in which they operate. For testing each vessel shall proceed through the range and record information on the date, time, vessel speed, vessel route, vessel load, weather conditions, and equipment operating on the vessel (all noise generating equipment on the vessel, other than geophysical equipment subject to separate testing under paragraph (1), shall be in operation while the vessel is proceeding through the range). The range should be established near a location where details on wind speed and direction are regularly monitored and archived.

(b) Mutual Agreement on Site for Testing; Advance Notice Required.

(1) In General. Each geophysical equipment sound signature test shall be conducted at a site mutually agreed upon by the Industry Participant conducting such test and the AEWC. Each Industry Participant conducting such sound signature test(s) will make a good faith effort to provide three (3) weeks advance notice to the AEWC and the NSB DWM of its intent to perform each test.

(2) Beaufort Sea Testing. For geophysical equipment sound signature tests conducted in the Beaufort Sea, the Industry Participant conducting such tests shall provide transportation for an appropriate number of representatives from: the AEWC, the whaling captains of the Villages of Barrow, Nuiqsut, and Kaktovik, and the NSB DWM to observe the sound signature tests.

(3) Chukchi Sea Testing. For geophysical equipment sound signature tests conducted on vessels to be used in the Chukchi Sea, the Industry Participant(s) conducting such tests shall provide transportation for an appropriate number of representatives from: the AEWC, the whaling captains of the Villages of Barrow, Wainwright, Pt. Lay, and Pt. Hope, and the NSB DWM to observe the sound signature tests.

(c) Chukchi Sea Monitoring Plans.

In the Chukchi Sea, the monitoring plans should focus on the identity, timing, location, and numbers of marine mammals and their behavioral responses to the noise source. The monitoring plans will place emphasis on understanding potential impacts from industrial sounds on bowhead whales.

(d) Use of Prior Information and Peer Reviewed Data.

(1) Prior impact study results shall be incorporated into the monitoring plans prepared by each Industry Participant as applicable.

(2) Each monitoring plan for oil and gas operations shall be subject to peer review by stakeholders on a peer review panel identified by NOAA Fisheries at the 2014 Open Water Season Peer Review Meeting, convened by NOAA Fisheries. Draft plans will be submitted to the NSB DWM and AEWC no later than two weeks prior to the 2014 Open Water Peer Review Meeting.

(e) Raw Data, Communication, and Summary Required.

(1) Each Industry Participant conducting site-specific monitoring will:

(A) after quality control reviews are completed, make electronic data, available to the NSB DWM at the end of the season.

(B) permit and encourage open communications among their contractors and the AEWC and NSB DWM.

(2) Each Industry Participant will submit a summary of monitoring plan results and progress to the AEWC and NSB DWM every two weeks during the operating season.

SECTION 404. CUMULATIVE NOISE IMPACTS STUDY.

Each Industry Participant further agrees to provide its monitoring plan and sound signature data, for use in a cumulative effects analysis of the multiple sound sources and their possible relationship to any observed changes in marine mammal behavior, to be undertaken pursuant to a Cumulative Noise Impacts Study.

The study design for the Cumulative Impacts Study shall be developed through a Cumulative Impacts Workshop to be organized by the North Slope Borough in the winter of 2014/2015. The results of this workshop will be presented at the 2015 Open Water Meeting.

TITLE V – AVOIDING CONFLICTS DURING THE OPEN WATER SEASON

Industry Participants are reminded that Sections 101(a)(5)(A) and (D) of the Marine Mammal Protection Act provide, among other things, that the Secretary can authorize the incidental taking of small numbers of marine mammals of a species or population stock if the Secretary finds, among other things, that the total of such takings during the authorized period **will not have an unmitigable adverse impact on the availability of such species or stock for taking for subsistence uses.**

The following Operating Guidelines apply in the Beaufort Sea and Chukchi Sea, except as otherwise specified and in all cases with due regard to environmental conditions and operational safety. These Operating Guidelines are in addition to any permit restrictions or stipulations imposed by the applicable governmental agencies.

SECTION 501. GENERAL PROVISIONS FOR AVOIDING INTERFERENCE WITH BOWHEAD WHALES OR SUBSISTENCE WHALE HUNTING ACTIVITIES.

(a) Routing Vessels and Aircraft.

(1) All vessel and aircraft routes shall be planned so as to minimize any potential conflict with bowhead whales or bowhead subsistence whaling activities. All vessels shall avoid areas of active or anticipated whaling activity (as reported pursuant to Section 202).

(2) Beaufort Sea. Vessels transiting east of Bullen Point to the Canadian border should remain at least five (5) miles offshore during transit along the coast, provided ice and sea conditions allow.

(3) Chukchi Sea. Vessels should remain as far offshore as weather and ice conditions allow, and at least five (5) miles offshore during transit.

(4) Safe Harbor / Loitering. Notwithstanding paragraphs 2 and 3, from August 31 to October 31 vessels in the Chukchi Sea or Beaufort Sea shall remain at least 20 miles offshore of the coast of Alaska from Icy Cape in the Chukchi Sea to Pitt Point on the east side of Smith Bay in the Beaufort Sea whether in transit or engaging in activities in support of oil and gas operations unless ice conditions or an emergency that threatens the safety of the vessel or crew prevents compliance with this requirement. This paragraph shall not apply to vessels actively engaged in transit to or from a coastal community to conduct crew changes or logistical support operations.

(b) Aircraft Altitude Floor and Flight Path.

(1) AIRCRAFT SHALL NOT OPERATE BELOW 1500 FEET unless the aircraft is engaged in marine mammal monitoring, approaching, landing or taking off, or unless engaged in providing assistance to a whaler or in poor weather (low ceilings) or any other emergency situations. Aircraft engaged in marine mammal monitoring shall not operate below 1500 feet in areas of active whaling; such areas to be identified through communications with the Com-Centers.

(2) Except for airplanes engaged in marine mammal monitoring, aircraft shall use a flight path that keeps the aircraft at least five (5) miles inland until the aircraft is directly south of its offshore destination, then at that point it shall fly directly north to its destination.

(c) Vessel Speeds.

Vessels shall be operated at speeds necessary to ensure no physical contact with whales occurs, and to make any other potential conflicts with bowhead whales or whalers unlikely. Vessel speeds shall be less than 10 knots in the proximity of feeding whales or whale aggregations.

(d) Vessels Operating in Proximity of Bowhead Whales.

If any vessel inadvertently approaches within 1.6 kilometers (1 mile) of observed bowhead whales, except when providing emergency assistance to whalers or in other emergency situations, the vessel operator will take reasonable precautions to avoid potential interaction with the bowhead whales by taking one or more of the following actions, as appropriate:

(1) reducing vessel speed to less than 5 knots within 900 feet of the whale(s);

(2) steering around the whale(s) if possible;

(3) operating the vessel(s) in such a way as to avoid separating members of a group of whales from other members of the group;

(4) operating the vessel(s) to avoid causing a whale to make multiple changes in direction; and

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

SECTION 502. GEOPHYSICAL ACTIVITY LIMITATIONS.

The following operating limitations are to be observed and the operations are to be accompanied by a monitoring plan as set forth in Section 403 and Attachment III of this Agreement. The Industry Participants conducting geophysical activity agree to co-ordinate the timing and location of such activity so as to reduce, by the greatest extent reasonably possible, the level of noise energy entering the water from such activity at any given time and at any given location.

(a) Limitations on Geophysical Activity in the Beaufort Sea.

All geophysical activity in the Beaufort Sea shall be conducted in accordance with the terms set forth below.

(1) Kaktovik: No geophysical activity from the Canadian Border to the Canning River (146 deg. 4 min. W) from 25 August to close of the fall bowhead whale hunt in Kaktovik and Nuiqsut.[2] From August 10 to August 25, Industry Participants will communicate and collaborate with AEWC on any planned vessel movement in and around Kaktovik and Cross Island to avoid impacts to whale hunt.

(2) Nuiqsut:

A. Pt. Storkerson(~148 deg. 42 min. W) to Thetis Island (~150 deg. 10.2 min. W).

(i) *Inside the Barrier Islands*: No geophysical activity prior to July 25. Geophysical activity is allowed from July 25 until completion of operations[3]

(ii). *Outside the Barrier Islands:* No geophysical activity from August 25 to close of fall bowhead whale hunting in Nuiqsut. Geophysical activity is allowed at all other times.

b. Canning River (~146 deg. 4 min. W) to Pt. Storkerson (~148 deg. 42 min. W): No geophysical activity from August 25 to the close of bowhead whale subsistence hunting in Nuiqsut.

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[2] The bowhead whale subsistence hunt will be considered closed for a particular village when the village Whaling Captains' Association declares the hunt ended or the village quota has been exhausted (as announced by the village Whaling Captains' Association or the AEWC), whichever occurs earlier.

[3] Geophysical activity allowed in this area after August 25 shall include a source array of no more than 12 air guns, a source layout no greater than 8 m x 6 m, and a single source volume no greater than 880 in^3.

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(3) Barrow: No geophysical activity from Pitt Point on the east side of Smith Bay (~152 deg. 15 min. W) to a location about half way between Barrow and Peard Bay (~157 deg. 20 min. W) from September 15 to the close of the fall bowhead whale hunt in Barrow.

(b) Limitations on Geophysical Activity in the Chukchi Sea.

All geophysical activity in the Chukchi Sea shall be conducted in accordance with the terms set forth below.

(1) Beginning September 15, and ending with the close of the fall bowhead whale hunt,[4] if Wainwright, Pt. Lay, or Pt. Hope intend to whale in the Chukchi Sea, no more than two geophysical activities employing geophysical equipment within 60 miles of the coastline will occur at any one time in the Chukchi Sea. During the fall bowhead whale hunt, geophysical equipment will not be used by Participants within 30 miles of any point along the Chukchi Sea coastline. Industry Participants will contact the Whaling Captains' Associations of each of those villages to determine if a village is prepared to whale and will notify the AEWC of any response.

(2) Safe harbor will be at sites selected by the Industry Participants and the AEWC. Safe harbor sites will be agreed upon no later than the beginning of operations and shall be listed in Attachment IV. However, a vessel captain will seek safety for his assets (vessel and personnel) as is his duty under the Law of the Sea.

(3) Any vessel operating within 60 miles of the Chukchi Sea coast will follow the communications procedures set forth in Title II of this Agreement. All vessels will adhere to the conflict avoidance measures set forth in Section 501 of this Agreement.

(4) If a dispute should arise, the resolution process set forth in Section 106 of this Agreement shall apply.

(5) Barrow: Within 100 miles of the coastline, no geophysical activity from Pitt Point on the east side of Smith Bay (~152 deg. 15 min. W) to a location about half way between Barrow and Peard Bay (~157 deg. 20 min. W) from September 15 to the close of the fall bowhead whale hunt in Barrow.

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[4] The bowhead whale subsistence hunt will be considered closed when village Whaling Captains' Associations of Wainwright, Pt. Lay, and Pt. Hope have each declared that (A) they do not intend to hunt, (B) their village hunt has ended, or (C) the village quota has been exhausted (as announced by the village Whaling Captains' Association or the AEWC), whichever occurs earlier.

(6) Notwithstanding any other provision of this Agreement, any Industry Participant who engages exclusively in geophysical activities that are conducted at least 45 miles or more from the Alaska coast in the Chukchi Sea shall only be responsible for complying with Title I (excluding Sections 104(c)(4) and 108(a) and (b)) and Sections 201, 205(b), 206, 501, and this subsection 502(b) of this Agreement. For the avoidance of doubt, an Industry Participant described in this subsection 502(b) shall be subject to the requirements of Section 203 only to the extent of one Com-Center at the closest community to the seismic acquisition area.

SECTION 503. DRILLING AND PRODUCTION.

(a) Camden Bay.

