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DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

RIN 0648-XD782

Takes of Marine Mammals Incidental to Specified Activities; Taking Marine Mammals Incidental to Marine Seismic Survey in the Beaufort Sea, Alaska

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Notice; issuance of an incidental take authorization.

SUMMARY: In accordance with the Marine Mammal Protection Act (MMPA) regulations, notification is hereby given that NMFS has issued an Incidental Harassment Authorization (IHA) to SAExploration, Inc. (SAE) to take, by harassment, small numbers of marine mammals incidental to a marine 3-dimensional (3D) ocean bottom node (OBN) seismic survey program in the Beaufort Sea, Alaska, during the 2015 Arctic open-water season.

DATES: Effective July 1, 2015, through October 15, 2015.

ADDRESSES: Inquiry for information on the incidental take authorization should be addressed to Jolie Harrison, Chief, Permits and Conservation Division, Office of Protected Resources, National Marine Fisheries Service, 1315 East West Highway, Silver Spring, MD 20910. A copy of the application containing a list of the references used in this document, NMFS' Environmental Assessment (EA) and Finding of No Significant Impact (FONSI), and the IHA may be obtained by writing to the address specified above, telephoning the contact listed below

(see **FOR FURTHER INFORMATION CONTACT**), or visiting the Internet at: *http://www.nmfs.noaa.gov/pr/permits/incidental.htm#applications*.

Documents cited in this notice may be viewed, by appointment, during regular business hours, at the aforementioned address.

FOR FURTHER INFORMATION CONTACT: Shane Guan, Office of Protected Resources, NMFS, (301) 427-8401.

SUPPLEMENTARY INFORMATION:

Background

Sections 101(a)(5)(A) and (D) of the MMPA (16 U.S.C. 1361 *et seq*.) direct the Secretary of Commerce to allow, upon request, the incidental, but not intentional, taking of small numbers of marine mammals by U.S. citizens who engage in a specified activity (other than commercial fishing) within a specified geographical region if certain findings are made and either regulations are issued or, if the taking is limited to harassment, a notice of a proposed authorization is provided to the public for review.

An authorization for incidental takings shall be granted if NMFS finds that the taking will have a negligible impact on the species or stock(s), will not have an unmitigable adverse impact on the availability of the species or stock(s) for subsistence uses (where relevant), and if the permissible methods of taking and requirements pertaining to the mitigation, monitoring and reporting of such takings are set forth. NMFS has defined "negligible impact" in 50 CFR 216.103 as "an impact resulting from the specified activity that cannot be reasonably expected to, and is not reasonably likely to, adversely affect the species or stock through effects on annual rates of recruitment or survival."

Except with respect to certain activities not pertinent here, the MMPA defines "harassment" as: any act of pursuit, torment, or annoyance which (i) has the potential to injure a marine mammal or marine mammal stock in the wild [Level A harassment]; or (ii) has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering [Level B harassment].

Summary of Request

On December 2, 2014, NMFS received an application from SAE for the taking of marine mammals incidental to a 3D ocean bottom node (OBN) seismic survey program in the Beaufort Sea. After receiving NMFS comments, SAE made revisions and updated its IHA application on December 5, 2014, January 21, 2015, January 29, 2015, and again on February 16, 2015. In addition, NMFS received the marine mammal mitigation and monitoring plan (4MP) from SAE on December 2, 2014, with an updated version on January 29, 2015. NMFS determined that the application and the 4MP were adequate and complete on February 17, 2015.

SAE proposes to conduct 3D OBN seismic surveys in the state and federal waters of the U.S. Beaufort Sea during the 2015 Arctic open-water season. The proposed activity would occur between July 1 and October 15, 2015. The actual seismic survey is expected to take approximately 70 days, dependent on weather. The following specific aspects of the proposed activities are likely to result in the take of marine mammals: seismic airgun operations and associated navigation sonar and vessel movements. Takes, by Level A and/or Level B Harassments, of individuals of six species of marine mammals are anticipated to result from the specified activity.

SAE also conducted OBN seismic surveys in the Beaufort Sea in the 2014 Arctic open-water season (79 FR 51963; September 2, 2014).

Detailed descriptions of SAE's 3D OBN seismic survey program are provided in the **Federal Register** notice for the proposed IHA (80 FR 20084; April 14, 2015). No change has been made in the action described in the **Federal Register** notice. Please refer to that document for detailed information about the activities involved in the seismic survey program.

Comments and Responses

A notice of NMFS' proposal to issue an IHA to SAE was published in the **Federal Register** on April 14, 2015 (80 FR 20084). That notice described in detail SAE's activity, the marine mammal species that may be affected by the activity, and the anticipated effects on marine mammals and the availability of marine mammals for subsistence uses. During the 30-day public comment period, NMFS received only one comment letter from the Marine Mammal Commission (Commission). All comments are addressed in this section of the **Federal Register** notice.

Comment 1: The Commission points out that information regarding the specific areas that would be surveyed by SAE, or specific times of year for the survey, was not available as part of the proposed incidental harassment authorization. The Commission recommends that, prior to issuing the IHA, NMFS require SAE to determine what areas it will survey and when, in order to ensure that the proposed survey area and associated numbers of takes are consistent with what NMFS plans to authorize and, if they are not, amend the numbers of takes accordingly.

Response: Although a specific survey area for SAE's proposed 3D OBN seismic survey has not been determined, and probably will be remain confidential until the beginning of the survey, the potential area is known and all scenarios of the proposed survey have been

considered and evaluated for impact assessment. As described in the **Federal Register** notice (80 FR 20084; April 14, 2015) for the proposed IHA, the worst-case scenario related to location (with the highest animal density) is taken into consideration for the analysis of the marine mammal impacts.

Comment 2: The Commission points out that the total survey area for the project, 777 km^2, appears low since it equates to roughly four times the size of each recording patch (192 km^2). The Commission further notes that SAE has indicated that each patch would take about four days to shoot, which means that if the proposed total survey are of 777 km^2 is indeed accurate, SAE would be able to shoot that area within 16 days instead of 49 days.

Response: The Commission has confused shot patch size (192 km^2) and recording patch size (19.4 km^2). The shot patches greatly overlap with one another, while the recorder patches do not. Considering the tremendous overlap in shot area between adjacent patches, no more than 777 km^2 will be shot under this authorization, although many areas will be shot more than once. It actually would take much longer than 49 days if SAE wanted to completely survey the entire777 km^2.

Comment 3: The Commission states that it is concerned that the method used by SAE and NMFS to estimate numbers of takes is based on the total ensonified area rather than the area expected to be ensonified on a daily basis, as is standard for a moving sound source. The Commission recommends that NMFS use the method of area times density times the number of survey days to estimate the total number of Level A and B harassment takes for each of the marine mammal species expected to be in the project area.

Response: Despite that in most cases monitoring reports from 3D seismic surveys showed that take numbers, based on observation with adjustment to count for animals missed,

are usually under or closely reflect the take estimates using a simple method of multiplying the total ensonified area by animal density, NMFS recognizes that such method has its limitation of not considering animal movement into the area on different days. The Commission's recommended method of area times density times the number of survey days provides an appropriate estimated of the *instances* of take, but often overestimates the number of individuals taken, because in many circumstances individual animals would be repeatedly taken. Except in rare cases when animals are migrating through the ensonified area, the "instances" of take generated by this method are higher than the individuals taken, given that in many cases marine mammals are using local habitat for multiple days and will be taken multiple times – and therefore, additional work may be needed to identify the likely numbers individuals taken to compare to the population size. NMFS is exploring new methodologies to calculate take estimates by accounting for daily ensonified area, days of the project, as well as the averaged rates of animal moving in/out of the survey area, prior monitoring report data, and other applicable information, if available. In the case of SAE's 3D OBN seismic survey, NMFS recalculated take numbers using daily ensonified area multiplied by project days multiplied by animal density and then adjusted the turnover rates based on species movement patterns and home ranges. A detailed description of the take estimates and the methodology are provided in section "**Estimated Take by Incidental Harassment**" below.

Comment 4: The Commission notes that NMFS is proposing to authorize the incidental taking of marine mammals by Level A harassment under section 101(a)(5)(D) of the MMPA, instead of through regulations under section 101(a)(5)(A) of the MMPA. The Commission states that authorizing Level A harassment under section 101(a)(5)(D) of the MMPA would be inconsistent with the intent of the MMPA. The Commission recommends that NMFS (1)

develop criteria for determining when taking by Level A harassment should be authorized (i.e., types of sound sources, project locations, species, effectiveness of mitigation measures) and (2) authorize any such takes through regulation under 101(a)(5)(A) of the MMPA and a letter of authorization rather than through an incidental harassment authorization. The Commission further states that it would welcome an opportunity to discuss the development of such criteria with NMFS.

Response: NMFS does not agree with the Commission's statement that Level A harassment cannot be authorized under section 101(a)(5)(D) of the MMPA. The legal requirements and underlying analysis for the issuance of a take authorization (i.e., an IHA) in this particular case do not require the issuance of regulations and a letter of authorization. In order to issue an authorization pursuant to section 101(a)(5)(D) of the MMPA, NMFS must determine that the taking by harassment (Level A and Level B) of small numbers of marine mammal species or stocks will have a negligible impact on affected species or stocks, and will not have an unmitigable adverse impact on the availability of affected species or stocks for taking for subsistence uses. Potential impact on marine mammals incidental to SAE's 3D seismic survey would be limited to harassments only. Therefore, the issuance of an IHA to SAE under section 101(a)(5)(D) of the MMPA meets the legal requirements stated above. However, if there were a potential for serious injury or mortality, NMFS could not issue an IHA. Instead, any incidental take authorization would need to be processed under section 101(a)(5)(A) of the MMPA.

As described here and in the **Federal Register** notice (80 FR 20084; April 14, 2015) for the proposed IHA, permanent hearing threshold shift (PTS) is considered to be injury (Level A Harassment), not serious injury or mortality. Therefore, it is appropriate to issue an incidental

take authorization under 101(a)(5)(D), as we have made the necessary findings (described elsewhere in this document) under that section of the MMPA.

NMFS agrees with the Commission that criteria for determining when taking by Level A harassment should be authorized (i.e., types of sound sources, project locations, species, effectiveness of mitigation measures) will enhance the analysis of marine mammal incidental takes under MMPA, and appreciates the Commission's willingness to be involved in such a process.

Comment 5: The Commission notes that NMFS has proposed that SAE conduct in-situ sound source measurements for the 1,240-in^3 airgun array to ensure accurate characterization of the Level A and B harassment zones for that sound source. The Commission recommends that NMFS verify that any adjustments to the size of the Level A and/or B harassment zones, based on in-situ measurements, are accurate before such adjustments are made.

Response: SAE is required to conduct in-situ sound source measurements for the 1,240-in^3 airgun array before the commencement of its 3D seismic surveys. The Commission did not specify a method for how the in-situ measurements should be verified. Nevertheless, NMFS will evaluate the empirically measured exclusion zone and zone of influence based on comparable measurements of similar airguns in similar environment before agreeing that SAE should adopt the measured zones for monitoring and mitigation measures.

Comment 6: The Commission recommends that NMFS require that SAE refrain from initiating or cease seismic activities if an aggregation of bowhead or gray whales (i.e., 12 or more whales of any age/sex class that appear to be engaged in a non-migratory, significant biological behavior (e.g., feeding, socializing)) is observed within the Level B harassment Zone.