For exploratory drilling and production between 144 deg. W and the Canning River (~146 deg. 4 min. W), zero discharge of:

(1) drilling fluids;

(2) cuttings after 20" casing;

(3) treated sanitary and gray water; and

(4) ballast and bilge water.

(b) Drilling Operations in the Beaufort Sea East of Cross Island.

No drilling equipment or related vessels used for at-sea oil and gas operations shall be onsite at any offshore drilling location east of Cross Island from 25 August until the close of the bowhead whale hunt in Nuiqsut and Kaktovik. However, such equipment may remain within the Beaufort Sea in the vicinity of 71 degrees 25 minutes N and 146 degrees 4 minutes W., or at the edge of the Arctic ice pack, whichever is closer to shore.

(c) Drilling Operations in the Beaufort Sea West of Cross Island.

In 2014, no drilling equipment or related vessels used for at-sea oil and gas operations shall be moved onsite at any location outside the barrier islands west of Cross Island until the close of the bowhead whale hunt in Barrow.

(d) Oil Spill Mitigation Agreement.

Industry Participants engaged in drilling operations agree to enter into a binding oil spill mitigation agreement with the Alaska Eskimo Whaling Commission, the North Slope Borough, and the Inupiat Community of the Arctic Slope to provide for hunter transport to alternate hunting locations in the event of an oil spill. The agreement shall be attached as Attachment V.

SECTION 504. SHORE-BASED SERVICE AND SUPPLY AREAS.

Shore-based service and supply areas used by Industry Participants shall be located and operated so as to ensure compliance with the terms of this Agreement.

SECTION 505. TERMINATION OF OPERATIONS AND TRANSIT THROUGH THE BERING STRAIT.

Except as provided in Title VI, all Industry Participant vessels shall complete operations in time to allow such vessels to complete transit through the Bering Strait to a point south of 59 degrees North latitude no later than November 15, 2014. Any Industry Participant vessel that encounters weather or ice that will prevent compliance with the date in the preceding sentence shall coordinate its transit through the Bering Strait to a point south of 59 degrees North latitude with the appropriate Com-Centers listed in Section 203. All Industry Participant vessels shall, weather and ice permitting, transit east of St. Lawrence Island and no closer than 10 miles from the shore of St. Lawrence Island.

TITLE VI – LATE SEASON SEISMIC OPERATIONS

SECTION 601. IN GENERAL.

Notwithstanding any other provision of this Agreement, any Industry Participant who engages exclusively in geophysical activities that are conducted at least 5 miles or more from the Alaska coast in the Beaufort Sea or Chukchi Sea and begin on or after October 1, 2014 shall only be responsible to comply with Title I (excluding Sections 104(c)(4) and 108(a) and (b)) and Sections 201, 205(b), 206, 502(a), and 602 of this Agreement. For the avoidance of doubt, an Industry Participant described in this Section 601 shall not be subject to the requirements of Section 203 including but not limited to funding of Com-Centers, providing certain equipment, training and providing representatives as designated operators of Com-Centers.

SECTION 602. VESSEL OPERATIONS.

(a) Reporting Positions When Vessels Come Within 40 Miles of the Coast.

(1) A vessel subject to this section operating within 40 miles of the Alaska coast shall report to the appropriate Com-Center, if open, at least once every six hours commencing with a call at approximately 06:00 hours. Each call shall report the following information:

(A) Vessel name, operator of vessel, charter or owner of vessel, and the project or entity the vessel is conducting operations for.

(B) Vessel location, speed, and direction.

(C) Plans for vessel movement between the time of the call and the time of the next call. The final call of the day shall include a statement of the vessel's general area of expected operations for the following day, if known at that time.

EXAMPLE: This is the Arctic Endeavor, operated by _____ for _____ in the Chukchi Sea. We are currently at ___'___ north ___'___ west, proceeding SE at ____ knots. We will proceed on this course for ___ hours and will report location and direction at that time.

(2) The appropriate Com-Center, if open, also shall be notified if there is any significant change in plans, such as an unannounced start-up of operations or significant deviations from announced course, and such Com-Center shall notify all whalers of such changes. A call to the appropriate Com-Center shall be made regarding any unsafe or unanticipated ice conditions.

(b) Operator Duties.

All vessel operators subject to this title are responsible for the following requirements.

(1) Monitoring VHF Channel 16. All vessel operators shall monitor marine VHF Channel 16 at all times.

(2) Avoidance of Whale Hunting Crews and Areas. It is the responsibility of each Industry Participant and vessel operator to determine the positions of their vessels and to exercise due care in avoiding any areas where subsistence whale hunting is active.

(3) Vessel-to-Vessel Communication. After any vessel owned or operated by any Industry Participant has been informed of or has determined the location of subsistence whale hunting boats in its vicinity, the Marine Mammal Observer / Inupiat Communicator shall contact those boats in order to coordinate movement and take necessary avoidance precautions.

(c) Routing Vessels.

(1) All vessel routes within 40 miles of the Alaska coast shall be planned so as to minimize any potential conflict with bowhead whales or subsistence whaling activities. All vessels shall avoid areas of active or anticipated whaling activity, as reported pursuant to Section 202.

(2) Beaufort Sea. Vessels transiting east of Bullen Point to the Canadian border should remain at least five (5) miles offshore during transit along the coast, provided ice and sea conditions allow.

(3) Chukchi Sea. Vessels should remain as far offshore as weather and ice conditions allow, and at all times at least five (5) miles offshore during transit.

(4) Safe Harbor / Loitering. Notwithstanding paragraphs 2 and 3, from August 31 to October 31 vessels in the Chukchi Sea or Beaufort Sea shall remain at least 20 miles offshore of the coast of Alaska from Icy Cape in the Chukchi Sea to Pitt Point on the east side of Smith Bay in the Beaufort Sea whether in transit or engaging in activities in support of oil and gas operations unless ice conditions or an emergency that threatens the safety of the vessel or crew prevents compliance with this requirement.

(d) Vessel Speeds.

Vessels shall be operated at speeds necessary to ensure no physical contact with whales occurs, and to make any other potential conflicts with bowhead whales or whalers unlikely. Vessel speeds shall be less than 10 knots in the proximity of feeding whales or whale aggregations.

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(e) Vessels Operating in Proximity of Bowhead Whales.

If any vessel inadvertently approaches within 1.6 kilometers (1 mile) of observed bowhead whales, except when providing emergency assistance to whalers or in other emergency situations, the vessel operator will take reasonable precautions to avoid potential interaction with the bowhead whales by taking one or more of the following actions, as appropriate:

(1) reducing vessel speed to less than 5 knots within 900 feet of the whale(s);

(2) steering around the whale(s) if possible;

(3) operating the vessel(s) in such a way as to avoid separating members of a group of whales from other members of the group;

(4) operating the vessel(s) to avoid causing a whale to make multiple changes in direction; and

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

(f) Marine Mammal Sighting Data.

Industry Participants whose operations are subject to this title will submit to the AEWC and NSB DWM all marine mammal sighting data.

TITLE VII – PARTICIPANTS

This Agreement shall be binding and effective when signed by the duly authorized representatives of the Participants. Signatures may be by facsimile on separate pages.

_____	_____
George Noongwook	Harry Brower, Jr.
AEWC Chairman	AEWC Commissioner for Barrow
Dated: _____	Dated: _____
_____	_____
Merlin Koonooka	Joseph Kaleak
AEWC Commissioner for Gambell	AEWC Commissioner for Kaktovik
Dated: _____	Dated: _____
_____	_____
Raymond Hawley	Ronald Ozenna, Jr.
AEWC Commissioner for Kivalina	AEWC Commissioner for Little Diomede
Dated: _____	Dated: _____

_____	_____
Isaac Nukapigak	Herbert Kinneeveauk
AEWC Commissioner for Nuiqsut	AEWC Commissioner for Pt. Hope
Dated: _____	Dated: _____
_____	_____
Julius Rexford	George Noongwook
AEWC Commissioner for Pt. Lay	AEWC Commissioner for Savoonga
Dated: _____	Dated: _____
_____	_____
John Hopson, Jr.	Raymond Seetook
AEWC Commissioner for Wainwright	AEWC Commissioner for Wales
Dated: _____	Dated: _____

_____	_____
Name:	Name:
BP Exploration (Alaska) Inc.	Eni US Operating Co Inc.
Dated: _____	Dated: _____
_____	_____
Name:	Name:
Exxon Mobil Corporation	GX Technology Corp.
Dated: _____	Dated: _____
_____	_____
Name:	Name:
Caelus Energy of Alaska	Shell Offshore, Inc.
Dated: _____	Dated: _____
_____	_____
Name:	Name:
SAExploration	TGS-NOPEC Geophysical Company
Dated: _____	Dated: _____

ATTACHMENT I -- LOCAL SAR CONTACTS

LOCAL SEARCH AND RESCUE ORGANIZATIONS -

CONTACT PERSONS
(IN EMERGENCIES, ALWAYS DIAL 911)

North Slope Borough
Search and Rescue (Pilots)

Director Price E. Brower		852-2822 WK 367-3225 Home

Barrow Volunteer
Search and Rescue Station 852-2808 OFS

President	Crawford Patkotak	852-3798 HM 360-3477 Cell
Vice-Pres.	Johnny Adams	852-7761 HM 878-2411 Cell
Secretary	Isabelle Kanayurak	852-2822 Wk
Treasurer	James Patkotak	852-4686 HM 855-0733 Cell
Coordinator	Roy Ahmaogak	367-4184 Cell

Director	Stephanie Lozano	244-4011 WK 382-6304
Director	Vernon Edwardsen	852-0521 WK 855-1264 Cell
Nuiqsut Volunteer		
Search and Rescue Station	480-6613 (Fire Hall)	
Fire Chief	Steven Kunaknana	480-6613 WK
Coordinator	Gordon Brown	480-6225/6223 480-0040 Cell
Volunteer	Winford Ipalook	480-0046 Cell
Volunteer	Willie Sielak	480-0003 Cell
Volunteer	Larry Kasak Sr.	480-0020 Cell
Kaktovik Volunteer		
Search and Rescue Station	640-6212 (Fire Hall)	
President	Lee Kayotuk 640-0033 Cell	640-5893 HM 640-6213 Home
Vice-Pres.	Tom Gordon 640-	
Secretary	Nathan Gordon	640-6925
Treasurer	Don Kayotuk	640-2947
Fire Chief	Sheldon Brower	640-6212 WK

Wainwright Volunteer Search and Rescue 763-2728 (Fire Station)

President	Joe Ahmaogak Jr.	763-2826 Home
Vice President	John Hopson, Jr.	763-3464 Home
Secretary	Raymond Negovanna	763-2102 Home
Treasurer	Ben Ahmaogak, Jr.	763-3030 Home
Director	Artic Kittick	763-2534 Home
Director	Raymond Negovanna	763-2826

Pt. Lay Volunteer Search and Rescue 833-2714 (Fire Hall)

President	Warren H Lampe	833-0049
Vice Pres.	Leo Ferreira	833-3185
Secretary	Misty Plymale	833-1209
Treasurer	Lily Anniskett	833-0060
Fire Chief	Anthony Neakok	833-2714/833-2253
Coordinator 1	Marie Tracey	833-2127/2428/350-9712
Coordinator 2	Cyrus Nukapigak	833-1209/2318

Pt. Hope Volunteer Search and Rescue

Coordinator	Midas Koenig	.368-2774Work

Fire Chief	Art Oomittuk	368-2774 Work (Note: Only contact for Pt. Hope)

North Slope Borough Disaster Relief Coordinator

Frederick Brower	852-0284 OFS

ATTACHMENT II -- OPERATIONS VESSELS

VESSELS TO BE USED FOR AND IN SUPPORT OF INDUSTRY PARTICIPANTS' OPERATIONS AS IDENTIFIED IN SECTION 401(b)(1)(B)

[ALL VESSELS TO BE IDENTIFIED BY COMPANY]

NOTE:
COPY OF PRESENTATION OF THE INDUSTRY PARTICIPANT ATTACHED IDENTIFYING VESSELS TO BE USED FOR AND IN SUPPORT OF THE INDUSTRY PARTICIPANTS' OPERATIONS.