Response: NMFS discussed the Commission's recommendation with SAE and SAE agrees to refrain from initiating or to cease seismic activities if an aggregation of bowhead or gray whales (i.e., 12 or more whales of any age/sex class that appear to be engaged in a non-migratory, significant biological behavior (e.g., feeding, socializing)) is observed within the Level B harassment Zone.

Comment 7: The Commission recommends that NMFS encourage SAE to coordinate with other operators and researchers who may be conducting aerial surveys with the goal that information collected during those surveys will assist SAE in monitoring pinnipeds use of haul-out sites before, during, and after SAE's planned seismic survey.

Response: NMFS discussed the Commission's recommendation with SAE and encouraged SAE to coordinate with other operations and researchers who may be conducting aerial surveys. SAE responded that they attempted to coordinate with other companies last year for spotted seal monitoring, but none agreed to cooperate. In addition, at this point it is unclear whether any other companies in the Beaufort Sea may be conducting pinnipeds haul-out aerial surveys in the 2015 open-water season. Nevertheless, NMFS encourages SAE again to seek cooperation with other companies who may be conducting aerial surveys with the goal that information collected during those surveys will assist SAE in monitoring pinnipeds use of haul-out sites before, during, and after SAE's planned seismic survey.

Comment 8: The Commission recommends that NMFS incorporate the peer-review panel's recommendations into the final authorization and, if necessary, consult with personnel directly associated with implementing passive acoustic monitoring to ensure that the monitoring objectives are able to be met.

Response: NMFS conducted a peer review process to evaluate SAE's monitoring plan in early March 2015 in Anchorage, AK. The peer review panel submitted its report to NMFS in early April and provided recommendations to SAE. NMFS worked with SAE extensively on these recommendations. As a result, NMFS requires and SAE agrees to implement the following recommendations from the peer-review panel: (1) conducting sound source verification (SSV) if SAE plans to use the 1,240 in^3 airgun array for seismic survey; (2) including an additional mitigation vessel for marine mammal monitoring if SAE plans to use the 1,240 in^3 airgun array; (3) deploying more acoustic sensors than the 2014 season for passive acoustic monitoring; (4) testing a new mooring design with NMFS National Marine Mammal Laboratory for micro Marine Autonomous Recording System (microMARS) to be deployed in shallow water; (5) including sightability curves in the 90-day report; and (6) making monitoring data available for valid scientific reasons and request.

In addition, though not solicited as part of the independent peer review of the monitoring, the peer-review panel also provided a number of mitigation measures which, upon discussion with SAE, the company agreed to limit the mitigation airgun shot interval to 1 shot per minute. However, SAE could not agree to the ramp up of 1 airgun per 5 minutes, as opposed to standard protocol of doubling the number of airguns every five minutes. SAE states that the recommended ramp up protocol is cost prohibitive.

A detailed description of peer-review process, peer-review recommendations, and NMFS' discussion with SAE regarding implementation of the recommendations is provided in "*Monitoring Plan Peer Review*" section below.

Description of Marine Mammals in the Area of the Specified Activity

The Beaufort Sea supports a diverse assemblage of marine mammals. Table 1 lists the 12

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

Table 1. Marine mammal species with confirmed or possible occurrence in the seismic survey area.

Common Name	Scientific Name	Status	Occurrence	Seasonality	Range	Abundance
Odontocetes Beluga whale (Beaufort Sea stock)	*Delphinapterus leucas*	-	Common	Mostly spring and fall with some in summer	Mostly Beaufort Sea	39,258
Beluga whale (eastern Chukchi Sea stock)		-	Common	Mostly spring and fall with some in summer	Mostly Chukchi Sea	3,710
Killer whale**	*Orcinus orca*	-	Occasional/ Extralimital	Mostly summer and early fall	California to Alaska	552
Harbor porpoise**	*Phocoena phocoena*	-	Occasional/ Extralimital	Mostly summer and early fall	California to Alaska	48,215
Narwhal**	*Monodon monoceros*	-				45,358
Mysticetes Bowhead whale*	*Balaena mysticetus*	Endangered; Depleted	Common	Mostly spring and fall with some in summer	Russia to Canada	19,534
Gray whale	*Eschrichtius robustus*	-	Somewhat common	Mostly summer	Mexico to the U.S. Arctic Ocean	19,126
Minke whale**	*Balaenoptera acutorostrata*	-				810-1,003
Humpback whale* ** (Central North Pacific stock)	*Megaptera novaeangliae*	Endangered; Depleted				21,063
Pinnipeds Bearded seal (Beringia distinct population segment)	*Erigathus barbatus*	Candidate	Common	Spring and summer	Bering, Chukchi, and Beaufort Seas	155,000
Ringed seal* (Arctic stock)	*Phoca hispida*	Threatened; Depleted	Common	Year round	Bering, Chukchi, and Beaufort Seas	300,000
Spotted seal	*Phoca largha*	-	Common	Summer	Japan to U.S. Arctic Ocean	141,479
Ribbon seal**	*Histriophoca fasciata*	Species of concern	Occasional	Summer	Russia to U.S. Arctic Ocean	49,000

* Species or stocks listed under the Endangered Species Act.
** Species are so rarely sighted in the proposed project area that take is unlikely

Minke whales are relatively common in the Bering and southern Chukchi Seas and have recently also been sighted in the northeastern Chukchi Sea (Aerts *et al.*, 2013; Clarke *et al.*, 2013). Minke whales are rare in the Beaufort Sea. They have not been reported in the Beaufort Sea during the Bowhead Whale Aerial Survey Project/Aerial Surveys of Arctic Marine Mammals (BWASP/ASAMM) surveys (Clarke *et al.*, 2011, 2012; 2013; Monnet and Treacy, 2005), and there was only one observation in 2007 during vessel-based surveys in the region (Funk *et al.*, 2010). Humpback whales have not generally been found in the Arctic Ocean. However, subsistence hunters have spotted humpback whales in low numbers around Barrow, and there have been several confirmed sightings of humpback whales in the northeastern Chukchi Sea in recent years (Aerts *et al.*, 2013; Clarke *et al.*, 2013). The first confirmed sighting of a humpback whale in the Beaufort Sea was recorded in August 2007 (Hashagen *et al.*, 2009), when a cow and calf were observed 54 mi east of Point Barrow. No additional sightings have been documented in the Beaufort Sea. Narwhal are common in the waters of northern Canada, west Greenland, and in the European Arctic, but rarely occur in the Beaufort Sea (COSEWIC, 2004). Only a handful of sightings have occurred in Alaskan waters (Allen and Angliss, 2013). These three species are not considered further in this proposed IHA notice. Both the walrus and the polar bear could occur in the U.S. Beaufort Sea; however, these species are managed by the U.S. Fish and Wildlife Service (USFWS) and are not considered further in this Notice of Proposed IHA.

The Beaufort Sea is a main corridor of the bowhead whale migration route. The main migration periods occur in spring from April to June and in fall from late August/early

September through October to early November. During the fall migration, several locations in the U.S. Beaufort Sea serve as feeding grounds for bowhead whales. Small numbers of bowhead whales that remain in the U.S. Arctic Ocean during summer also feed in these areas. The U.S. Beaufort Sea is not a main feeding or calving area for any other cetacean species. Ringed seals breed and pup in the Beaufort Sea; however, this does not occur during the summer or early fall. Further information on the biology and local distribution of these species can be found in SAE's application (see **ADDRESSES**) and the NMFS Marine Mammal Stock Assessment Reports, which are available online at: *http://www.nmfs.noaa.gov/pr/species/*.

Potential Effects of the Specified Activity on Marine Mammals

Operating active acoustic sources such as airgun arrays, navigational sonars, and vessel activities have the potential for adverse effects on marine mammals. Potential effects from SAE's 3D OBN seismic surveys on marine mammals in the U.S. Beaufort Sea are discussed in the "**Potential Effects of the Specified Activity on Marine Mammals**" section of the **Federal Register** notice for the proposed IHA (80 FR 20084; April 14, 2015). No changes have been made to the discussion contained in this section of the **Federal Register** notice for the proposed IHA.

Anticipated Effects on Habitat

The primary potential impacts to marine mammal habitat are associated with elevated sound levels produced by airguns and vessels and their effects on marine mammal prey species. These potential effects from SAE's 3D OBN seismic survey are discussed in the "**Anticipated Effects on Marine Mammal Habitat**" section of the **Federal Register** notice for the proposed IHA (80 FR 20084; April 14, 2015). No changes have been made to the discussion contained in this section of the **Federal Register** notice for the proposed IHA.

Mitigation Measures

In order to issue an incidental take authorization under section 101(a)(5)(D) of the MMPA, NMFS must set forth the permissible methods of taking pursuant to such activity, and other means of effecting the least practicable adverse impact on such species or stock and its habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance, and on the availability of such species or stock for taking for certain subsistence uses.

For the SAE open-water 3D OBN seismic surveys in the Beaufort Sea, NMFS is requiring SAE to implement the following mitigation measures to minimize the potential impacts to marine mammals in the project vicinity as a result of its survey activities. The primary purpose of these mitigation measures is to detect marine mammals within or about to enter designated exclusion zones and to initiate immediate shutdown or power down of the airgun(s).

Besides the mitigation measures that were proposed in the **Federal Register** notice (80 FR 20084; March 14, 2015), NMFS included two additional measures that require SAE (1) refrain from initiating or cease seismic activities if an aggregation of bowhead or gray whales (i.e., 12 or more whales of any age/sex class that appear to be engaged in a non-migratory, significant biological behavior (e.g., feeding, socializing)) is observed within the Level B harassment zone; and (2) operate a mitigation airgun at a rate of 1 shot per minute. A detailed discussion of the mitigation measures are provided below.

(1) Establishing Exclusion and Disturbance Zones

Under current NMFS guidelines, the "exclusion zone" for marine mammal exposure to impulse sources is customarily defined as the area within which received sound levels are ≥180 dB (rms) re 1 μPa for cetaceans and ≥190 dB (rms) re 1 μPa for pinnipeds. These safety criteria

are based on an assumption that SPL received at levels lower than these will not injure these animals or impair their hearing abilities, but at higher levels might have some such effects. Disturbance or behavioral effects to marine mammals from underwater sound may occur after exposure to sound at distances greater than the exclusion zones (Richardson *et al.* 1995). Currently, NMFS uses 160 dB (rms) re 1 μPa as the threshold for Level B behavioral harassment from impulse noise.

In 2014, Heath *et al.* (2014) conducted a sound source verification (SSV) of the very same 620-in^3 array SAE plans to use in 2015. The SSV was conducted in generally the same survey area of SAE's planned 2015 work. They empirically determined that the distances to the 190, 180, and 160 dB isopleths for sound pressure levels emanating from the 620-in^3 array was 195, 635, and 1,820 m, respectively (Table 3). Heath *et al.* (2014) also measured sound pressure levels from an active 10-in^3 gun during SAE's 2014 Beaufort operations and found noise levels exceeding 190 dB extended out 54 m, exceeding 180 dB out to 188 m, and exceeding 160 dB out to 1,050 m (Table 2).

Sound source studies have not been done for the 1,240-in^3 array; however, Austin and Warner (2013) conducted a sound source verification of a 1,200-in^3 array operated by SAE in Cook Inlet found the radius to the 190 dB isopleth to be 250 m, to the 180 dB isopleth to be 910 m, and to the 160 dB isopleth to be 5,200 m. These are the distance values SAE intends to use before the SSV for the 1,240 in^3 airgun arrays are obtained before the survey. If SAE plans to use the 1,240 in^3 airgun arrays, SSV of these zones will be empirically measured before the 2015 open-water seismic survey for monitoring and mitigation measures.

Table 2. Summary of airgun array source levels and proposed exclusion zone and zones of influence radii

Array size (in^3)	Source level (dB)	190 dB radius (m)	180 dB radius (m)	160 dB radius (m)
10	195	54	188	1,050
620	218	195	635	1,820
1,240*	224	250	910	5,200

*Denotes modelled source level that need to be empirically measured before the seismic survey.

(2) Vessel Related Mitigation Measures

These mitigation measures apply to all vessels that are part of SAE's Beaufort Sea seismic survey activities, including supporting vessels.

- Avoid concentrations or groups of whales. Operators of vessels should, at all times, conduct their activities at the maximum distance possible from such concentrations or groups of whales.
- If any vessel approaches within 1.6 km (1 mi) of observed 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 whales by taking one or more of the following actions, as appropriate:
    - Reducing vessel speed to less than 5 knots within 300 yards (900 feet or 274 m) of the whale(s);
    - Steering around the whale(s) if possible;
    - Operating the vessel(s) in such a way as to avoid separating members of a group of whales from other members of the group;
    - Operating the vessel(s) to avoid causing a whale to make multiple changes in direction; and
    - Checking the waters immediately adjacent to the vessel(s) to ensure that no whales will be injured when the propellers are engaged.

- Reduce vessel speed, not to exceed 5 knots, when weather conditions require, such as when visibility drops, to avoid the likelihood of injury to whales.

(3) Mitigation Measures for Airgun Operations

The primary requirements for airgun mitigation during the seismic surveys are to monitor marine mammals near the airgun array during all daylight airgun operations and during any nighttime start-up of the airguns and, if any marine mammals are observed, to adjust airgun operations, as necessary, according to the mitigation measures described below. During the seismic surveys, Protected Species Observers (PSOs) will monitor the pre-established exclusion zones for the presence of marine mammals. When marine mammals are observed within, or about to enter, designated safety zones, PSOs have the authority to call for immediate power down (or shutdown) of airgun operations, as required by the situation. A summary of the procedures associated with each mitigation measure is provided below.

Ramp Up Procedure

A ramp up of an airgun array provides a gradual increase in sound levels, and involves a step-wise increase in the number and total volume of airguns firing until the full volume is achieved. The purpose of a ramp up (or "soft start") is to "warn" cetaceans and pinnipeds in the vicinity of the airguns and to provide time for them to leave the area and thus avoid any potential injury or impairment of their hearing abilities.

During the open-water survey program, the seismic operator will ramp up the airgun arrays slowly. Full ramp ups (i.e., from a cold start after a shutdown, when no airguns have been firing) will begin by firing a single airgun in the array (i.e., the mitigation airgun). A full ramp up, after a shutdown, will not begin until there has been a minimum of 30 minutes of observation of the safety zone by PSOs to assure that no marine mammals are present. The entire exclusion

zone must be visible during the 30-minute lead-in to a full ramp up. If the entire exclusion zone is not visible, then ramp up from a cold start cannot begin. If a marine mammal is sighted within the exclusion zone during the 30-minute watch prior to ramp up, ramp up will be delayed until the marine mammal is sighted outside of the exclusion zone or the animal is not sighted for at least 15 minutes, for small odontocetes (harbor porpoise) and pinnipeds, or 30 minutes, for baleen whales and large odontocetes (including beluga and killer whales and narwhal).

Use of a Small-Volume Airgun During Turns and Transits

Throughout the seismic survey, during turning movements and short transits, SAE will employ the use of the smallest-volume airgun (i.e., "mitigation airgun") to deter marine mammals from being within the immediate area of the seismic operations. The mitigation airgun will be operated at approximately one shot per minute and will not be operated for longer than three hours in duration (turns may last two to three hours for the project).

During turns or brief transits (i.e., less than three hours) between seismic tracklines, one mitigation airgun will continue operating. The ramp up procedures described above will be followed when increasing the source levels from the one mitigation airgun to the full airgun array. However, keeping one airgun firing during turns and brief transits will allow SAE to resume seismic surveys using the full array without having to ramp up from a "cold start," which requires a 30-minute observation period of the full exclusion zone and is prohibited during darkness or other periods of poor visibility. PSOs will be on duty whenever the airguns are firing during daylight and during the 30-minute periods prior to ramp-ups from a "cold start."

Power Down and Shutdown Procedures

A power down is the immediate reduction in the number of operating energy sources from all firing to some smaller number (e.g., a single mitigation airgun). A shutdown is the

immediate cessation of firing of all energy sources. The array will be immediately powered down whenever a marine mammal is sighted approaching close to or within the applicable exclusion zone of the full array, but is outside the applicable exclusion zone of the single mitigation airgun. If a marine mammal is sighted within or about to enter the applicable exclusion zone of the single mitigation airgun, the entire array will be shut down (i.e., no sources firing). In addition, SAE will implement shutdown measures when aggregations of bowhead whales or gray whales that appear to be engaged in non-migratory significant biological behavior (e.g., feeding, socializing) are observed within the 160-dB harassment zone around the seismic operations.

No Seismic Survey with Presence of Aggregation of Whales

SAE shall refrain from initiating or cease seismic activities if an aggregation of bowhead or gray whales (i.e., 12 or more whales of any age/sex class that appear to be engaged in a non-migratory, significant biological behavior (e.g., feeding, socializing)) is observed within the Level B harassment Zone.

Poor Visibility Conditions

SAE plans to conduct 24-hour operations. PSOs will not be on duty during ongoing seismic operations during darkness, given the very limited effectiveness of visual observation at night (there will be no periods of darkness in the survey area until mid-August). The provisions associated with operations at night or in periods of poor visibility include the following:

- If during foggy conditions, heavy snow or rain, or darkness (which may be encountered starting in late August), the full 180 dB exclusion zone is not visible, the airguns cannot commence a ramp-up procedure from a full shut-down.

- If one or more airguns have been operational before nightfall or before the onset of poor visibility conditions, they can remain operational throughout the night or poor visibility conditions. In this case ramp-up procedures can be initiated, even though the exclusion zone may not be visible, on the assumption that marine mammals will be alerted by the sounds from the single airgun and have moved away.

Mitigation Conclusions

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

● The manner in which, and the degree to which, the successful implementation of the measures are expected to minimize adverse impacts to marine mammals;

● The proven or likely efficacy of the specific measure to minimize adverse impacts as planned; and

● The practicability of the measure for applicant implementation.

Any mitigation measure(s) prescribed by NMFS should be able to accomplish, have a reasonable likelihood of accomplishing (based on current science), or contribute to the accomplishment of one or more of the general goals listed below:

1. Avoidance or minimization of injury or death of marine mammals wherever possible (goals 2, 3, and 4 may contribute to this goal).

2. A reduction in the numbers of marine mammals (total number or number at biologically important time or location) exposed to received levels of seismic airguns, or other

activities expected to result in the take of marine mammals (this goal may contribute to 1, above, or to reducing harassment takes only).

3. A reduction in the number of times (total number or number at biologically important time or location) individuals would be exposed to received levels of seismic airguns or other activities expected to result in the take of marine mammals (this goal may contribute to 1, above, or to reducing harassment takes only).

4. A reduction in the intensity of exposures (either total number or number at biologically important time or location) to received levels of seismic airguns or other activities expected to result in the take of marine mammals (this goal may contribute to 1, above, or to reducing the severity of harassment takes only).

5. Avoidance or minimization of adverse effects to marine mammal habitat, paying special attention to the food base, activities that block or limit passage to or from biologically important areas, permanent destruction of habitat, or temporary destruction/disturbance of habitat during a biologically important time.

6. For monitoring directly related to mitigation – an increase in the probability of detecting marine mammals, thus allowing for more effective implementation of the mitigation.

Based on our evaluation of these mitigation measures, NMFS has determined that the proposed mitigation measures provide the means of effecting the least practicable impact on marine mammals species or stocks and their habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance. Mitigation measures to ensure availability of such species or stock for taking for certain subsistence uses are discussed later in this document (see "**Impact on Availability of Affected Species or Stock for Taking for Subsistence Uses**" section).

Monitoring and Reporting

In order to issue an ITA for an activity, section 101(a)(5)(D) of the MMPA states that NMFS must set forth, "requirements pertaining to the monitoring and reporting of such taking." The MMPA implementing regulations at 50 CFR 216.104(a)(13) indicate that requests for ITAs must include the suggested means of accomplishing the necessary monitoring and reporting that will result in increased knowledge of the species and of the level of taking or impacts on populations of marine mammals that are expected to be present in the action area. SAE submitted a marine mammal monitoring plan as part of the IHA application.

Monitoring measures prescribed by NMFS should accomplish one or more of the following general goals:

1. An increase in our understanding of the likely occurrence of marine mammal species in the vicinity of the action, i.e., presence, abundance, distribution, and/or density of species.

2. An increase in our understanding of the nature, scope, or context of the likely exposure of marine mammal species to any of the potential stressor(s) associated with the action (e.g. sound or visual stimuli), through better understanding of one or more of the following: the action itself and its environment (e.g. sound source characterization, propagation, and ambient noise levels); the affected species (e.g. life history or dive pattern); the likely co-occurrence of marine mammal species with the action (in whole or part) associated with specific adverse effects; and/or the likely biological or behavioral context of exposure to the stressor for the marine mammal (e.g. age class of exposed animals or known pupping, calving or feeding areas).

3. An increase in our understanding of how individual marine mammals respond (behaviorally or physiologically) to the specific stressors associated with the action (in specific contexts, where possible, e.g., at what distance or received level).

4. An increase in our understanding of how anticipated individual responses, to individual stressors or anticipated combinations of stressors, may impact either: the long-term fitness and survival of an individual; or the population, species, or stock (e.g. through effects on annual rates of recruitment or survival).

5. An increase in our understanding of how the activity affects marine mammal habitat, such as through effects on prey sources or acoustic habitat (e.g., through characterization of longer-term contributions of multiple sound sources to rising ambient noise levels and assessment of the potential chronic effects on marine mammals).

6. An increase in understanding of the impacts of the activity on marine mammals in combination with the impacts of other anthropogenic activities or natural factors occurring in the region.

7. An increase in our understanding of the effectiveness of mitigation and monitoring measures.

8. An increase in the probability of detecting marine mammals (through improved technology or methodology), both specifically within the safety zone (thus allowing for more effective implementation of the mitigation) and in general, to better achieve the above goals.

Monitoring Measures

Monitoring will provide information on the numbers of marine mammals potentially affected by the exploration operations and facilitate real-time mitigation to prevent injury of marine mammals by industrial sounds or activities. These goals will be accomplished in the Beaufort Sea during 2015 by conducting vessel-based monitoring and passive acoustic monitoring to document marine mammal presence and distribution in the vicinity of the survey area.