ATTACHMENT III -- MONITORING VESSELS

VESSELS TO BE USED
FOR AND IN SUPPORT
OF THE INDUSTRY PARTICIPANTS MONITORING PLANS
AS IDENTIFIED IN SECTION 401(b)(1)(B)

[ALL VESSELS TO BE IDENTIFIED BY COMPANY]

NOTE:

COPY OF PRESENTATION OF THE INDUSTRY PARTICIPANT ATTACHED IDENTIFYING VESSELS TO BE USED FOR AND IN SUPPORT OF THE INDUSTRY PARTICIPANTS' MONITORING PLAN.

ATTACHMENT IV -- SAFE HARBOR

ATTACHMENT V -- OIL SPILL MITIGATION

APPENDIX C. PROGRESS ON FISH ACOUSTICS STUDY

PROGRESS ON FISH ACOUSTICS STUDY, 2014

Provided by Bill Streever (BPXA), Katherine Kim (Greeneridge Sciences), and Scott Raborn (LGL).

Introduction

As part of the North Prudhoe Bay Seismic Operation, BPXA (BP Exploration, Alaska, Inc.) considered a number of monitoring and reporting opportunities that could contribute to the collective knowledge of marine mammals, marine mammal prey, and marine mammal habitat. BPXA and others recognized that the potential to undertake meaningful research on direct impacts to marine mammals that might result from the seismic operation would be limited due to the small number of marine mammals in the project area and other factors. However, BPXA and others also recognized the potential value of research on fish responses to airgun sounds. Since ice seals prey on at least some of the fish species occurring in the area around the seismic operation, a study of fish responses was seen as relevant to marine mammal issues, in keeping with guidance provided by the NMFS in Section 5.3.1(e) of the 2013 Supplemental Draft Environmental Impact Statement (SDEIS), which calls for "an increase in our understanding of how the activity affects marine mammal habitat, such as through effects on prey sources or acoustic habitat."

BPXA has collected fish in permanently established fyke nets at 4 locations in shallow water close to the project area for three decades (Figure 1). The juxtaposition of the seismic operation with the fish sampling locations provided an opportunity to assess changes in fish abundance and mortality with changing levels of received sounds.

The effect of airgun sounds on fish displacement and mortality is an issue of concern not only for marine mammal conservation but also for the Inupiat traditional Arctic cisco fishery in Nuiqsut, Alaska. In addition, it is an issue of growing importance in various locations around the world where fishing coexists with oil and gas exploration.

This summary provides an overview of progress on the fish acoustics study available as of 1 November 2014. As proposed prior to the project, full processing and analyses of fish and acoustic data will not be completed until sometime in 2015.

Fish Sampling

During the first two months of the open water season from 1981 through 2013 (with the exception of 1999 and 2000), biologists have checked fyke nets daily at four locations: Niakuk, West Beach, West Dock, and Endicott. During the two-month study period each year, fish are counted and sized every day, unless sampling is prevented by weather, the presence of bears, or other events. Fish mortality is also noted. In a typical year, more than 50,000 fish representing 18 species are caught in the fyke nets. Primary species caught in the fyke nets are Arctic cisco (*Coregonus autumnalis*), least cisco (*Coregonus sardinella*), northern dolly varden (*Salvalinus malma*), broad whitefish (*Coregonus nasus*), humpback whitefish (*Coregonus pidschian*), Arctic flounder (*Liopsetta glacialis*), fourhorn sculpin (*Myoxocephalus quadricornis*), and rainbow smelt (*Osmerus mordax*).

In 2014, fish-sampling began on 30 June 2014 (26 days before airgun operations began on 26 July 2014). Fish sampling continued until 1 September 2014 (7 days after airgun operations ceased on 25 August 2014). During a cumulative (all four fyke nets combined) 183.3 days of fishing, a total of 82,569 fish representing 19 species were captured and released (Table 1).

As of 1 November 2014, fish data had not been completely assessed. However, initial assessments did not suggest the presence of increased mortality of fish in nets or unusual catch rates. For example, initial assessments of Arctic cod abundance show catch levels within the range found in earlier years (Figure 2). Similarly, initial assessments of juvenile Arctic cisco abundance, which is heavily influenced by winds, was somewhat low for 2014 but within the range found in earlier years (Figure 3).

These initial assessments would not detect anything less than severe impacts. More sophisticated statistical analyses described below will incorporate acoustic data and account for day-to-day changes in sound levels in an attempt to detect subtle relationships between fish catches and airgun sounds.

Acoustic Records

Throughout the seismic project, airgun operations were intermittently stopped due to factors related to weather conditions, logistical issues, and the presence of marine mammals. In addition, the location of airgun support vessels varied throughout the seismic project as transects, or source lines, were completed. In keeping with these realities, received airgun sound levels at each fish sampling location varied through the sampling period.

Because fishes detect sounds as changes in pressure (analogous to human hearing), as particle motion (the movement of water molecules that accompanies fluctuating pressures, which cannot be detected by human hearing), or as both changes in pressure and particle motion, sound pressure measurements and particle motion measurements may be related to fish responses to airgun sounds. With that in mind, sound pressure levels and particle motion (in the terms of particle velocity via particle acceleration) in the water were recorded from 13 July 2014 (13 days before airgun operations began) until 29 August 2014 (4 days after airgun operations ceased) at locations within about 50 m of each fish sampling location. All in-water recorders were placed on the seabed at a depth of about 1 m. Also, in an effort to overcome challenges associated with waves in shallow water, particle motion was recorded using "nails" (a type of geophone sometimes used in seismic data acquisition) placed about 20 cm underground near three of the four fish sampling locations (Niakuk, West Beach, and West Dock locations). Nails recorded particle motion from 26 July 2014 until 25 August 2014. As of 1 November 2014, data quality in all recorders had not been completely assessed.

Sound Pressure Measurements

Sound pressures were measured using Autonomous Submersible Acoustic Recorders, or ASARs (Model C08 ASAR-Cs built by Greeneridge Sciences). Each ASAR is equipped with two omnidirectional sensors of different sensitivities, enabling measurement of a wide dynamic range of acoustic sound pressures and, therefore, providing the ability to record very loud sounds from nearby airgun shots and quieter sounds from more distant airgun shots. For this study, the ASARs recorded at a 24 kHz sampling rate for each of its two sensors, providing a record of sounds ranging in frequency from a few Hz to about 12 kHz.

Early assessment shows that ASARs performed reliably for more than 97 % of their deployment. Early comparisons of ASAR data to airgun shot records show that many airgun shots were not audible at the fish sampling locations, presumably because the shallow water environment restricted sound propagation, especially at low frequencies, in the water column. Figure 4 illustrates an airgun pulse received on an ASAR, confirming that, at least for this pulse, the low frequencies normally associated with airgun pulses were not received at the recorder.

Particle Motion Measurements

In-water particle motion was measured using Directional Autonomous Seafloor Acoustic Recorders, or DASARs (Model C08 DASAR-Cs built by Greeneridge Sciences). DASARs, originally developed for BPXA's Northstar bowhead whale research (Greene et al. 2004, MacDonald et al. 2012), are equipped with an omnidirectional sensor that measures acoustic pressure and a pair of orthogonal directional sensors that measure acoustic particle motion along two horizontal axes. For the fish acoustics study, only the directional sensors were used, since sound pressures were measured using ASARs.

Early assessment of DASAR data suggests that wave motion during windy days overwhelmed in-water particle motion measurements. Further assessment will be needed to determine the usefulness of in-water particle motion measurements.

In-ground particle motion measurements using "nails" deployed near three of the fish sampling locations may provide more useful data than in-water particle motion measurements. For each nail, recorded data were extracted for the 6-second period following each airgun shot. Early assessment shows that all shots reported in shot logs were captured in nail recordings.

Planned Analyses

Complex statistical analyses will be needed to determine if the catch rate or mortality of numerically dominant fish species was related to airgun sounds associated with BPXA's project activities during the summer of 2014. Details regarding the analytical approach will evolve as analyses progress, and the overall approach could change dramatically as analyses progress. Nevertheless, the analyses currently planned are described below.

Simply put, the analyses will test for relationships between independent variables (received sound levels at each net as well as other environmental variables) and dependent variables (fish mortality and the catch-per-unit-effort (CPUE) of the numerically dominant fish species).

Conceptually, analyses of changes in mortality and CPUE will be undertaken at three levels:

(1) year-to-year differences to determine the degree to which 2014 differed from previous years,
(2) days with and without airgun sounds to determine changes in daily fluctuation outside of the normal range, and
(3) location-specific differences with respect to airgun sounds.

The third approach, assessing the relationship between mortality and CPUE and summary acoustic metrics for each day, will be the most complex and the most likely to detect subtle relationships that may be of interest. The general experimental design will follow the before-after-control-gradient (BACG) approach described by Ellis and Schneider (1997) with variables outlined in Table 2. Independent variables describing potential disturbance probably will include acoustic metrics collected at fyke net locations as well as distances to the nearest airgun sources each day. Many natural environmental influences affect mortality and the daily catch rates of various species. Moreover, these influences affect age classes within certain species differently. In order to detect a response signal caused by acoustic disturbance, these natural influences must be included in size-specific models of species mortality and catch rates. For example, important natural influences for Arctic cod (all ages), age-0 Arctic cisco, and least cisco include daily and cumulative seasonal wind patterns, as well as daily salinity. As a second example, older age cohorts of Arctic cisco, least cisco, and broad whitefish may be

affected by these influences in addition to an index of winter severity and an index of the cohort's abundance from the previous year.

Parameters quantifying disturbance related influences and natural environmental variables will be valuated within the context of a generalized linear mixed model (GLMM) using the GLIMMIX Procedure of the statistical software SAS 9.4 (SAS Institute, Inc. 2012). The relative fit of various model specifications (combinations of independent variables) will be compared based on their respective Akaike Information Criteria (AIC) values as per Burnham and Anderson (2002). Absolute model fit will be assessed with cumulative residual plots (Lin et al. 2002).

Although statistical analyses will assess both mortality and CPUE, it should be noted that received sound levels found in initial acoustic data processing are low compared to levels known to kill fish. Also, previous work on airgun arrays in shallow water near Prudhoe Bay have not detected fish mortality.

Catch and effort will enter statistical models separately as has been done in recent literature (e.g., Terceiro 2003, Ver Hoef and Boveng 2007, Dunn 2009). Catch is discrete by nature due to being generated by the Poisson process of counting individuals. However, a Poisson distribution will likely be inadequate as CPUE data tend to be overdispersed and better represented with a negative binomial distribution (Stroup 2013).

Schedule

As data processing and statistical analyses progress, the three key principle scientists (Bill Streever of BPXA, Katherine Kim of Greeneridge Sciences, and Scott Raborn of LGL) will collaborate on a draft manuscript, with input as needed from the study's advisory panel (Arthur Popper of the University of Maryland, Tony Hawkins of the Scottish Environmental Research Institute, and Craig George of the North Slope Borough). The draft manuscript should be ready for review by about 1 April 2015. The initial draft review will be limited to the study's advisory panel. After review comments are returned, revisions will address comments. The revised manuscript will be submitted to the National Marine Fisheries Service (NMFS) and to a peer-reviewed journal simultaneously by about 15 July 2015. Additional comments from NMFS and peer reviewers will be addressed as needed, with the hope of acceptance for publication by the end of 2015.