Visual monitoring by PSOs during seismic survey operations, and periods when these surveys are not occurring, will provide information on the numbers of marine mammals potentially affected by these activities and facilitate real-time mitigation to prevent impacts to marine mammals by industrial sounds or operations. Vessel-based PSOs onboard the survey vessels and mitigation vessel will record the numbers and species of marine mammals observed in the area and any observable reaction of marine mammals to the survey activities in the Beaufort Sea.

Besides the monitoring measures that were proposed in the **Federal Register** notice (80 FR 20084; March 14, 2015), NMFS included several additional measures based on the Commission and peer-review recommendations. These additional monitoring measures include: (1) NMFS evaluation of empirically measured exclusion zones and zone of influence before they are adopted; (2) conducting SSV if SAE plans to use the 1,240 in^3 airgun array for seismic survey; (3) including an additional mitigation vessel for marine mammal monitoring if SAE plans to use the 1,240 in^3 airgun array; (4) deploying more acoustic sensors than the 2014 season for passive acoustic monitoring; and (5) testing a new mooring design with NMFS National Marine Mammal Laboratory for microMARS to be deployed in shallow water.

Details of the monitoring measures are described below.

Visual-based PSOs

The visual-based marine mammal monitoring will be implemented by a team of experienced PSOs, including both biologists and Inupiat personnel. PSOs will be stationed aboard both survey vessels through the duration of the project. The vessel-based marine mammal monitoring will provide the basis for real-time mitigation measures as discussed in the

Mitigation Measures section. In addition, monitoring results of the vessel-based monitoring program will include the estimation of the number of "takes" as stipulated in the IHA.

(1) PSOs

Vessel-based monitoring for marine mammals will be done by trained PSOs throughout the period of survey activities. The observers will monitor the occurrence of marine mammals near the survey vessel during all daylight periods during operation, and during most daylight periods when operations are not occurring. PSO duties will include watching for and identifying marine mammals; recording their numbers, distances, and reactions to the survey operations; and documenting "take by harassment."

A total of 2 PSOs will be required onboard each survey vessel to meet the following criteria:

- 100% monitoring coverage during all periods of survey operations in daylight;
- At least two PSOs conducting vessel-based visual monitoring from both vessels during all time;
- Maximum of 4 consecutive hours on watch per PSO; and
- Maximum of 12 hours of watch time per day per PSO.

PSO teams will consist of Inupiat observers and experienced field biologists. Each vessel will have an experienced field crew leader to supervise the PSO team. The total number of PSOs may decrease later in the season as the duration of daylight decreases.

(2) PSO Role and Responsibilities

When onboard the seismic and support vessels, there are three major parts to the PSO position:

- Observe and record sensitive wildlife species;

- Ensure mitigation procedures are followed accordingly; and
- Follow monitoring and data collection procedures.

The main roles of the PSO and the monitoring program are to ensure compliance with requirements set in place by NMFS to ensure that disturbance of marine mammals is minimized, and potential effects on marine mammals are documented. The PSOs will implement the monitoring and mitigation measures specified in the IHA. The primary purposes of the PSOs on board of the vessels are:

- Mitigation: Implement mitigation clearing and ramp up measures, observe for and detect marine mammals within, or about to enter the applicable safety zone and implement necessary shut down, power down and speed/course alteration mitigation procedures when applicable. Advise marine crew of mitigation procedures.
- Monitoring: Observe for marine mammals and determine numbers of marine mammals exposed to sound pulses and their reactions (where applicable) and document those as required.

(3) Observer Qualifications and Training

Crew leaders and most PSOs will be individuals with experience as observers during recent seismic, site clearance and shallow hazards, and other monitoring projects in Alaska or other offshore areas in recent years. New or inexperienced PSOs will be paired with an experienced PSO or experienced field biologist so that the quality of marine mammal observations and data recording is kept consistent.

Biologist-observers will have previous marine mammal observation experience, and field crew leaders will be highly experienced with previous vessel-based marine mammal monitoring and mitigation projects. Resumes for those individuals will be provided to NMFS for review and

acceptance of their qualifications. Inupiat observers will be experienced in the region and familiar with the marine mammals of the area. All observers will complete a NMFS-approved observer training course designed to familiarize individuals with monitoring and data collection procedures.

PSOs will complete a 2- or 3-day training and refresher session on marine mammal monitoring, to be conducted shortly before the anticipated start of the 2015 open-water season. Any exceptions will have or receive equivalent experience or training. The training session(s) will be conducted by qualified marine mammalogists with extensive crew-leader experience during previous vessel-based seismic monitoring programs.

(4) Marine Mammal Observer Protocol

Source vessels will employ PSOs to identify marine mammals during all hours of airgun operations. To better observe the exclusion zone, a lead PSO, one or two PSOs, and an Inupiaq communicator will be on the primary source vessel and two PSOs will be stationed aboard the secondary source vessel. (The total number of observers is limited by available berthing space aboard the vessels.) The three to four total observers aboard the primary source vessel will allow two observers simultaneously on watch during daylight hours.

The PSOs will watch for marine mammals during all periods of source operations and for a minimum of 30 minutes prior to the planned start of airgun or pinger operations after an extended shutdown. Marine mammal monitoring shall continue throughout airgun operations and last for 30 minutes after the finish of airgun firing. SAE vessel crew and operations personnel will also watch for marine mammals, as practical, to assist and alert the PSOs for the airgun(s) to be shut down if marine mammals are observed in or about to enter the exclusion zone.

The PSOs will watch for marine mammals from the best available vantage point on the survey vessels, typically the bridge. The PSOs will scan the area around the vessel systematically with reticle binoculars (e.g., 7 × 50 and 16-40 × 80) and with the naked eye. Laser range finders (Leica LRF 1200 laser rangefinder or equivalent) will be available to assist with distance estimation.

The observers will give particular attention to the areas within the marine mammal exclusion zones around the source vessels. These zones are the maximum distances within which received levels may exceed 180 dB (rms) re 1 µPa (rms) for cetaceans, or 190 dB (rms) re 1 µPa for pinnipeds.

When a marine mammal is seen approaching or within the exclusion zone applicable to that species, the seismic survey crew will be notified immediately so that mitigation measures called for in the applicable authorization(s) can be implemented.

Night-vision equipment (Generation 3 binocular image intensifiers or equivalent units) will be available for use if and when needed. Past experience with night-vision devices (NVDs) in the Beaufort Sea and elsewhere has indicated that NVDs are not nearly as effective as visual observation during daylight hours (e.g., Harris *et al.* 1997, 1998; Moulton and Lawson 2002).

(5) Dedicated Monitoring Vessel

If SAE decides to use the 1,240 in^3 airgun array, an additional dedicated visual monitoring vessel will be employed to assist marine mammal monitoring due to the larger exclusion zones and zone of influence from this larger airgun array. A minimum of 2 PSOs will be positioned on this dedicated monitoring vessel.

(6) Field Data-Recording

The PSOs will record field observation data and information about marine mammal sightings that include:

- Species, group size, age/size/sex categories (if determinable);
- Physical description of features that were observed or determined not to be present in the case of unknown or unidentified animals;
- Behavior when first sighted and after initial sighting, heading (if consistent);
- Bearing and distance from observer, apparent reaction to activities (e.g., none, avoidance, approach, paralleling, etc.), closest point of approach, and behavioral pace;
- Time, location, speed, and activity of the source and mitigation vessels, sea state, ice cover, visibility, and sun glare; and
- Positions of other vessel(s) in the vicinity.

Acoustic Monitoring

(1) Sound Source Measurements

Since the same airgun array of 620 in^3 and a single mitigation airgun of 10 in^3 to be used were empirically measured in the generally same seismic survey vicinity in 2014 (Heath 2014), NMFS does not think additional SSV tests for this array and a single airgun are necessary for the 2015 seismic survey. However, if SAE decides to use the 1,240 in^3 airgun arrays for deeper water, SSV on these arrays is required before the commencement of the surveys. Results of the acoustic characterization and SSV will be used to establish the 190 dB, 180 dB, 170 dB, and 160 dB isopleths for the 1,240 in^3 airgun arrays.

The results of the SSV will be submitted to NMFS within five days after completing the measurements, followed by a report to be submitted within 14 days after completion of the

measurements. A more detailed report will be provided to NMFS as part of the required 90-day report following completion of the acoustic program.

NMFS will evaluate the empirically measured exclusion zones and zone of influence from the 1,240 in^3 before they are formally established for mitigation and monitoring measures.

(2) Passive Acoustic Monitoring

SAE will conduct Passive Acoustical Monitoring (PAM) using microMARS. These sensors will be deployed on the seabed and will record continuously at 64 kHz sample rate and 16-bit samples. The recorders will be calibrated and their mooring designs tested prior to deployment.

PAM Deployment

Passive acoustic monitoring package will be deployed at the four corners of SAE's survey site. Each PAM package will include two microMARS units coupled with an ARC-1 release device, a float and a retrievable mooring. Deploying two microMARS at each monitoring location will allow redundancy in the system to reduce the likelihood of failures and/or data loss.

PAM will be deployed before the SAE's proposed 3D seismic survey and remain at the study site during the entire survey period.

Data Analysis

Acoustic data will be analyzed for two frequency bands, low (below 2 kHz for baleen whales and low-frequency noise) and high (2 kHz - 32 kHz for beluga whales and high-frequency noise). This will allow sounds produced by different species and anthropogenic sources to be reviewed and analyzed in greater detail. Specialized acoustic review and analysis

software, Trition will be used to create long-term spectral averages (LTSAs) for all acoustic files downloaded from the recorders.

Once LTSAs of all the acoustic data have been created and preliminarily reviewed, experienced bioacoustic data analysts will perform a detailed review of the data. Analysts will log the time of occurrence of all biological sounds, seismic source events (if audible), and other relevant acoustic signals (e.g. ships, small boats, and other noise events). Combined event log data will then be organized into tables to provide summaries including (1) the number and type of acoustic events; (2) the number of days each event occurred at each site; and (3) event durations for each deployment and site. Graphs of daily event occurrence will be made for each identified marine mammal species that have sufficient data to plot. Graphs of the percentage of time for which signals from each species were detected with respect to total recording time at each site will be plotted by species.

Noise analysis will be performed on all recorded acoustic data. Sound levels will be measured for full and octave frequency bands. This analysis will be conducted using automated algorithms that measure root-mean-square (RMS) sound pressure level (SPL) each octave bands. These results will be averaged both hourly and daily to provide a synoptic representation of the ambient noise levels present at each location for each of the different frequency bands measured.

Monitoring Plan Peer Review

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

receipt of the proposed monitoring plan, schedule a workshop to review the plan" (50 CFR 216.108(d)).

NMFS established an independent peer review panel to review SAE's 4MP for the proposed 3D seismic survey in the Beaufort Sea. The panel met in early March 2015, and provided comments and recommendations to NMFS in April 2015. The full panel report can be viewed on the Internet at: *http://www.nmfs.noaa.gov/pr/permits/incidental.htm*.

NMFS provided the panel with SAE's IHA application and monitoring plan and asked the panel to answer the following questions:

1. Will the applicant's stated objectives effectively further the understanding of the impacts of their activities on marine mammals and otherwise accomplish the goals stated above? If not, how should the objectives be modified to better accomplish the goals above?

2. Can the applicant achieve the stated objectives based on the methods described in the plan?

3. Are there technical modifications to the proposed monitoring techniques and methodologies proposed by the applicant that should be considered to better accomplish their stated objectives?