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Dunn, M.R. 2009. Review and stock assessment of black cardinalfish (*Epigonus telescopes*) on the east coast North Island, New Zealand. New Zealand Fisheries Assessment Report 2009/39. 55 p.

Ellis, J. I., and D. C. Schneider. 1997. Evaluation of a gradient sampling design for environmental impact assessment. Environmental Monitoring and Assessment 48:157-172.

Greene, C.R., M.W. McLennan, R.G. Norman, T.L. McDonald, R.S. Jakubczak, and W.J. Richardson. 2004. Directional frequency and recording (DIFAR) sensors in seafloor recorders to locate calling bowhead whales during their fall migration. Journal of Acoustic Society of America 116(2): 799-813.

Lin, D.Y., L.J. Wei, and Z. Ying. 2002. Model-checking techniques based on cumulative residuals. Biometrics, 58:1-12.

McDonald, T.L., W.J. Richardson, C.R. Greene, S.B. Blackwell, C.S. Nations, R.M. Nielson, and B. Streever 2012. Detecting changes in the distribution of calling bowhead whales exposed to fluctuating anthropogenic sounds. Journal of Cetacean Research and Management. 12(1): 91-106.SAS Institute Inc. 2012. SAS Online Doc, Version 9.4. Cary, North Carolina.

Stroup, W. W. 2013. Generalized Linear Mixed Models: Modern Concepts, Methods and Applications. Taylor & Francis Group, LLC. Boca Raton, Florida.

Ver Hoef, J. M. and P. L. Boveng. 2007. Quasi-Poisson vs. negative binomial regression: How should we model overdispersed count data? Ecology, 88:2766-2772.

Table 1. Preliminary summary catch data for four fyke net locations.

	Fyke Net Location					
Common Name	1	2	3	4	Total	%
Arctic cisco	5,291	2,108	4,263	5,121	16,783	20
Broad Whitefish	3,902	1,175	517	7,496	13,090	16
Least cisco	2,704	4,686	3,919	1,380	12,689	15
Arctic flounder	3,556	3,370	1,154	690	8,770	11
Arctic cod	893	336	3,374	2,569	7,172	9
Saffron cod	1,507	3,734	775	365	6,381	8
Fourhorn sculpin	1,379	2,742	1,448	810	6,379	8
Rainbow smelt	1,998	530	873	1,675	5,076	6
Humpback whitefish	684	795	1,002	223	2,704	3
Dolly Varden	1,807	363	275	229	2,674	3
Round whitefish	293	8	6	354	661	1
Ninespine stickleback	32	6	21	63	122	0
Arctic grayling	12	4	4	11	31	0
Capelin	1	5	6		12	0
Pink salmon	7		1		8	0
Burbot	5			1	6	0
Threespine stickleback	3		3		6	0
Pacific herring	1	1	2		4	0
Kelp snailfish			1		1	0
Total	24,075	19,863	17,644	20,987	82,569	

Table 2. Acoustic, fish, and environmental variables that may be considered in statistical analyses.

Fish variables*	**Disturbance and acoustic variables**	**Environmental variables**
Daily fish abundance per net (in log of Catch-per-Unit-Effort) for numerically dominant species and size classes	Daily maximum rms and peak sound pressure levels	Julian day
Daily number of fish mortalities for each species in each net for numerically dominant species and size classes	Daily maximum per pulse sound exposure levels	Daily wind conditions
	Daily cumulative sound exposure levels	Daily water temperatures
	Daily average such as Leq (equivalent continuous noise level)	Daily salinity
	Daily average and maximum particle motion values	Tide conditions
	Distance to nearest airgun activities	Index of previous winter conditions

* Fish abundance and fish mortalities will have to be assessed separately for each species.

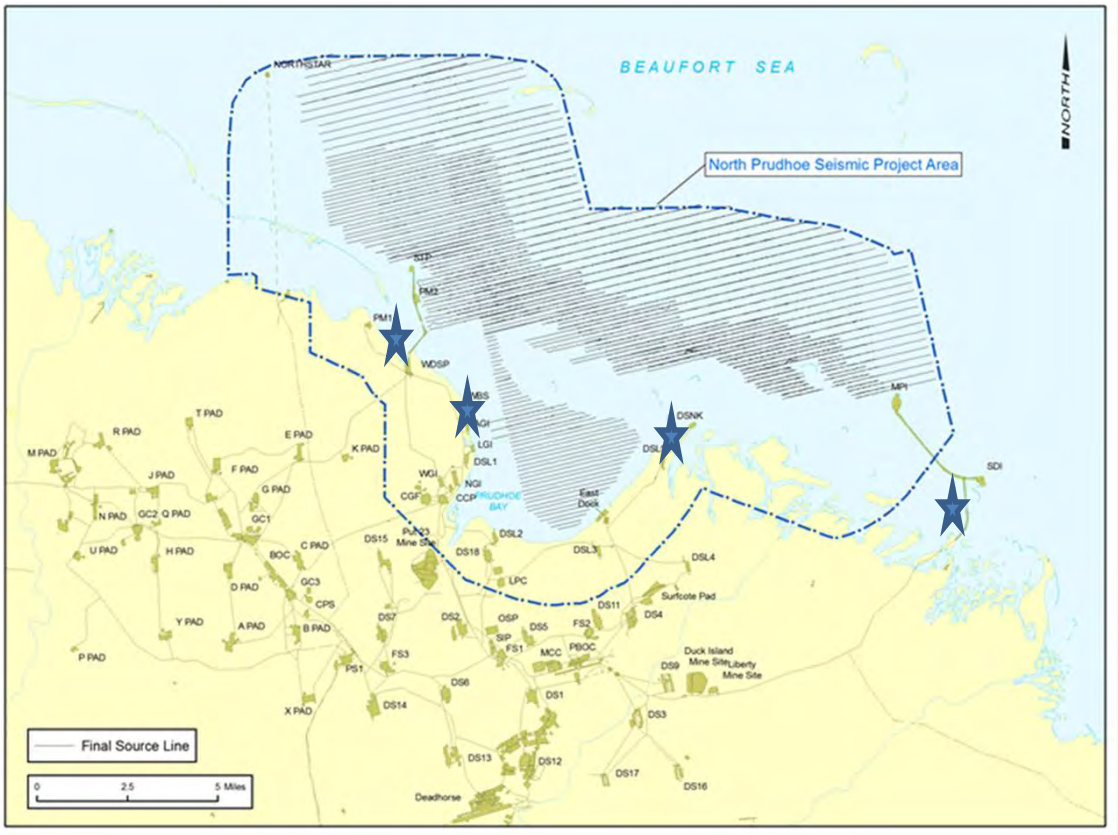

Figure 1. Location map showing outline of seismic project area, airgun transects (lines running east and west within the seismic project area), and approximate locations of fyke nets (stars).

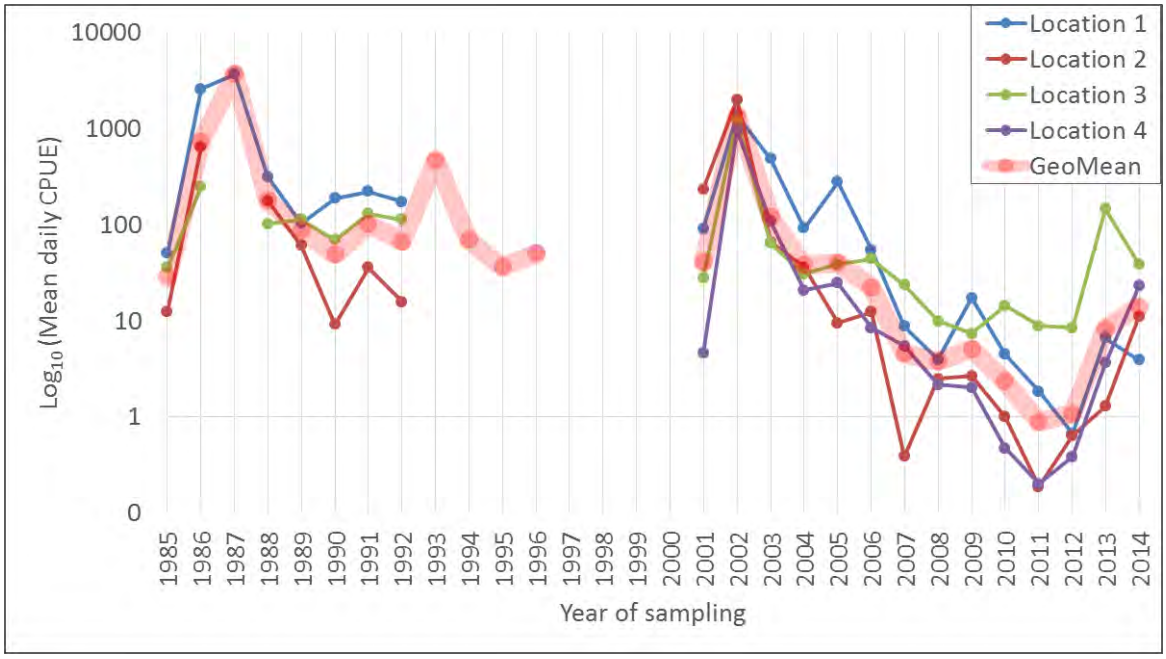

Figure 2. Abundance of Arctic cod based on preliminary counts for summer 2014 at four fyke net locations and earlier reported data for the same fyke net locations, expressed as the log of the daily catch per unit effort, along with the geometric mean for each year.

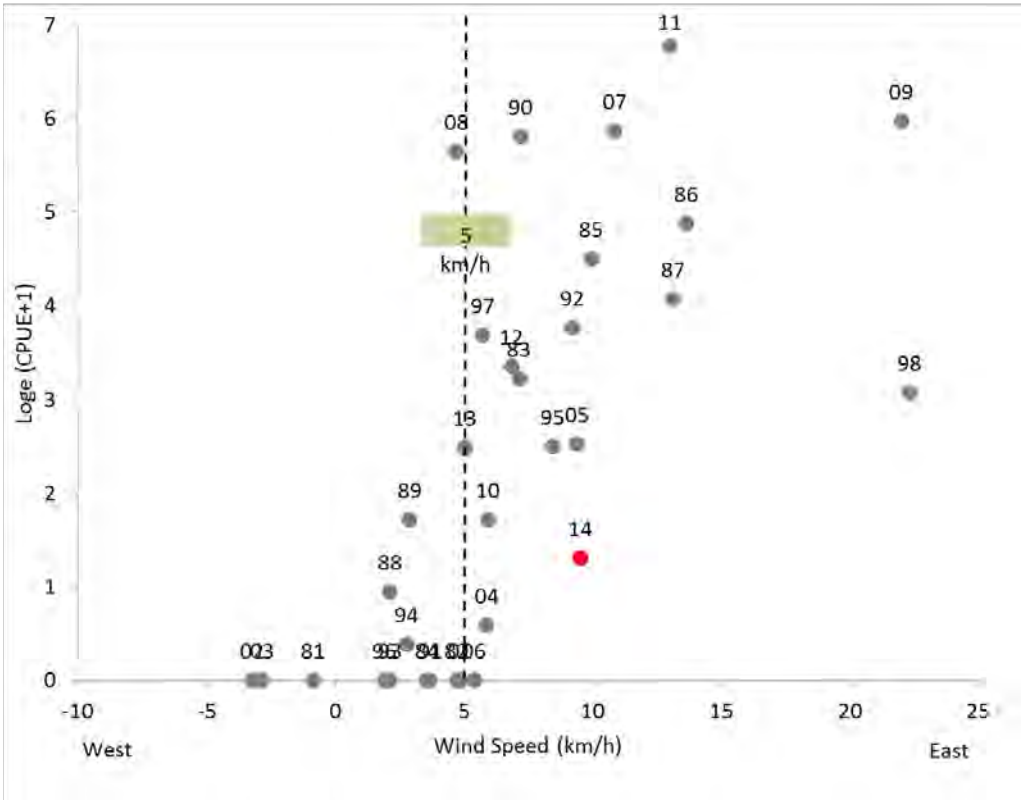

Figure 3. Abundance of juvenile (young of year) Arctic cisco based on preliminary counts for summer 2014 at four fyke net locations and earlier reported data for the same fyke net locations, expressed as the log of the daily catch per unit effort and plotted against wind. Juvenile Arctic cisco are carried on wind-driven currents from the MacKenzie Delta to the west when consistent winds blow from the east, as was the case in 2014.

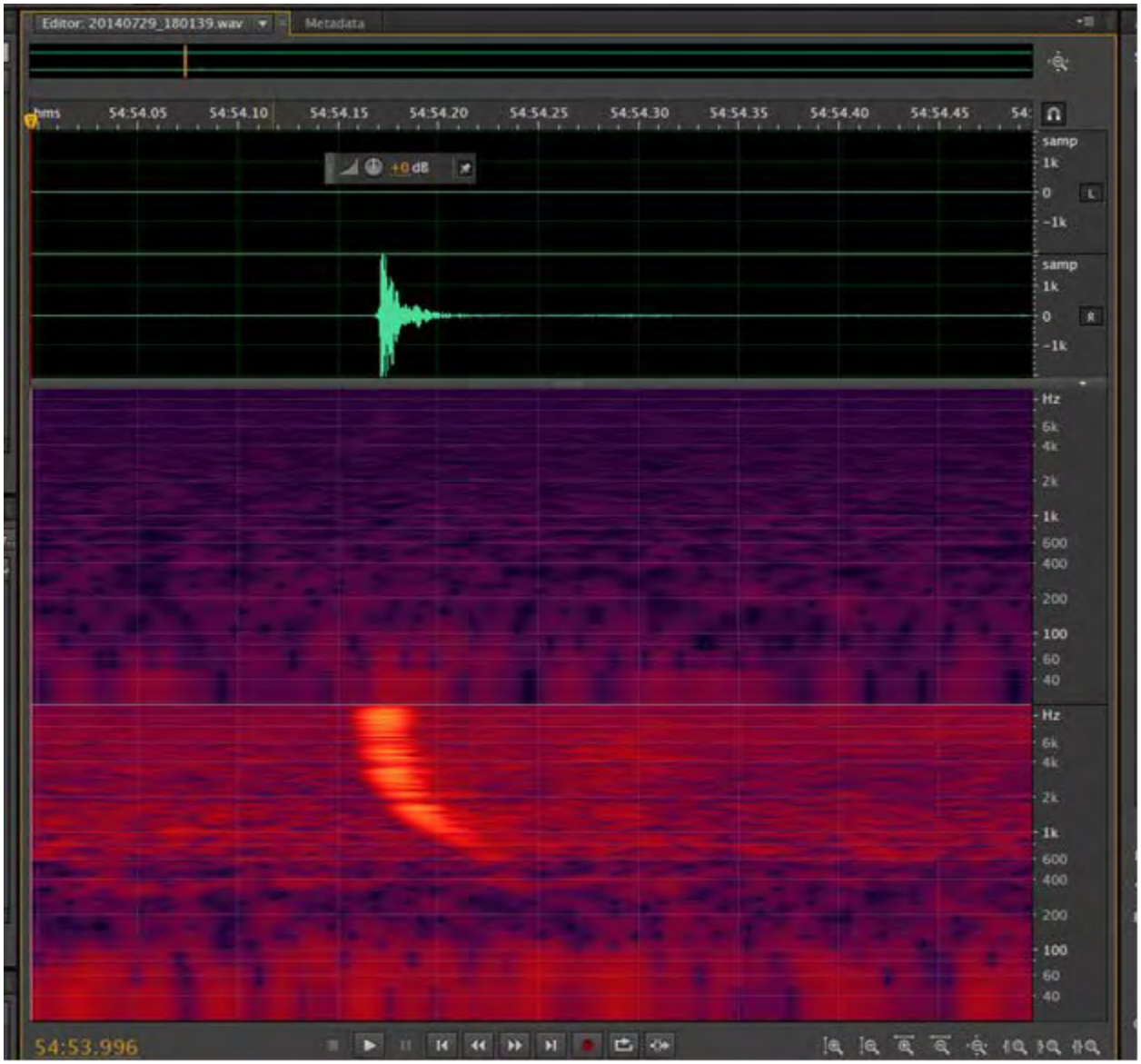

Figure 4. Airgun pulse received on an ASAR. The top panel shows the received time series, the middle panel shows the spectrogram from the "insensitive" sensor (i.e., the sensor intended to record high received sound pressures that would occur during close approaches by source vessels), and the bottom panel shows the spectrogram from the "sensitive" sensor. Note the curved shape of the impulsive broadband airgun pulse, a result of the dispersive nature of the shallow-water waveguide. In addition, the lowest frequencies typically associated with airguns, which should have relatively high sound pressures well below 500 Hz, are not present, since low frequency sounds below a depth-dependent "cutoff frequency" cannot propagate in shallow water.

APPENDIX D. ENSONIFIED TRACKLINES

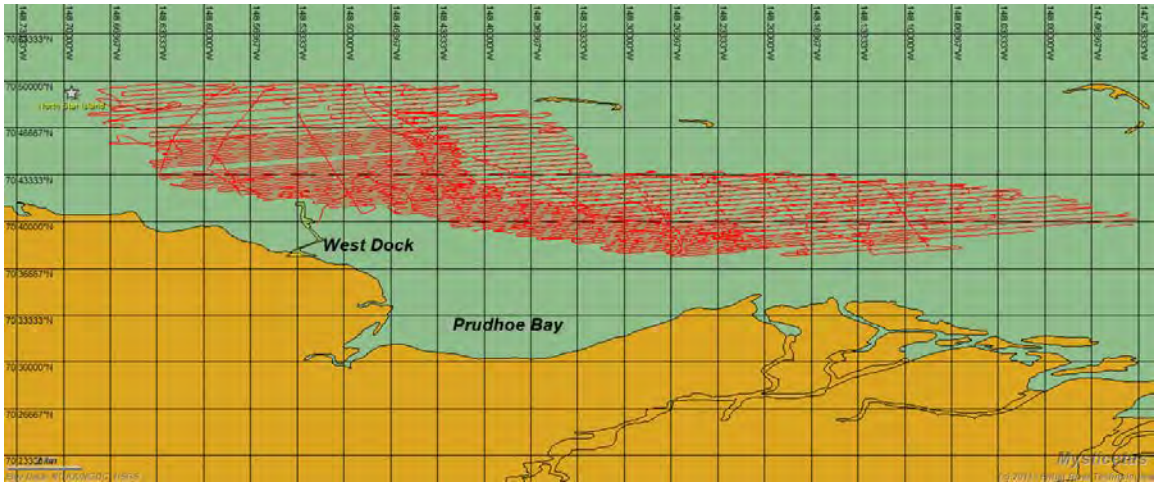

Chart 1. Lines acquired by R/V *Maxime*

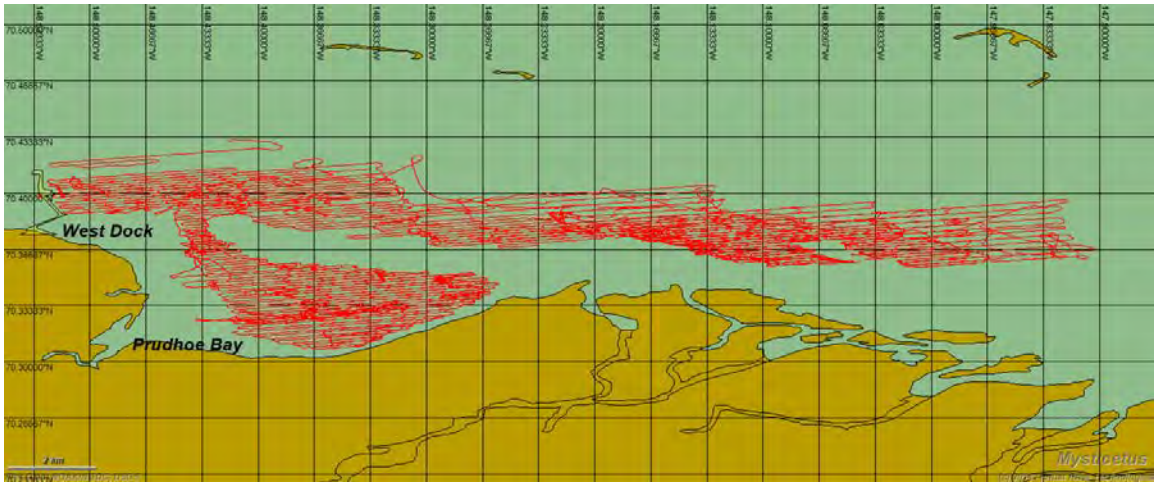

Chart 2. Lines acquired by R/V *Peregrine*

APPENDIX E. MITIGATION MEASURES

General Mitigation Measures from IHA and LOA which apply to all vessels in the survey.

1. To minimize collision risk with marine mammals, the vessel shall not be operated at speeds that would make collisions with whales likely. When weather conditions require, such as when visibility drops, the vessel shall adjust speed accordingly to avoid the likelihood of collisions.
2. Vessel operators shall check the waters immediately adjacent to the vessel to ensure that no marine mammals will be injured when the vessel's propellers (or screws) are engaged.
3. Vessel operators shall avoid concentrations or groups of whales and the vessel shall not be operated in a way that separates members of a group. In proximity of feeding whales or aggregations, vessel speed shall be less than 10 kt.
4. When within 300 m (900 ft) of whales vessel operators shall take every effort and precaution to avoid harassment of these animals by:

    - Reducing speed and steering around (groups of) whales if circumstances allow, but never cutting off a whale's travel path; and

    - Avoiding multiple changes in direction and speed.

5. Sightings of dead marine mammals will be reported immediately to the BP HSSE Representative. The BP HSSE Representative is responsible for ensuring reporting of the sightings according to the guidelines provided by NMFS.
6. In the event that any aircraft (such as helicopters) are used offshore to support the planned survey, the mitigation measures below will apply:

    - Under no circumstances, other than an emergency, shall aircraft be operated at an altitude lower than 1,000 ft above sea level (ASL) when within 0.3 mile (0.5 km) of groups of whales.

    - Helicopters shall not hover or circle above or within 0.3 mile (0.5 km) of groups of whales.

Ramp-up procedures following a shutdown exceeding 10 minutes were as follows:

1. Ramp-up can be started if the safety zone (200 m for 180 dB (rms)) has been free of marine mammals for a consecutive 30-minute period. The entire safety zone must be visible and under observation by PSOs during the 30-minute period. If the entire safety zone was not visible through the entire 30-minute period, ramp-up from a shutdown cannot begin. This is called a 30-minute "clear".
2. The 30-minute period will be extended if a marine mammal is sighted within the safety zone. If a marine mammal is seen in the safety zone but is then observed to leave the safety zone, the 30-minute period will resume uninterrupted. Otherwise, the 30-minute observation period has to be restarted from the time of the last sighting of the marine mammal inside the safety zone.
3. If the shutdown is required because of the presence of a marine mammal in the safety zone during sound source operations, ramp-up can be started if the marine mammal(s) for which the shutdown occurred have been observed to leave the safety zone or have not been sighted for at least 15 minutes (pinnipeds) or 30 minutes (cetaceans). This assumes that there was continuous observation effort by PSOs prior to the shutdown and that the entire safety zone was visible.
4. The airgun operator and PSOs will maintain records of the times when ramp-ups started and when the airgun arrays reached full power.