4. Are there techniques not proposed by the applicant (i.e., additional monitoring techniques or methodologies) that should be considered for inclusion in the applicant's monitoring program to better accomplish their stated objectives?

5. What is the best way for an applicant to present their data and results (formatting, metrics, graphics, etc.) in the required reports that are to be submitted to NMFS (i.e., 90-day report and comprehensive report)?

The peer-review panel report contains recommendations that the panel members felt were applicable to the SAE' monitoring plans. The peer-review panel believed that the objectives for both vessel-based and passive acoustic monitoring were appropriate. The panel also agreed that the objectives of real-time mitigation of potential disturbance of marine mammals would be mostly met through visual monitoring. However, there are some limitations associated with PSOs' ability to monitor the entire safety radii at all times. Specific panel recommendations are provided below.

(1) If SAE decides to use the larger airgun array (i.e., the 1,240 in^3 array), SAE should conduct sound source verification;

(2) SAE should have an additional observer on the secondary source vessel such that at least two observers are on watch during all daylight hours;

(3) If SAE uses the 1,240 in^3 airgun array and the measured safety radii (exclusion zones) in the Beaufort Sea are similar to the measurement done in Cook Inlet (250 m for 190 dB and 910 m for 180 dB), SAE should have a dedicated scout (monitoring) vessel with at least 2 PSOs to monitor the 180 dB exclusion zone (910 m);

(4) If the seismic surveys are offshore, more acoustic sensors are needed at more locations than what is presented by SAE at the peer-review meeting (one sensor at each of the four corners);

(5) microMARS used for PAM should be deployed well before the seismic surveys begin in order to collect baseline data before all the vessels are operative in the area and the airgun arrays begin operating;

(6) SAE should develop a more compact mooring design for microMARS that are deployed in shallow waters, particularly because of the compact size of these recorders;

(7) Additional testing to be conducted to verify PAM recorders' performance due to the limited or non-existent field experience in long term deployments and cold Arctic waters;

(8) Improve the effectiveness of monitoring by using Unmanned Aerial Systems for monitoring of marine mammals in the Beaufort Sea;

(9) Provide information in the reports about how the detections obtained by the microMARS are ground-truthed;

(10) Acoustic characteristics of the identified noise sources be included in the reports to provide a better understanding of source levels and the robustness of SSV results, and other acoustic characteristics of the seismic survey equipment, such as spectral content, and received levels in different metrics such as RMS dB, cSEL 24h, dB peak to peak, and 1/3 octave bands;

(11) Sightability curves be included in the reports as much as possible;

(12) Coordinate and collaborate with other companies (such as Caelus and Repsol) for monitoring the aggregated effects of all their activities on spotted seals, especially animals that may be haulted out; and

(13) Continue to make all environmental data (including PSO observations, acoustic monitoring, vessel track lines and timing of operations) available to the general public.

In addition, though not solicited as part of the independent peer review of the monitoring, the peer review panel also recommended the following mitigation measures:

(1) SAE should limit seismic operations at night or during periods of low visibility because PSOs' ability to detect marine mammals entering the safety zone is limited;

(2) If a bowhead whale mother/calf pair or an aggregation of three or more bowhead whales are sighted within the Level B harassment zone prior to the onset of night or during that day, SAE could be more cautious during darkness based on the potential risk to marine

mammals. If the risk is relatively high, it might be decided that airguns should be shut down for the night;

(3) SAE should not use a mitigation gun for longer than one hour, which is the equivalent amount of time for surveying the safety radii plus ramp up; and

(4) Mitigation gun should be shot only once every minute instead of every few seconds;

NMFS discussed the peer review panel report and the list of recommendations with SAE. For the aforementioned monitoring measures, NMFS requires and SAE agrees to implement the following:

(1) Conducting sound source verification if the 1,240 in^3 airgun array is used in the proposed 3D seismic survey;

(2) Mobilizing a dedicated scout (monitoring) vessel with at least 2 PSOs onboard to monitor the 180 dB exclusion zone (910 m) if the SSV test show that the 180 dB radius of the exclusion zone from the 1,240 in^3 airgun array is 910 m or larger;

(3) Deploying microMARS used for PAM at least three days before the seismic surveys till three days after the seismic survey in order to collect data for comparing the sound field before, during, and after the seismic survey;

(4) Deploying two microMARS units at each of the four corners (total of 8 microMARS units);

(5) Developing a more compact mooring design for microMARS that are deployed in shallow waters, particularly because of the compact size of these recorders;

(6) Conducting tests and calibration to verify PAM recorders' performance prior to deployment;

(7) Including sightability curves in the 90-day report;

(8) Making all environmental data (including PSO observations, acoustic monitoring, vessel track lines and timing of operations) available for valid scientific research.

In addition, NMFS worked with SAE on the following 5 of the panel recommendations and determined that these will also be required in the IHA issued to SAE with clarification and certain modifications to make them practicable for implementation. These measures are listed below:

(1) Regarding the number of PSOs onboard the secondary source vessel, this is to clarify that SAE plans to have two PSOs on both source vessels, and they will be working on a shift described earlier in the "Monitoring Measure" section of this document. Therefore, at any given time, there will be 2 PSOs monitoring from both source vessels. NMFS notes that the number of PSOs is limited by the available berth on the seismic vessel. The source vessels SAE plan to use are small, and therefore, could only afford maximum of 2 PSOs onboard each vessel.

(2) Regarding ground-truth information in the reports about microMARS detection, SAE states that it should be able to identify bowhead and beluga calls from acoustic recordings. However, SAE states that it will be difficult to identify pinniped calls for species identification at distances, especially at the locations where the microMARS are deployed there will be no PSOs on watch to verify the calling animals. Therefore, ground-truth of acoustic data to specific species calls would not be possible. Nevertheless, as stated earlier, SAE will make the acoustic data available to researchers who are interested in studies that will shed light on marine mammal call identification.

(3) Regarding acoustic characteristics of the identified noise sources, and other acoustic characteristics of the seismic survey equipment, such as spectral content, and received levels in different metrics such as RMS dB, cSEL 24h, dB peak to peak, and 1/3 octave bands, SAE will

work with its contractor to characterize the identified noise sources as much as possible within the limits of the microMARS. However, SAE states that some of the requested data analysis would require knowing not only the real-time distance of each noise sources, but the aspect (e.g., forward, endfire) of the array as well. SAE states that for cost reasons, SAE cannot afford extended acoustic analysis beyond identified source characterization. Nevertheless, SAE will make the acoustic data available to researchers who are interested in additional studies of the noise field from data collected by SAE. In the IHA issued to SAE, NMFS requires that SAE at least perform basic acoustic characteristics of the identified noise sources that include spectral content and received levels in different metrics such as RMS dB, cSEL 24h, dB peak to peak, and 1/3 octave bands.

(4) Regarding coordinating and collaborating with other companies (such as Caelus and Repsol) for monitoring the aggregated effects of all their activities on spotted seals, especially animals that may be haulted out, SAE responded that they attempted to coordinate with other companies last year for spotted seal monitoring, but none agreed to cooperate. In addition, at this point it is unclear whether any other companies in the Beaufort Sea may be conducting pinnipeds haul-out aerial surveys in the 2015 open-water season. Nevertheless, NMFS encourages SAE again to seek cooperation with other companies who may be conducting aerial surveys with the goal that information collected during those surveys will assist SAE in monitoring pinnipeds use of haul-out sites before, during, and after SAE's planned seismic survey.

The only recommendation from the peer-review panel SAE is not able to implement is the utilization of Unmanned Aerial Systems (UAS) for monitoring of marine mammals in the Beaufort Sea for marine mammal monitoring. The major reason for this is that using UAS for

marine mammal monitoring is still not a proven technology to provide an effective monitoring modality. The resolution from the UAS video camera does not have high resolution, especially for pinniped survey due to the small size of the animals. In addition, SAE states that the expense of flying a UAS is cost-prohibitive for the company. NMFS agrees with SAE's reasoning. Therefore, this recommendation is not included in the IHA issued to SAE.

With regards to the panel's mitigation recommendations, NMFS agrees with the panel that mitigation airgun should be fired at a rate of 1 shot per minute instead of every few seconds. This condition is required in the IHA issued to SAE.

Regarding the remaining three mitigation measures provided by the peer-review panel, SAE and NMFS discussed and decided that it is important to be consistent with existing mitigation practices for typical 3D seismic surveys unless new scientific information is available that warrant a change. These mitigation measures are described in the "**Mitigation**" section above. These three mitigation recommendations from the panel are addressed and clarified below:

(1) *Limiting seismic operations at night or during periods of low visibility*: This recommendation is not consistent with existing mitigation practices for a typical marine seismic survey, which require no airgun ramping up when the entire exclusion zone cannot be cleared due to low visibility. However, if the entire exclusion zone can be visually cleared by PSOs, a ramp up can be commenced and, as long as no shutdown occurs during the course of the survey, airgun firing can continue into night or during periods of low visibility. By limiting seismic operations at night or during periods of low visibility, SAE would not be able to complete its 3D seismic survey during the project period and would have to come back the following year to

continue their work. This can be cost-prohibitive for the company and will also extend the season when the marine environment is affected.

(2) *Be more cautious during darkness based on the potential risk to marine mammals if a bowhead whale mother/calf pair or an aggregation of three or more bowhead whales are sighted within the Level B harassment zone prior to the onset of night or during that day. If the risk is relatively high, airguns should be shut down for the night*: The panel did not define what constitutes "the risk is relatively high", and without a clear definition, NMFS considers that this recommendation cannot be made into a requirement. Additionally, as discussed in (1) above, ceasing seismic activities at night because bowhead whale mother/calf pair or an aggregation of three or more bowhead whales are sighted within the Level B harassment zone during the day would be cost-prohibitive, especially consider that the potential risk is not identified.

(3) *Mitigation gun not to be operated for more than one hour*: NMFS does not allow extended use of "mitigation airgun" when the seismic survey is not ongoing, just so that the applicant can ramp up at night or without the 30-minute clearance before ramping up airgun arrays. However, NMFS allows a single airgun (so called "mitigation gun") to be kept on for turning from one track to the next and for short transiting purposes. SAE, as well as other seismic surveyors (e.g., BP), state that for 3D seismic surveys, an approximately 3-hour time frame is needed to complete a turn or short transit, and NMFS has been requiring the applicants to use the smallest single airgun for a maximum of 3 hours for turning and short transiting purposes (e.g., IHA to SAE's 3D seismic survey in 2014 open-water season in Beaufort Sea). Further, the panel did not provide a justification for its recommendation of maximum of one-hour use of "mitigation airgun". Therefore, to be consistent with the existing mitigation

measures, NMFS again requires that SAE use the "mitigation airgun" for turning and short line transiting only, with a maximum operation time of 3 hours.

Reporting Measures

(1) Sound Source Verification Report

As discussed earlier, if SAE plans to use the 1,240 in^3 airgun arrays, SSV tests on these arrays will be required. A report on the preliminary results of the sound source verification measurements, including the measured 190, 180, 170, and 160 dB (rms) radii of the 1,240 in^3 airgun array, would be submitted within 14 days after collection of those measurements at the start of the field season.

(2) Weekly Reports

SAE will submit weekly reports to NMFS no later than the close of business (Alaska Time) each Thursday during the weeks when seismic surveys take place. The field reports will summarize species detected, in-water activity occurring at the time of the sighting, behavioral reactions to in-water activities, and the number of marine mammals exposed to harassment level noise.