Power Down Procedures:

1. The array was immediately powered down whenever a marine mammal was sighted approaching close to or within the applicable safety zone of the full array (70 m for pinnipeds, 200 m for cetaceans), but was outside the applicable safety zone of the single airgun (20 m for pinnipeds, 50 m for cetaceans).
2. Likewise, if a marine mammal was already within the safety zone of the full array when first detected, the airgun array was powered down to one operating airgun immediately.
3. If a marine mammal was sighted within or about to enter the applicable safety zone of the single airgun, it too was shutdown.
4. Following a power down, ramp-up to the full airgun array did not resume until the marine mammal had cleared the safety zone. The animal was considered to have cleared the safety zone if it had been visually observed leaving the safety zone of the full array, or had not been seen within the zone for 15 minutes (seals) or 30 minutes (whales).

APPENDIX F. EMAIL CORRESPONDENCE BETWEEN BPXA AND NMFS REGARDING THE EFFECTIVENESS OF NIGHT VISION DEVICES (NVDS) ON THE 2014 NPB 3D OBS SURVEY

From: "May, Christina H" <Christina.May@bp.com>
Date: Wednesday, July 2, 2014 at 12:10 PM
To: "Lisanne Aerts (lisanne@LAMAECOLOGICAL.COM)" <lisanne@LAMAECOLOGICAL.COM>, "Wyman, Larry" <Larry.Wyman@bp.com>, "Perrin, Gwen E. (Petrotechnical Resources Of AK)" <Gwen.Perrin@bp.com>, "Brock, Mike" <mike.brock@uk.bp.com>, Kate Lomac-MacNair <kate@smulteasciences.com>
Cc: "Streever, Bill J" <Bill.Streever@bp.com>, Candace Nachman - NOAA Federal <candace.nachman@noaa.gov>
Subject: FW: Talk with NMFS today

Hi team,

Bill and I spoke with Candace at NMFS yesterday and got her concurrence on three issues, as summarized below:

. Language/interpretation around stipulation 3 a)iv. from the IHA, which basically states that BP must shut down sound sources to avoid take of any species not listed in IHA table 1 that are likely to be exposed to SPLs greater than or equal to 160dB re 1µPa(rms) for impulse sources.
. Our interpretation is that this shutdown will only occur if a positive ID is made of a species not listed inTable 1, in this case a humback, minke, fin or Nawhal. If the i.d. is uncertain it is reasonable to consider the whales bowheads for mitigation purposes.
. NMFS is confirming their concurrence with this stipulation but their initial reaction was supportive.
. We've drafted language for the PSO handbook calling for:

- Immediately call for **power down** of the active airguns to one operating airgun (40 CI or 10 CI mitigation gun) when a positively identified whale species not included in Table 1 is seen within or about to enter the zone where they may be exposed to SPLs greater than or equal to 160 dB re 1µPa (rms) of the full array (2 km), but is outside the safety radii of the single active airgun (1 km for 40 CI; 0.5 km for 10 CI).

and

-Immediately call for a **shutdown** of all active airguns when a positively identified whale species not included in Table 1 is seen within or about to enter the zone where they may be exposed to SPLs greater than or equal to 160 dB re 1µPa (rms) of the single airgun (1 km for 40 CI ; 0.5 km for 10 CI).

. Night vision equipment as described in stipulation 7. We will be operating in periods of civil and possibly nautical twilight by the end of our survey period (August 25). Night vision goggles will not be particularly useful/helpful, but we do have one set that we can send North and will be made available to PSOs should they choose to use them. If PSOs request additional night vision equipment, it will be provided as quickly as possible.

. Reporting: the ITS statement has some odd language around reporting. At this point we (i.e., me) are required to call John Kurland weekly in Juneau and follow the phone call up with a written report. Candace is seeking clarification on this internally and will let us know if there is a change. In the meantime, we will plan to send our weekly report to both John Kurland and Candace Nachman. During data acquisition we'll include Candace on our daily PSO reports as a courtesy.

Please let me know if you have any questions,
Chrissy

Chrissy May
Wildlife Compliance Advisor
BP Exploration (Alaska), inc
office: 907.564-4132

From: Patti Haase <Patti@SmulteaSciences.com> **Date:** Friday, August 8, 2014 at 11:32 AM **To:** Lisanne Aerts <lisanne@lamaecological.com> **Cc:** Bridget Watts <bridgetwatts@smulteasciences.com> **Subject:** Re: FW: Night Vision Goggle Info

Hi Lisanne. A few thoughts about NVDs that you're welcome to forward to whomever. Bridget and I have used NVD PVS-7 Gen 3 goggles on Scripps' seismic cruises only to clear the safety radii when airguns need to start up at night. You can probably see 100-200 m under the best conditions: no cloud cover, calm seas. When ambient light decreases due to increased cloud cover, visibility decreases dramatically and at these times we were unable to see even 50 m with the goggles. Also, any light coming from the ship has to be extinguished. The reflection off structures of any light coming out of windows, for example, can be blinding, blacking out the water behind.

---------- Forwarded message ----------From: "Mark Cotter" < markpcotter@hotmail.com> Date: Aug 8, 2014 2:14 PM Subject: NVDs To: "bridgetwatts@smulteasciences.com" <bridgetwatts@smulteasciences.com> Cc:

My personal experience with night vision devices has been limited to generation 1 and 2 binoculars. I have used them on several occasions from both shorebased and vessel based platforms, but with both scenarios involving searching water for marine mammals - as opposed to pure terrestrial (urban or rural) settings. My overall opinion is that although the technology

has come a long way in the last 10 years, they are not a critical piece of equipment and probably not worthwhile unless you were to use generation 3 or 4 NVD. The limitation in my experience has been because the technology of gen 1 and 2 is to use an infrared illuminator to amplify all available light as it converts photons into electrons to give you the image; it is similar to a flashlight beam (albeit barely visible to human eye) and the effective reach is typically less than ~100 meters. These NVD typically work better when there is ambient light like stars or a bright moon, but tend to fail miserably when there is direct man-made light such as streetlights, cars, boat lights, etc. anywhere near the field of view.

Lastly, there is a big difference between detection ranges (seeing something enough to know it is there) versus recognition range and the clarity that you can see your subject to know exactly what it is. Ideally, if these devices were to be useful the detection ranges would have to be greater, and recognition ranges would have to be great enough to consider using them for marine mammal monitoring. Ultimately, the price points start to increase dramatically with the best devices, and makes me think again if they are really worth much past the novelty of having them.

APPENDIX G. ALL SIGHTINGS TABLE

Sgt Id	Time (AKDT)		Species	Beh 1	Beh 2	Count	Juveniles	Sgt Lat	Sgt Lon	Activity	Array Volume	BfBf	Effort
P1	07-22	10:55:19	Spotted Seal	Swimming	Diving	1	0	70.39800946	-148.5215056	Anchor/Dock	0	2	Opportunistic
P2	07-22	12:11:53	Ringed/Spotted	Looking	Sink	1	0	70.39698844	-148.5109914	Anchor/Dock	0	2	Opportunistic
P3	07-22	12:43:23	Spotted Seal	Swimming	Diving	1	0	70.39796294	-148.5207739	Anchor/Dock	0	2	Opportunistic
P4	07-24	03:57:06	Spotted Seal	Surface Active	None	1	0	70.40530583	-148.5386664	Anchor/Dock	0	2	Opportunistic
P5	07-24	06:16:55	Spotted Seal	Resting	Looking	1	0	70.40610876	-148.5368592	Anchor/Dock	0	3	Opportunistic
P6	07-24	09:14:50	Spotted Seal	Swimming	Looking	1	0	70.40547041	-148.536232	Anchor/Dock	0	4	Opportunistic
P7	07-24	23:01:34	Spotted Seal	Diving	Sink	1	0	70.3981724	-148.5163938	Anchor/Dock	0	3	Opportunistic
P8	07-25	23:56:40	Ringed/Spotted	Diving	None	1	0	70.39438283	-148.5204691	Anchor/Dock	0	3	Opportunistic
P9	07-27	17:16:36	Ringed/Spotted	Looking	Unknown	1	0	70.49280403	-148.5937822	Shooting ON Line	620	3	Seismic Effort
P10	07-27	18:42:42	Ringed/Spotted	Looking	Sink	1	0	70.48453974	-148.6170488	Shooting ON Line	620	3	Seismic Effort
P11	07-27	19:19:34	Beluga Whale	Milling	Swimming	2	0	70.48558282	-148.6226684	Transit	0	3	Non-Seismic Effort
P12	07-27	20:19:43	Ringed/Spotted	Looking	Unknown	1	0	70.48439723	-148.6276765	Shooting OFF Line	620	4	Seismic Effort
P13	07-27	22:52:00	Ringed/Spotted	Looking	Unknown	1	0	70.48532414	-148.6200649	Shooting ON Line	620	3	Seismic Effort
M1	07-28	13:08:23	Spotted Seal	Swimming	Diving	1	0	70.40421823	-148.5367629	Anchor/Dock	0	3	Opportunistic
M2	07-28	19:25:07	Spotted Seal	Swimming	Looking	1	0	70.4183761	-148.5135362	No/Slow speed	0	2	Opportunistic
M3	07-29	08:57:50	Spotted Seal	Looking	Sink	1	0	70.40160211	-148.515382	Transit	0	3	Non-Seismic Effort
M4	07-29	09:15:43	Unid Seal	Diving	None	1	0	70.40133242	-148.5058439	No/Slow speed	0	3	Opportunistic
P14	07-29	16:09:41	Ringed/Spotted	Swimming	Sink	1	0	70.39223491	-148.5210451	Anchor/Dock	0	3	Opportunistic
P15	07-29	17:25:22	Ringed/Spotted	Swimming	Diving	1	0	70.39394682	-148.521386	Anchor/Dock	0	2	Opportunistic
M5	07-29	17:29:43	Spotted Seal	Swimming	Diving	1	0	70.39659031	-148.519761	Shooting ON Line	620	3	Seismic Effort
P16	07-29	17:48:47	Ringed/Spotted	Diving	Unknown	1	0	70.39794662	-148.5188955	No/Slow speed	0	3	Opportunistic
P17	07-29	18:40:53	Ringed/Spotted	Surface Active	Diving	1	0	70.39791389	-148.5190672	No/Slow speed	0	3	Opportunistic
P18	07-29	19:24:38	Ringed/Spotted	Swimming	Sink	1	0	70.39885813	-148.51863	Anchor/Dock	0	1	Opportunistic
M6	07-30	01:36:42	Spotted Seal	Sink	Looking	1	0	70.39700325	-148.5314617	Anchor/Dock	0	0	Opportunistic
P19	07-30	03:55:49	Ringed Seal	Diving	Unknown	1		70.40914685	-148.3313739	Shooting OFF Line	620	1	Seismic Effort
P20	07-30	04:26:56	Ringed/Spotted	Looking	Unknown	1	0	70.40705083	-148.3622181	Transit	0	1	Non-Seismic Effort
P21	07-30	04:41:08	Unid Seal	Swimming	Diving	1	0	70.40047519	-148.3955632	Transit	0	1	Non-Seismic Effort
M7	07-31	02:08:05	Ringed/Spotted	Looking	Diving	1	0	70.33320739	-148.3762472	Shooting ON Line	620	5	Seismic Effort
P22	07-31	05:20:16	Ringed/Spotted	Swimming	Unknown	1	0	70.45284104	-148.4546515	Shooting ON Line	620	4	Seismic Effort

Sgt Id	Time (AKDT)	Species	Beh 1	Beh 2	Count	Juveniles	Sgt Lat	Sgt Lon	Activity	Array Volume	BfBf	Effort
M8	08-01 21:46:12	Spotted Seal	Swimming	Diving	1	0	70.3983524	-148.5165	No/Slow speed	0	4	Opportunistic
M9	08-06 07:45:12	Spotted Seal	Swimming	Diving	1	0	70.42131706	-148.5281223	Transit	0	2	Non-Seismic Effort
P23	08-07 04:20:23	Ringed/Spotted	Resting	Looking	1		70.41681672	-148.5359676	Transit	0	4	Non-Seismic Effort
M10	08-07 11:04:09	Spotted Seal	Looking	Diving	1	0	70.41198618	-148.5483641	Transit	0	6	Non-Seismic Effort
P24	08-11 12:27:28	Ringed/Spotted	Looking	Sink	1	0	70.41883201	-148.5538292	No/Slow speed	0	4	Opportunistic
P25	08-11 12:30:40	Ringed/Spotted	Looking	Swimming	1	0	70.41996702	-148.5535643	No/Slow speed	0	4	Opportunistic
P26	08-11 13:42:41	Spotted Seal	Looking	Sink	1	0	70.45670281	-148.5486417	Shooting OFF Line	620	5	Seismic Effort
P27	08-11 13:51:26	Ringed/Spotted	Looking	Sink	1	0	70.45528461	-148.5502969	Shutdown (mammal)	0	5	Non-Seismic Effort
P28	08-11 15:18:00	Unid Seal	Looking	Sink	1	0	70.44762437	-148.5634693	Transit	0	5	Non-Seismic Effort
P29	08-11 15:55:53	Unid Seal	Looking	Unknown	1	0	70.41925144	-148.5456832	Transit	0	5	Non-Seismic Effort
M11	08-11 16:58:41	Spotted Seal	Looking	Diving	1	0	70.41423237	-148.5394777	Transit	0	4	Non-Seismic Effort
M12	08-15 07:25:49	Spotted Seal	Swimming	Sink	1	0	70.39819768	-148.5282676	Anchor/Dock	0	4	Opportunistic
M13	08-16 18:57:41	Ringed/Spotted	Looking	Sink	1	0	70.41759233	-148.5366406	Transit	0	4	Non-Seismic Effort
P30	08-17 05:02:58	Unid Seal	Swimming	Sink	1	0	70.41256027	-148.5362498	Anchor/Dock	0	2	Opportunistic
P31	08-17 08:13:12	Unid Seal	Swimming	Diving	1	0	70.40543427	-148.5521154	Anchor/Dock	0	1	Opportunistic
P32	08-17 14:18:42	Unid Seal	Swimming	Sink	1	0	70.41540065	-148.5324065	Transit	0	4	Non-Seismic Effort
P33	08-18 04:48:51	Unid Seal	Swimming	Diving	1	0	70.40458297	-148.2337792	Shooting ON Line	620	1	Seismic Effort
M14	08-18 08:22:41	Spotted Seal	Sink	Resting	1	0	70.36941519	-148.1092847	Shooting OFF Line	510	1	Seismic Effort
P34	08-18 09:38:50	Unid Seal	Resting	Milling	1	0	70.36569051	-148.1561632	Shooting ON Line	620	0	Seismic Effort
P35	08-18 09:54:58	Unid Seal	Looking	Unknown	1	0	70.3722308	-148.1732253	Shooting OFF Line	370	0	Seismic Effort
P36	08-18 11:15:29	Spotted Seal	Looking	Diving	1	0	70.42887617	-148.3633262	Transit	0	1	Non-Seismic Effort
P37	08-18 11:25:05	Ringed/Spotted	Looking	Sink	1	0	70.42631112	-148.4252181	Transit	0	1	Non-Seismic Effort
P38	08-18 21:54:59	Unid Seal	Looking	Diving	1	0	70.42528134	-148.3566431	Transit	0	1	Non-Seismic Effort
M15	08-19 06:35:33	Ringed/Spotted	Resting	Diving	1	0	70.38719102	-148.1445628	Shooting ON Line	510	1	Seismic Effort
M16	08-19 08:55:17	Ringed/Spotted	Diving	Unknown	1	0	70.37246184	-148.243707	Shooting ON Line	510	3	Seismic Effort
P39	08-19 14:52:55	Unid Seal	Swimming	Diving	1	0	70.40521739	-148.2030301	Shooting ON Line	550	0	Seismic Effort
M17	08-19 15:55:05	Ringed Seal	Swimming	Diving	1	0	70.36375243	-148.1030742	Shooting ON Line	510	1	Seismic Effort
M18	08-19 16:16:09	Ringed/Spotted	Swimming	Looking	1	0	70.35818861	-148.1279058	Shooting ON Line	510	1	Seismic Effort
P40	08-19 16:25:24	Beluga Whale	Swimming	Diving	6	2	70.41451771	-148.183459	Shooting ON Line	550	1	Seismic Effort
M19	08-19 16:27:52	Spotted Seal	Swimming	Diving	1	1	70.35744299	-148.1095502	Shooting ON Line	510	1	Seismic Effort
P41	08-19 17:30:56	Unid Seal	Swimming	Diving	1	0	70.40634686	-148.1210849	Shooting ON Line	550	1	Seismic Effort

Sgt Id	Time (AKDT)	Species	Beh 1	Beh 2	Count	Juveniles	Sgt Lat	Sgt Lon	Activity	Array Volume	BfBf	Effort
P42	08-19 18:59:09	Unid Seal	Looking	Sink	1	0	70.38870436	-148.259204	Shooting ON Line	550	1	Seismic Effort
P43	08-19 20:25:52	Ringed/Spotted	Swimming	Unknown	1		70.39530207	-148.2028422	Shooting ON Line	550	0	Seismic Effort
P44	08-19 21:02:42	Unid Seal	Diving	Unknown	1	0	70.40683374	-148.2407586	Shooting ON Line	550	0	Seismic Effort
P45	08-19 21:13:32	Unid Seal	Swimming	Unknown	1	0	70.38709294	-148.2465951	Shooting ON Line	550	0	Seismic Effort
M20	08-20 07:29:29	Polar Bear	Resting	None	3	2	70.36039699	-148.2253188	No/Slow speed	0	2	Opportunistic
M21	08-21 08:42:43	Spotted Seal	Swimming	Looking	1	0	70.38066554	-148.1295007	No/Slow speed	0	2	Opportunistic
M22	08-21 08:56:00	Spotted Seal	Swimming	Diving	1	1	70.38145743	-148.1391818	No/Slow speed	0	2	Opportunistic
P46	08-21 18:08:42	Beluga Whale	Swimming	Diving	2	0	70.42896198	-148.2448741	Anchor/Dock	10	1	Seismic Effort
P47	08-21 18:30:52	Bearded Seal	Swimming	Looking	1	0	70.43026105	-148.233655	Anchor/Dock	10	1	Seismic Effort
M23	08-21 19:30:04	Spotted Seal	Looking	Sink	1	0	70.39656495	-148.1105765	No/Slow speed	0	1	Opportunistic
M24	08-22 06:28:43	Ringed/Spotted	Looking	Sink	1	0	70.36531137	-148.0389806	Shooting ON Line	510	2	Seismic Effort
P48	08-22 08:14:35	Unid Seal	Sink	Unknown	1	0	70.36019574	-148.0633265	Shooting ON Line	620	2	Seismic Effort
P49	08-22 09:41:34	Unid Seal	Sink	None	1	0	70.37985758	-148.1425428	Shooting ON Line	620	0	Seismic Effort
P50	08-22 11:27:54	Unid Seal	Swimming	Diving	1	0	70.41476473	-148.213061	Shooting OFF Line	620	1	Seismic Effort
P51	08-22 11:33:30	Ringed/Spotted	Swimming	Diving	1	0	70.42247092	-148.1954	Shutdown (non-mammal)	0	1	Non-Seismic Effort
P52	08-23 07:25:40	Unid Seal	Looking	Sink	1	0	70.41998567	-148.1564626	Anchor/Dock	0	1	Non-Seismic Effort
P53	08-23 07:49:06	Ringed/Spotted	Looking	Sink	2	0	70.42959007	-148.2017069	Anchor/Dock	0	2	Non-Seismic Effort
P54	08-23 08:00:26	Spotted Seal	Looking	Sink	1	0	70.43059787	-148.2007965	Anchor/Dock	0	2	Non-Seismic Effort
P55	08-23 08:23:49	Spotted Seal	Looking	Sink	1	0	70.4271621	-148.1970582	Anchor/Dock	0	2	Non-Seismic Effort
P56	08-23 10:14:04	Spotted Seal	Looking	Sink	1	0	70.43118377	-148.1998066	Anchor/Dock	0	1	Non-Seismic Effort
P57	08-23 13:08:58	Spotted Seal	Milling	Surface Active	1	0	70.42282726	-148.0224621	Shutdown (non-mammal)	0	1	Non-Seismic Effort
P58	08-23 13:50:56	Unid Seal	Surface Active	Diving	1	0	70.4152126	-148.0039251	Shooting OFF Line	620	0	Seismic Effort
P59	08-23 13:53:41	Unid Seal	Swimming	Sink	1	0	70.42018831	-148.0153418	Shooting OFF Line	620	0	Seismic Effort
P60	08-23 14:12:34	Spotted Seal	Swimming	Diving	1	0	70.41810862	-148.0272635	Ramp Up	40	0	Seismic Effort
M25	08-23 14:49:34	Unid Seal	Resting	Diving	1	0	70.3748561	-148.0756681	Shooting ON Line	510	1	Seismic Effort
M26	08-23 15:16:18	Ringed/Spotted	Looking	Diving	1	0	70.38667093	-147.9914099	Shooting OFF Line	510	1	Seismic Effort
P61	08-23 16:16:50	Unid Seal	Looking	Sink	1	0	70.42391818	-148.1768928	Shooting ON Line	550	0	Seismic Effort
P62	08-23 16:48:10	Spotted Seal	Other	Resting	1	0	70.41420743	-148.049301	Shooting ON Line	550	0	Seismic Effort
P63	08-23 17:00:08	Bearded Seal	Swimming	Diving	1	0	70.41116228	-148.051327	Transit	0	0	Non-Seismic Effort
M27	08-23 18:12:12	Spotted Seal	Resting	Diving	1	0	70.3746638	-148.0132293	Shooting ON Line	510	0	Seismic Effort
M28	08-23 19:02:22	Spotted Seal	Resting	Diving	1	0	70.3743691	-147.9634136	Shooting ON Line	510	0	Seismic Effort