(3) Monthly Reports

SAE will submit monthly reports to NMFS for all months during which seismic surveys take place. The monthly reports will contain and summarize the following information:

- Dates, times, locations, heading, speed, weather, sea conditions (including Beaufort Sea state and wind force), and associated activities during the seismic survey and marine mammal sightings.

- Species, number, location, distance from the vessel, and behavior of any sighted marine mammals, as well as associated surveys (number of shutdowns), observed throughout all monitoring activities.
- An estimate of the number (by species) of: (i) pinnipeds that have been exposed to the seismic surveys (based on visual observation) at received levels greater than or equal to 160 dB re 1 µPa (rms) and/or 190 dB re 1 µPa (rms) with a discussion of any specific behaviors those individuals exhibited; and (ii) cetaceans that have been exposed to the geophysical activity (based on visual observation) at received levels greater than or equal to 160 dB re 1 µPa (rms) and/or 180 dB re 1 µPa (rms) with a discussion of any specific behaviors those individuals exhibited.

(4) Technical Report

The results of SAE's 2015 vessel-based monitoring, including estimates of "take" by harassment, will be presented first in a "90-day" draft Technical Report, to be submitted to NMFS within 90 days after the end of the seismic survey, and then in a final Technical Report, which will address any comments NMFS had on the draft. The Technical Report will include:

(a) Summaries of monitoring effort (e.g., total hours, total distances, and marine mammal distribution through the study period, accounting for sea state and other factors affecting visibility and detectability of marine mammals);

(b) Analyses of the effects of various factors influencing detectability of marine mammals (e.g., sea state, number of observers, and fog/glare);

(c) Species composition, occurrence, and distribution of marine mammal sightings, including date, water depth, numbers, age/size/gender categories (if determinable), group sizes, and ice cover;

(d) Data analysis separated into periods when a seismic airgun array (or a single mitigation airgun) is operating and when it is not, to better assess impacts to marine mammals – the final and comprehensive report to NMFS should summarize and plot:

- Data for periods when a seismic array is active and when it is not; and
- The respective predicted received sound conditions over fairly large areas (tens of km) around operations;

(e) Sighting rates of marine mammals during periods with and without airgun activities (and other variables that could affect detectability), such as:

- Initial sighting distances versus airgun activity state;
- Closest point of approach versus airgun activity state;
- Observed behaviors and types of movements versus airgun activity state;
- Numbers of sightings/individuals seen versus airgun activity state;
- Distribution around the survey vessel versus airgun activity state; and
- Estimates of take by harassment;

(f) Results from all hypothesis tests, including estimates of the associated statistical power, when practicable;

(g) Estimates of uncertainty in all take estimates, with uncertainty expressed by the presentation of confidence limits, a minimum-maximum, posterior probability distribution, or another applicable method, with the exact approach to be selected based on the sampling method and data available;

(h) A clear comparison of authorized takes and the level of actual estimated takes;

(i) Acoustic characteristics of the identified noise sources. These should include the acoustic characteristics of the seismic survey equipment, such as spectral content, and received

levels in different metrics such as RMS dB, cSEL 24h, dB peak to peak, and 1/3 octave bands; and

(j) Provide sightability curves in the 90-day report.

(5) Data Sharing and Research Collaboration

(a) Make all environmental data (including PSO observation, acoustic monitoring, vessel track lines and timing of operations) available for valid scientific research purposes; and

(b) Make a best effort to coordinate and collaborate with other companies for monitoring the aggregated effects of all their activities on spotted seals, especially animals that many be hauled out.

(6) Notification of Injured or Dead Marine Mammals

In the unanticipated event that the specified activity clearly causes the take of a marine mammal in a manner prohibited by the IHA, such as a serious injury, or mortality (e.g., ship-strike, gear interaction, and/or entanglement), SAE would immediately cease the specified activities and immediately report the incident to the Chief of the Permits and Conservation Division, Office of Protected Resources, NMFS, and the Alaska Regional Stranding Coordinators. The report would include the following information:

- Time, date, and location (latitude/longitude) of the incident;
- Name and type of vessel involved;
- Vessel's speed during and leading up to the incident;
- Description of the incident;
- Status of all sound source use in the 24 hours preceding the incident;
- Water depth;

- Environmental conditions (e.g., wind speed and direction, Beaufort sea state, cloud cover, and visibility);
- Description of all marine mammal observations in the 24 hours preceding the incident;
- Species identification or description of the animal(s) involved;
- Fate of the animal(s); and
- Photographs or video footage of the animal(s) (if equipment is available).

Activities would not resume until NMFS is able to review the circumstances of the prohibited take. NMFS would work with SAE to determine what is necessary to minimize the likelihood of further prohibited take and ensure MMPA compliance. SAE would not be able to resume its activities until notified by NMFS via letter, email, or telephone.

In the event that SAE discovers a dead marine mammal, and the lead PSO determines that the cause of the death is unknown and the death is relatively recent (i.e., in less than a moderate state of decomposition as described in the next paragraph), SAE would immediately report the incident to the Chief of the Permits and Conservation Division, Office of Protected Resources, NMFS, and the NMFS Alaska Stranding Hotline and/or by email to the Alaska Regional Stranding Coordinators. The report would include the same information identified in the paragraph above. Activities would be able to continue while NMFS reviews the circumstances of the incident. NMFS would work with SAE to determine whether modifications in the activities are appropriate.

In the event that SAE discovers a dead marine mammal, and the lead PSO determines that the death is not associated with or related to the activities authorized in the IHA (e.g., previously wounded animal, carcass with moderate to advanced decomposition, or scavenger

damage), SAE would report the incident to the Chief of the Permits and Conservation Division, Office of Protected Resources, NMFS, and the NMFS Alaska Stranding Hotline and/or by email to the Alaska Regional Stranding Coordinators, within 24 hours of the discovery. SAE would provide photographs or video footage (if available) or other documentation of the stranded animal sighting to NMFS and the Marine Mammal Stranding Network. SAE can continue its operations under such a case.

Monitoring Results from Previously Authorized Activities

SAE was issued an IHA for a 3D OBN seismic survey in the same area of the proposed 2015 seismic survey in the Beaufort Sea during the 2014 Arctic open-water season. SAE conducted the seismic survey between August 25 and September 30, 2014. The technical report (90-day report) submitted by SAE indicates that one beluga whale and 2 spotted seals were observed within the 180-dB exclusion zones during the survey that prompted immediate shutdown. Two additional spotted seals were detected within the zone of influence when the airgun arrays were firing. Post-activity analysis based on total sighting data concluded that up to approximately 5 beluga whales and 264 pinnipeds (likely all spotted seals due to their large numbers) could be exposed to received levels above 160-dB re 1 µPa. Some of these could be exposed to levels that may have Level A harassment which was not authorized under the previous IHA. Nevertheless, take of Level B harassment were under the take limits allowed by the IHA issued to SAE.

Based on the monitoring results from SAE's 2014 seismic survey, NMFS is re-evaluating the potential effects on marine mammals and requested SAE to conduct analysis on potential Level A takes (see "**Estimated Take by Incidental Harassment**" section below).

Estimated Take by Incidental Harassment

Except with respect to certain activities not pertinent here, the MMPA defines "harassment" as: any act of pursuit, torment, or annoyance which (i) has the potential to injure a marine mammal or marine mammal stock in the wild [Level A harassment]; or (ii) has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering [Level B harassment].

Takes by Level A and Level B harassments of some species are anticipated as a result of SAE's proposed 3D seismic survey. NMFS expects marine mammal takes could result from noise propagation from operation of seismic airguns. NMFS does not expect marine mammals would be taken by collision with seismic and support vessels, because the vessels will be moving at low speeds, and PSOs on the survey vessels and the mitigation vessel will be monitoring for marine mammals and will be able to alert the vessels to avoid any marine mammals in the area.

For impulse sounds, such as those produced by the airguns proposed to be used in SAE's 3D OBN seismic surveys, NMFS uses the 180 and 190 dB (rms) re 1 μPa isopleth to indicate the onset of Level A harassment for cetaceans and pinnipeds, respectively; and the 160 dB (rms) re 1 μPa isopleth for Level B harassment of all marine mammals. SAE provided calculations of the 190-, 180-, and 160-dB isopleths expected to be produced by the proposed seismic surveys and then used those isopleths to estimate takes by harassment. NMFS used those calculations to make the necessary MMPA findings. SAE provided a full description of the methodology used to estimate takes by harassment in its IHA application, which is also provided in the following sections.

Acoustic Footprint

The acoustical footprint that could cause harassment (Levels A and B) was determined by placing a 160-dB isopleth buffer around the area that would be surveyed (shot) during the 2015 open water season (777 km^2). SAE stated that for the majority of its proposed 2015 seismic survey, a 620 in^3 airgun array would be used. However, to make conservative impact analysis, SAE uses the acoustic footprint of a large 1,240 in^3 array for this analysis.

There are no precise estimates for the 1,240-in^3 array. The estimated distances to the 160 dB isopleth for the 1,240-in^3 array are based on the sound source measurements from Austin and Warner (2012) for a 1,200-in^3 array in Cook Inlet. The results showed a measured distance of 5.2 km to the 160 dB isopleths (Table 2). Placing a 5.2-km buffer around the 777 km^2 maximum shot area results in an estimated annual ZOI of 1,463 km^2 (565 mi^2), which is the ZOI value used in the exposure estimate calculations.

Because the exact location of the 2015 shoot area is currently unknown, the distribution of marine mammal habitat within the shoot area is unknown. However, within the 4,562 km^2 potential survey box, 19% (860 km^2) falls within the 0 to 1.5 m water depth range, 16% (753 km^2) falls within the 1.5 to 5 m range, 36% (1,635 km^2) within the 5 to 15 m range, and 29 percent% (1,348 km^2) within waters greater than 15 m deep (bowhead migration corridor). Thus, not all the area that could be surveyed in 2015 constitutes bowhead summer (>5 m depth) or fall migrating (>15 m depth) habitat. Further, few of the lease areas that could be shot in 2015 extend into the deeper waters of the potential survey box. The distribution of these depth ranges is found in Figure 6-1 of SAE's IHA application.

Marine Mammal Densities

In the **Federal Register** notice (80 FR 20084; April 14, 2015) for the proposed IHA, NMFS used the aerial survey data (Ferguson and Clarke 2013) collected in the Beaufort Sea

during the Aerial Surveys of Arctic Marine Mammals (ASAMM) program in 2012 and 2013 for bowhead whale density calculation. At the time of the proposed IHA stage, 2014 density data had not been vetted. Subsequently, the 2014 aerial survey data for bowhead whale became available, and NMFS was advised by the National Marine Mammal Laboratory (NMML) and NMFS Alaska Regional Office (AKRO) to use the 2008 – 2014 bowhead and beluga whale survey data and a g(0) of 0.8696 and f(0) of 0.07 for density estimates. Both g(0) and f(0) are factors used to correct the potential presence of animals not detected and potential missed sighting from the survey. The results showed much higher density for bowhead whale within the SAE's proposed 3D seismic survey area. The revised bowhead whale density, along with densities of other marine mammals that could be affected by SAE's 3D seismic survey, are provided in Table 3.

Table 3. Marine mammal densities (#/km^2) in the Beaufort Sea

Species	Summer	Fall
Bowhead whale	0.1674	0.4828
Beluga whale	0.0020	0.0057
Ringed seal	0.3547	0.2510
Spotted seal	0.0177	0.0125
Bearded seal	0.0177	0.0125

Level B Exposure Calculations

In the **Federal Register** notice (80 FR 20084; April 14, 2015) for the proposed IHA, NMFS performed marine mammal take estimates by multiplying animal density and the total ensonified area of the entire survey without incorporating a time vector. However, the Commission pointed out in its comment that such method does not take into account the potential of new animals moving into the ensonified area during the course of the survey. NMFS also realized that although such method provides take estimates that closely matched the actual

estimated takes provided in the 90-day reports (with corrections to count for animals missed due to avoidance of seismic exposure and missed detection), the potential of not counting new animals moving into the area could underestimate the actual take. Therefore, in response to the Commission's response, NMFS is incorporating a time vector, survey days, into take estimates by multiplying animal density and daily ensonified area and the number of survey days. However, this method provides the number of instances of take without accounting for the fact that some individuals may be taken more than once during the survey. Since the same animal is very likely to be taken multiple times on different days, this method presents a serious issue when analyzing the number of unique animals from a given population that are harassed. To address this issue, NMFS applied a correction factor, the daily turnover rate, to provide take estimates that are more realistic.

1. Daily Ensonified Area

SAE states that regardless the size of the airgun array, the daily survey area is 18.75 mi^2. However, the daily ensonified areas, which are the daily survey areas in additional to areas that would be ensonified to 160 dB re 1 µPa, would vary with the size of the airgun array used. The specific daily ensonified areas depend on the ensonified radii from different airgun arrays shown in Table 2. For the 620 in^3 airgun array, the daily ensonified area out to the 160 dB re 1 µPa is 43.6 mi^2, or 113 km^2. For the 1,240 in^3 airgun array, the daily ensonified area out the 160 dB re 1 µPa is 117 mi^2, or 303 km^2.

Assuming that the survey areas of different bathymetry are proportionally represented by the bathymetry of the entire survey box, then 19% of the survey area will be less than 1.5 m deep, 16% survey area is 1.5 – 5 m deep, 36% survey area 5 – 15 m deep, and the remaining 29% survey area is deeper than 15 m. As stated earlier, waters below 5 m deep are not bowhead

whale habitat, therefore, bowhead takes are excluded from these waters. In addition, waters below 15 m deep are not bowheads habitat during the fall, therefore, they are also excluded for take calculation for SAE's 3D survey in the fall.

No adjustments were made for beluga whales, and ringed, spotted, and bearded seals, as they could appear in much shallower waters.

2. Number of Survey Days

As discussed in the Federal Register notice (80 FR 20084; April 14, 2015) and in this document, within the total of 107 days of this IHA (from July 1 to October 15, 2015), SAE states that survey is anticipated to last 70 days, of which approximately 70% of the time, or a total of 49 days, when the actual seismic survey using airgun arrays will be occurring, depending on weather and ice conditions. Though it cannot be predicted the exact days when incremental weather and ice conditions would present the surveys, for the purpose of this analysis, NMFS prorated survey days in summer (July 1 to August 31) and in fall (September 1 to October 15) with the total days in summer (62 days) and fall (45 days), which yielded 28 survey days in summer and 21 survey days in fall.

3. Turnover Rate of Marine Mammals

For bowhead whales, during the summer period into early fall (August to October), they are often observed feeding from Smith Bay to Point Barrow (Clarke & Ferguson, 2010a, 2010b; Clarke *et al.* 2011a, 2011b, 2012, 2013). In other areas of the western Beaufort Sea (including the SAE's proposed seismic survey area), bowhead whales may feed on the continental shelf, out to approximately the 50-m isobath, in September and October (Clarke *et al.* 2015). In the fall period (September and October), bowhead whales are observed migrating through the western

Beaufort Sea primarily on the shelf (including the SAE's proposed seismic survey area), at depths less than 50 m, with some whales migrating across the outer shelf (Clarkes *et al.*, 2015).

It is difficult to determine an average turnover time for individual bowhead whales in a particular area of the Beaufort Sea. Reasons for this include differences in residency time between migratory and non-migratory periods, changes in distribution of food and other factors such as behavior that influence animal movement, variation among individuals, etc.

Complete turnover of individual bowhead whales in the project area each 24-hour period is possible during distinct periods within the fall migration when bowheads are traveling through the area, however, bowheads often move in pulses with one to several days between major pulses of whales (Miller *et al.* 2002). Gaps between groups of traveling whales during fall migration result in days when no bowhead whales would be expected to be present in the activity area. The absence of bowhead whales during periods of the fall migration can likely be attributed to individuals stopping to feed opportunistically when food is encountered, which is known to occur annually in an area north of Barrow (Citta *et al.* 2014). The extent of feeding by bowhead whales during fall migration varies greatly from year to year based on the location and abundance of prey (Shelden and Mocklin 2013). For these reasons, NMFS believes a daily 100% turnover period for bowhead whales is unnecessarily conservative and has selected a daily turnover rate of 50% to account for both feeding (where animals stay relatively within an area) and migration (where animals are moving across an area) in both fall and winter.

For beluga whales, two stocks are potentially present in the SAE 3D seismic survey areas: the East Chukchi Sea and Beaufort Sea stocks. Since they cannot be visually distinguished in the field, the proportion of take form each stock in the seismic survey area in Beaufort Sea cannot be determined (Allen and Angliss 2014). Thus it would be difficult to

assess the turnover rate of beluga whales because each different stock has its own migratory pattern and time. Therefore, NMFS used the most conservative measure of assuming complete turnover of the animals every 24 hours, making a daily turnover rate of 100% for a more conservative take calculation.

For ringed seals, satellite tagging data from tagging studies fromthe State of Alaska Department of Fish and Game's Marine Mammals Program, the Ice Seal Committee, and interested seal hunters from villages along the west and north coasts of Alaska were used to derive a turnover rate for this species. Data from these tagged animals showed that in addition to a long distance seasonal migration, there are many instances from July through September when individual ringed seals stayed in a relatively small area (compared to their migration route) up to multiple weeks, including on and around the offshore continental shelf leased blocks. In addition, Patterson *et al.* (2014) indicate a turnover period of a week or more for individual seals in the vicinity of the seismic survey in the Alaskan Arctic may be more appropriate, based on the 6-24 day area occupancy. These results suggest that assuming a 100% turnover of all individual seals around SAE's seismic survey box on a daily basis is unreasonable, and a period closer to a week may be more appropriate and yet still conservative for other individuals that remained in the area for longer periods. Therefore, for the purpose of this IHA, NMFS used a slightly higher turnover rate than the weekly rate, i.e., a 48-hour (or 50%) turnover rate, to be more conservative.

Few data are available on the home range and movement patterns of the other two ice seals, the bearded seal and spotted seals. Therefore, we used the most conservative daily turnover rate for take estimates of these species.

4. Use of Different Size of Airgun Arrays

As discussed in the Federal Register notice (80 FR 20084; April 14, 2015) for the proposed IHA and early in this document, two types of airgun arrays will be used during SAE's 3D seismic survey in the Beaufort Sea: 620 in^3 and 1,240 in^3 airgun arrays. Upon inquiry from NMFS regarding the frequency of different airgun arrays being used, SAE expects that approximately 80% of the survey would be done using the 620 in^3 array, with the remaining by the 1,240 in^3 array. Therefore, the take number estimates reflect the combination of takes from each of these two airgun arrays in a 4:1 ration for the 620 in^3 vs. 1,240 in^3 arrays.

Based on the above described take estimate calculation by multiplying ensonified area by animal density by survey days in specific marine mammal habitat and season, adjusted by turnover rates and different airgun usage, the estimated number of bowhead and beluga whales, and ringed, spotted, and bearded seals can be calculated. A summary of the calculation is provided in Table 4 below.

Table 4. Summary of calculation of marine mammal exposed to received levels higher than 160 dB re 1 µPa for SAE's proposed 3D seismic survey.

Airgun array volume: 620 in^3											
	Summer				Fall				All seasons		
Species (habitat)	ZOI (km^2)	Days	Density (km^{-1})	Summer exposure	ZOI (km^2)	Days	Density (km^{-1})	Fall exposure	Turn-over	Airgun usage	Total adjusted exposure
Bowhead whale	113			344	113			332.2	50%	80%	271
(0.0 – 1.5m)	*21.47*	*28*	*0*	*0*	*21.47*	*21*	*0*	*0*			
(1.5 – 5.0m)	*18.08*	*28*	*0*	*0*	*18.08*	*21*	*0*	*0*			
(5.0 – 15.0m)	*40.68*	*28*	*0.1674*	*190.6*	*40.68*	*21*	*0*	*0*			
(> 15.0m)	*32.77*	*28*	*0.1674*	*153.6*	*32.77*	*21*	*0.4828*	*332.2*			
Beluga whale	113	28	0.0020	6.3	113	21	0.0057	13.5	100%	80%	16
Ringed seal	113	28	0.3547	1122.3	113	21	0.2510	595.6	20%	80%	687
Spotted seal	113	28	0.0177	56	113	21	0.0125	29.7	100%	80%	69
Bearded seal	113	28	0.0177	56	113	21	0.0125	29.7	100%	80%	69
Airgun array volume: 1,240 in^3											
	Summer				Fall				All seasons		
Species (habitat)	ZOI (km^2)	Days	Density (km^{-1})	Summer exposure	ZOI (km^2)	Days	Density (km^{-1})	Fall exposure	Turn-over	Airgun usage	Total adjusted exposure
Bowhead whale	303			923	303			891	50%	20%	181
(0.0 – 1.5m)	*57.57*	*28*	*0*	*0*	*57.57*	*21*	*0*	*0*			
(1.5 – 5.0m)	*48.48*	*28*	*0*	*0*	*48.48*	*21*	*0*	*0*			
(5.0 – 15.0m)	*109.1*	*28*	*0.1674*	*511.2*	*109.1*	*21*	*0*	*0*			
(> 15.0m)	*87.87*	*28*	*0.1674*	*411.8*	*87.87*	*21*	*0.4828*	*890.8*			
Beluga whale	303	28	0.0020	17	303	21	030057	36.3	100%	20%	11
Ringed seal	303	28	0.3547	3009.3	303	21	0.2510	1597.1	20%	20%	461
Spotted seal	303	28	0.0177	150.2	303	21	0.0125	79.5	100%	20%	46

Bearded seal	303	28	0.0177	150.2	303	21	0.0125	79.5	100%	20%	46

The potential takes of spotted seals are adjusted based on observations during SAE's 2014 seismic operations immediately east of the Colville River Delta (Lomac-MacNair *et al.*, 2014). The 90-day report (Lomac-MacNair *et al.*, 2014) reported only 5 confirmed sightings of ringed seals, none of which were observed during active seismic activity. But a total of 40 spotted seals (4 during seismic surveys) and an additional 28 seals (could be either ringed or spotted seals, with 4 during seismic surveys) were observed. Given only 88 km^2 were shot in 2014, this would extrapolate to about 353 spotted seals observed during the planned 777 km2 of operations planned in 2015. If 80% of the ringed/spotted seal sightings were actually spotted seals, then an additional 200 spotted seals would be observed during the seismic survey. Given the nearshore location of the planned seismic activities and proximity to Colville River Delta spotted seal haulout sites, and likelihood that a number of seals that were exposed to seismic noise exceeding 160 dB were not observed, NMFS corrected the spotted seal takes to 500.