Sgt Id	Time (AKDT)	Species	Beh 1	Beh 2	Count	Juveniles	Sgt Lat	Sgt Lon	Activity	Array Volume	BfBf	Effort
M29	08-23 19:22:30	Spotted Seal	Resting	Swimming	1	0	70.37272991	-148.0135967	Shooting ON Line	510	0	Seismic Effort
M30	08-23 19:25:47	Ringed/Spotted	Resting	Looking	1	0	70.37676434	-148.036613	Shooting ON Line	510	0	Seismic Effort
M31	08-23 19:38:54	Spotted Seal	Looking	Swimming	1	0	70.37040899	-148.0728069	Shooting ON Line	510	0	Seismic Effort
M32	08-23 19:46:09	Beluga Whale	Sink	Milling	1	0	70.37766198	-148.0721843	Transit	0	0	Non-Seismic Effort
M33	08-23 19:48:38	Ringed/Spotted	Looking	Sink	2	0	70.37839046	-148.0659232	Transit	0	0	Non-Seismic Effort
P64	08-23 19:51:53	Unid Seal	Looking	Sink	1	0	70.41248477	-147.9729871	Shooting ON Line	550	1	Seismic Effort
P65	08-23 19:54:45	Unid Seal	Looking	Sink	2	0	70.41688557	-147.9630256	Shooting ON Line	550	1	Seismic Effort
P66	08-23 19:56:37	Unid Seal	Looking	Diving	1	0	70.41701378	-147.9639533	Shooting ON Line	550	1	Seismic Effort
P67	08-23 19:59:09	Unid Seal	Looking	Sink	1	0	70.41275383	-147.9511782	Transit	0	1	Non-Seismic Effort
M34	08-23 20:00:46	Ringed/Spotted	Looking	Sink	1	0	70.37276772	-148.0382275	Transit	0	0	Non-Seismic Effort
M35	08-23 20:09:11	Ringed/Spotted	Looking	Sink	1	0	70.37184724	-148.0009848	Transit	0	0	Non-Seismic Effort
P68	08-23 21:10:12	Unid Seal	Swimming	Diving	1	0	70.39969319	-148.0663859	Shooting ON Line	550	1	Seismic Effort
M36	08-23 21:37:27	Spotted Seal	Looking	Sink	1	0	70.36441413	-147.9270558	Shooting OFF Line	510	0	Seismic Effort
P69	08-23 21:59:16	Unid Seal	Looking	Sink	1	0	70.40202222	-148.0542458	Shooting ON Line	550	1	Seismic Effort
M37	08-23 22:34:48	Beluga Whale	Swimming	Diving	1	0	70.35749038	-147.9344073	Shooting OFF Line	510	2	Seismic Effort
M38	08-23 22:47:32	Beluga Whale	Swimming	Diving	1	0	70.36249532	-147.9487149	Shooting ON Line	510	2	Seismic Effort
M39	08-23 22:51:49	Ringed/Spotted	Looking	Sink	1	0	70.36297782	-147.9508108	Shooting ON Line	510	2	Seismic Effort
M40	08-23 22:53:43	Ringed/Spotted	Looking	Sink	1	0	70.35789883	-147.957158	Shooting ON Line	510	2	Seismic Effort
M41	08-23 22:57:42	Ringed/Spotted	Sink	Diving	1	0	70.35896917	-147.9629821	Shooting ON Line	510	2	Seismic Effort
M42	08-23 23:01:54	Ringed Seal	Looking	Sink	1	0	70.36014054	-147.9582617	Shooting OFF Line	40	2	Seismic Effort
M43	08-23 23:04:02	Beluga Whale	Swimming	Diving	1	0	70.36265002	-147.952249	Shooting OFF Line	40	2	Seismic Effort
P70	08-24 06:58:25	Polar Bear	Resting	None	1	0	70.39601864	-148.5731814	Anchor/Dock	0	3	Non-Seismic Effort
P71	08-24 15:13:39	Spotted Seal	Milling	Surface Active	2	0	70.39579208	-148.5201248	Anchor/Dock	0	3	Non-Seismic Effort
P72	08-24 16:41:03	Spotted Seal	Swimming	Surface Active	1	0	70.39268601	-148.5117413	No/Slow speed	0	1	Non-Seismic Effort
P73	08-24 16:52:32	Polar Bear	Swimming	Surface Active	1	0	70.39569258	-148.5234342	Anchor/Dock	0	2	Non-Seismic Effort
P74	08-24 17:02:29	Unid Seal	Looking	Sink	1	0	70.39560758	-148.5228964	Anchor/Dock	0	2	Non-Seismic Effort
P75	08-24 17:42:10	Unid Seal	Swimming	Diving	1	0	70.39578774	-148.5234214	Anchor/Dock	0	1	Non-Seismic Effort
P76	08-24 18:21:34	Ringed/Spotted	Swimming	Sink	1	0	70.41188356	-148.5231818	Transit	0	1	Non-Seismic Effort
P77	08-24 18:37:12	Unid Seal	Looking	Sink	1	0	70.42352785	-148.5551299	Transit	0	1	Non-Seismic Effort
P78	08-25 06:04:21	Polar Bear	Walking		1	0	70.40217558	-148.5956042	Shooting OFF Line	620	3	Seismic Effort
P79	08-25 07:13:47	Ringed/Spotted	Looking	Sink	1	0	70.42620441	-148.4694432	Shooting ON Line	620	4	Seismic Effort

Sgt Id	Time (AKDT)	Species	Beh 1	Beh 2	Count	Juveniles	Sgt Lat	Sgt Lon	Activity	Array Volume	BfBf	Effort
P80	08-25 14:23:38	Polar Bear	Walking	None	1	0	70.47699586	-148.3008021	Shooting OFF Line	620	3	Seismic Effort
P81	08-25 18:43:47	Polar Bear	Swimming	Diving	1	0	70.46028766	-148.4979517	Shooting ON Line	620	5	Seismic Effort
P82	08-25 20:50:27	Polar Bear	Walking		2	0	70.48749263	-148.3990296	Shooting OFF Line	620	5	Seismic Effort

APPENDIX H. BELUGA SIGHTINGS TABLE

Sgt Id	Time (AKDT)	Species	Beh 1	Beh 2	Count	Juveniles	Sgt Lat	Sgt Lon	Activity	Array Volume	BfBf	Effort
P11	07-27 19:19:34	Beluga Whale	Milling	Swimming	2		70.48558282	-148.6226684	Transit	0	3	Non-Seismic Effort
P40	08-19 16:25:24	Beluga Whale	Swimming	Diving	6	2	70.41451771	-148.183459	Shooting ON Line	550	1	Seismic Effort
P46	08-21 18:08:42	Beluga Whale	Swimming	Diving	2		70.42896198	-148.2448741	Anchor/Dock	10	1	Seismic Effort
M32	08-23 19:46:09	Beluga Whale	Sink	Milling	1	0	70.37766198	-148.0721843	Transit	0	0	Non-Seismic Effort
M37	08-23 22:34:48	Beluga Whale	Swimming	Diving	1	0	70.35749038	-147.9344073	Shooting OFF Line	510	2	Seismic Effort
M38	08-23 22:47:32	Beluga Whale	Swimming	Diving	1	0	70.36249532	-147.9487149	Shooting ON Line	510	2	Seismic Effort
M43	08-23 23:04:02	Beluga Whale	Swimming	Diving	1	0	70.36265002	-147.952249	Shooting OFF Line	40	2	Seismic Effort

APPENDIX I. SHUTDOWN CORRESPONDENCE

Sent: Tuesday, August 05, 2014 4:52 AM
To: Streever, Bill J
Cc: Brad Smith - NOAA Federal; Lisanne Aerts; May, Christina H; Alicia Bishop - NOAA Federal
Subject: Re: seal potentially exposed to two airgun pulses at about 100 to 200 m distance

Bill,
Thanks for this information. I have cc'd her here, but Alicia Bishop should be on all such communications. She is the Alaska Regional office staff biologist who worked on the ESA Section 7 consultation for this project and therefore should be informed immediately of such events as well.

Thanks,
Candace

On Mon, Aug 4, 2014 at 6:51 PM, Streever, Bill J <Bill.Streever@bp.com> wrote:
Hi Brad. We'll add you to the reporting. I know others at NMFS are on the list and had assumed that it would be shared around, but it will be easy enough to put one more name on the recipient list. Liasnne, can you confirm that Brad will be added to the list? –bill

From: Brad Smith - NOAA Federal [mailto:brad.smith@noaa.gov]
Sent: Monday, August 04, 2014 2:21 PM
To: Streever, Bill J
Cc: Candace Nachman - NOAA Federal; Lisanne Aerts; May, Christina H
Subject: Re: seal potentially exposed to two airgun pulses at about 100 to 200 m distance

Thanks Bill, was the firing after shutdown just from the mitigation gun or full array?

On Mon, Aug 4, 2014 at 2:03 PM, Streever, Bill J <Bill.Streever@bp.com> wrote:

Hi Candace and Brad.

See below. At this time, there is no clear way to understand if the two "pops" that were inadvertently fired after the shutdown were from a single gun, a partial array, or the full array. As I understand it, the seal was sighted by one MMO. The seal did not display any unusual behavior at that time. As often happens, the seal was not seen after the initial shutdown. Let me know if you have any questions or if you would like any additional follow up. In the meantime, we will let you know if we learn any more on our end. –bill

Bill Streever, Ph.D.
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From: Lisanne Aerts [mailto:lisanne@LAMAECOLOGICAL.COM]
Sent: Saturday, August 02, 2014 10:40 AM
To: Streever, Bill J; May, Christina H
Subject: Glitch in shutdown protocol
Bill, Chrissy,

It seems that on July 31 we had a glitch in the shutdown protocol. We have put measures in place to prevent it from happening in the future. Below a short summary:

At 2:08 am in the morning of 7/31 the PSO on the Maxime called for a shutdown for a ringed/spotted seal seen at an estimated distance of 55 m from the vessel. The seal looked at the boat, then dove, in a direction away from the vessel. The vessel was traveling at about 4 knots and the 620 CI gun array was operating. The PSO called for a shutdown. The navigator, who controls the airgun activation, disabled the guns that then stopped popping. However, about 1 minute later an airgun was heard, and by the time that the lead PSOs was down at the gun shack to check what happened, an airgun popped again after another minute. We are not sure why (and which) gun(s) popped, but it seems they were activated in ramp up mode (i.e. one pop per minute). With a speed of ~4 knots the vessel was about 100 m away from where the seal was spotted during the first pop, and 200 m away when the gun popped a second time. I do not know the volume of the gun(s) that popped accidentally.

Lessons learned:

1. Test radio shutdown request to make sure that the gunner who is on the back deck can hear the command.

2. Any time a new gun or navigator crew comes aboard, the lead PSO will ensure to go over the shutdown/power down communication protocol, i.e., what the PSOs will say and the response from the gunner. Shutdown/Power down/Ramp up procedure one-pager and flow diagrams will be placed in the gun shack where they are more easily visible.

3. The PSO Supervisor will inform the lead PSO when new gun crew arrives. The lead PSO and navigator will go through the protocols and test radio communication before airgun operations can start.
Please let me know if you have questions.
~~Lisanne
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LAMA Ecological
Ph: (907) 268-1970 | lisanne@lamaecological.com
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Candace Nachman

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Web: http://www.nmfs.noaa.gov/pr/

From: Candace Nachman - NOAA Federal [mailto:candace.nachman@noaa.gov]
Sent: Wednesday, August 27, 2014 6:28 AM
To: Streever, Bill J
Cc: Sloan, Pete; Brad Smith - NOAA Federal; Ruddy, Pauline; MacKenzie, Amy; Platt, Janet D; May, Christina H; Wyman,
Larry; Lisanne Aerts

Subject: Re: delayed shutdown on Peregrine

Thank you for the information Bill. I do not have any questions.
Candace

On Sun, Aug 24, 2014 at 5:47 PM, Streever, Bill J <Bill.Streever@bp.com> wrote:

Hi all.

I'm emailing to report a delayed shutdown on the North Prudhoe Bay operation that occurred on 23 August at about 1700. A PSO on the Peregrine sighted a spotted seal at an estimated distance of 50 m from the vessel and called for a shutdown. Shutdown implementation time was 30 seconds during which the array, operating airguns with a cumulative volume of 550 cubic inches (i.e., a partial array), fired twice before being disabled. The delayed shutdown, according to reports from the field, appears to be related to the presence of a relatively inexperienced navigator on the bridge of the Peregrine. Although the inexperienced navigator was teamed with an experienced navigator, his reaction time to the PSO's command for a shutdown was delayed.
Following the event, Larry Wyman, BP Project Manager, implemented a stand down on both the Peregrine and the Maxime for both shifts to discuss the incident. As I understand it, discussions led to changes in training of navigators and changes in handover communications between shifts.

Please let me or Chrissy May know if you have any questions.

--bill
Bill Streever, Ph.D.

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"Everywhere in the world, people want to make a living without destroying their environment. It's up to science,
technology and corporate leadership to find a way to make a living without destroying their environment." --E.O. Wilson
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