No density data for gray whale is available in the SAE's proposed survey area, because gray whale occurrence in the Beaufort Sea is not frequent, especially in nearshore water where SAE's survey area is. Based on sighting data, only a few gray where have been documented in the nearshore Beaufort Sea (Green and Negri, 2005, Green *et al*., 2007). Therefore, it is estimated up to 2 gray whales could be taken by Level B harassment as a result of SAE's 3D seismic survey during the 2015 open-water season in the Beaufort Sea.

A summary of estimated number of marine mammal potentially exposed to received sound levels greater than 160 dB re 1 µPa is provided in Table 6.

Level A Exposure Calculations

As discussed earlier in this section, NMFS considers that exposures to pinnipeds at noise levels above 190 dB and cetaceans at noise levels above 180 dB constitute Level A takes under the MMPA. Although brief exposure of marine mammals at these levels are not likely to cause TTS or PTS (Southall *et al.* 2007), this consideration is a precaution NMFS takes for its effect analysis.

The methods used in estimate Level A exposure is the same for Level B estimates, i.e., multiplying the total amount of area available to the species that could be seasonally ensonified by noise levels exceeding 190 and 180 dB by density of each species by the number of survey days in each season, then corrected by the animals turnover rates and different airgun array usage. The results of potential Level A exposure are shown in Table 5, assuming that animals will not avoid being exposed to received levels that could cause hearing threshold shifts or even injury, which is highly unlikely, and that no mitigation and monitoring measures would be implemented to avoid Level A takes.

Table 5. Summary of calculation of cetaceans exposed to received levels higher than 180 dB and pinnipeds exposure to received levels higher than 190 dB re 1 µPa, with no consideration of animals avoiding Level A exclusion zone and no monitoring and mitigation measures are in place to avoid such exposures.

Airgun array volume: 620 in^3											
	Summer				Fall				All seasons		
Species (habitat)	ZOI (km^2)	Days	Density (km^{-1})	Summer exposure	ZOI (km^2)	Days	Density (km^{-1})	Fall exposure	Turn-over	Airgun usage	Total adjusted exposure
Bowhead whale	67.8			206	67.8			199	50%	80%	162
(0.0 – 1.5m)	*12.88*	*28*	*0*	*0*	*12.88*	*21*	*0*	*0*			
(1.5 – 5.0m)	*10.85*	*28*	*0*	*0*	*10.85*	*21*	*0*	*0*			
(5.0 – 15.0m)	*24.41*	*28*	*0.1674*	*114.4*	*24.41*	*21*	*0*	*0*			
(> 15.0m)	*19.66*	*28*	*0.1674*	*92.2*	*19.66*	*21*	*0.4828*	*199.4*			
Beluga whale	67.8	28	0.0020	3.8	67.8	21	0.0057	8.1	100%	80%	10
Ringed seal	54.2	28	0.3547	538	54.2	21	0.2510	285.5	20%	80%	329
Spotted seal	54.2	28	0.0177	26.8	54.2	21	0.0125	14.2	100%	80%	33
Bearded seal	54.2	28	0.0177	26.8	54.2	21	0.0125	14.2	100%	80%	33
Airgun array volume: 1,240 in^3											
	Summer				Fall				All seasons		
Species (habitat)	ZOI (km^2)	Days	Density (km^{-1})	Summer exposure	ZOI (km^2)	Days	Density (km^{-1})	Fall exposure	Turn-over	Airgun usage	Total adjusted exposure
Bowhead whale	78			237	78			229	50%	20%	47
(0.0 – 1.5m)	*14.77*	*28*	*0*	*0*	*14.77*	*21*	*0*	*0*			
(1.5 – 5.0m)	*12.44*	*28*	*0*	*0*	*12.44*	*21*	*0*	*0*			

(5.0 – 15.0m)	*27.99*	*28*	*0.1674*	*131.1*	*27.99*	*21*	*0*	*0*			
(> 15.0m)	*22.54*	*28*	*0.1674*	*105.6*	*22.54*	*21*	*0.4828*	*228.6*			
Beluga whale	77.74	28	0.0020	4.4	77.74	21	030057	9.3	100%	20%	3
Ringed seal	55.84	28	0.3547	554.6	55.84	21	0.2510	294.3	20%	20%	85
Spotted seal	55.84	28	0.0177	27.7	55.84	21	0.0125	14.7	100%	20%	8
Bearded seal	55.84	28	0.0177	27.7	55.84	21	0.0125	14.7	100%	20%	8

It is important to note that the numbers presented in Table 5 are not the Level A take numbers. These numbers represent an unlikely scenario of exposure incidences if an animal did not avoid the intense noise field that could cause hearing impairment or injury and no monitoring or mitigation measures were implemented to avoid such consequences. Literature (e.g., Richardson *et al.* 1995, 1999; Southall *et al.* 2007) shows that marine mammals often avoid areas with intense noises, especially bowhead whales, even when the received noise levels are way below the levels that could elicit Level B harassment. Although this avoidance of an area by the marine mammals does not preclude the animals being taken by Level B harassment, it lessens the likelihood that they will be exposed above 180 dB for cetaceans and 190 dB for pinnipeds and incur hearing impairment or injury.

Most importantly, monitoring and mitigation measures prescribed in the IHA require SAE to shut down or power down airgun arrays when a marine mammal is detected approaching, therefore, potential Level A harassment can be further avoided. Especially for non-deep diving large cetaceans such as bowhead whales (and to some extent beluga whales), vessel-based visual monitoring is effective to detect the whales before they enter the exclusion zone, as shown in previous 90-day reports from SAE and other open-water seismic survey activities. Nevertheless, in the unlikely case if a marine mammal is not detected by the PSO and did not avoid the 180 or 190 dB established for cetaceans and pinnipeds, respectively, a Level A take could occur. To derive more realistic Level A take estimates and in discussion with the Commission, NMFS consulted with the ESA biologists at NMFS Alaska Region. In addition, NMFS reviewed the

monitoring results from SAE's 90-day report of its 2014 3D seismic survey in the same area with similar airgun arrays and vessel types, and also reviewed monitoring results from other monitoring reports in nearby waters in Beaufort Sea using similar sizes of airgun arrays (e.g., BP's 2012 Simpson Lagoon 3D seismic survey and BP's 2014 North Prudhoe Bay 3D seismic survey). Based on the review of these monitoring plans (including consideration of missed detections), the likely effectiveness of the mitigation and the likely avoidance of high levels of sound, NMFS modified the authorized Level A take as follows: 1 bowhead whale, 4 beluga whale, 20 ringed seals, 20 spotted seals, and 10 bearded seals.

A summary of authorized Level A and Level B harassments for SAE's 3D seismic surveys in the Colville Delta of the Beaufort Sea is provided in Table 6.

Table 6. The authorized Level A and Level B harassments of marine mammals for SAE's 2015 open-water 3D seismic survey in the Beaufort Sea.

Species	Stock Abundance	Authorized Level B Harassment	Authorized Level A Harassment	% of Take by Stock
Bowhead whale	19,534	452	1	2.31%
Beluga whale (Beaufort Sea stock)	39,258	27	4	0.07%
Beluga whale (E. Chukchi Sea stock)	3,710	27	4	0.73%
Gray whale	19,126	2	0	0.01%
Ringed seal	300,000	1,148	20	0.39%
Spotted seal	141,479	500	20	0.35%
Bearded seal	155,000	115	10	0.07%

The estimated Level A and Level B takes as a percentage of the marine mammal stock are 2.31% or less in all cases (Table 6). The highest percent of population estimated to be taken is 0.005% for Level A and 2.31% for Level B harassments for bowhead whale. For beluga whales, since there are two stocks in the proposed action, the percentage of the takes represent the worst case scenario when all takes occur in Beaufort Sea stock (0.07%) or East Chukchi Sea

stock (0.73%). However, most likely the percentage of takes for each stock would not be this worst case scenario.

Analysis and Determinations

Negligible Impact

Negligible impact is "an impact resulting from the specified activity that cannot be reasonably expected to, and is not reasonably likely to, adversely affect the species or stock through effects on annual rates of recruitment or survival" (50 CFR 216.103). A negligible impact finding is based on the lack of likely adverse effects on annual rates of recruitment or survival (i.e., population-level effects). An estimate of the number of Level B harassment takes, alone, is not enough information on which to base an impact determination. In addition to considering estimates of the number of marine mammals that might be "taken" through behavioral harassment, NMFS must consider other factors, such as the likely nature of any responses (their intensity, duration, etc.), the context of any responses (critical reproductive time or location, migration, etc.), as well as the number and nature of estimated Level A harassment takes, the number of estimated mortalities, effects on habitat, and the status of the species.

To avoid repetition, this introductory discussion of our analyses applies to all the species listed in Table 6, given that the anticipated effects of SAE's 3D seismic survey project on marine mammals are expected to be relatively similar in nature. Where there are meaningful differences between species or stocks, or groups of species, in anticipated individual responses to activities, impact of expected take on the population due to differences in population status, or impacts on habitat, they are described independently in the analysis below.

No serious injuries or mortalities are anticipated to occur as a result of SAE's proposed 3D seismic survey, and none are proposed to be authorized. The takes that are anticipated and

authorized are expected to be limited to short-term Level B behavioral harassment, and Level A harassment in the form of permanent hearing threshold shifts. While the airguns are expected to be operated for approximately 49 days within a 70-day period, the project timeframe will occur when cetacean species are typically not found in the project area or are found only in low numbers. While pinnipeds are likely to be found in the proposed project area more frequently, their distribution is dispersed enough that they likely will not be in the Level A or Level B harassment zone continuously. As mentioned previously in this document, pinnipeds appear to be more tolerant of anthropogenic sound than mysticetes.

Bowhead Whales

The bowhead whale is listed as endangered species under the ESA and depleted under the MMPA. However, despite these designations, the Bering-Chukchi-Beaufort stock of bowheads has been increasing at a rate of 3.4% annually for nearly a decade (Allen and Angliss, 2011), even in the face of ongoing industrial activity. Additionally, during the 2001 census, 121 calves were counted, which was the highest yet recorded. The calf count provides corroborating evidence for a healthy and increasing population (Allen and Angliss, 2011).

Most of the bowhead whales encountered will likely show overt disturbance (avoidance) only if they receive airgun sounds with levels ≥ 160 dB re 1 μPa. In addition, elevated background noise level from the seismic airgun reverberant field could cause acoustic masking to bowhead whales and reduce their communication space. However, even though the decay of the signal is extended, the fact that pulses are separated by approximately 8 to 10 seconds for each individual source vessel (or 4 to 5 seconds when taking into account the two separate source vessels stationed 300 to 335 m apart) means that overall received levels at distance are expected to be much lower, thus resulting in less acoustic masking.

Bowhead whales are less likely to occur in the proposed project area in July and early August, as they are found mostly in the Canadian Beaufort Sea at this time. The animals are more likely to occur later in the season (late-August through October), as they head west towards Chukchi Sea.

It is estimated that a maximum of 452 bowhead whales (2.31%) could be taken by Level B harassment. Potential impacts to bowhead whales from SAE's 3D seismic surveys would be limited to brief behavioral disturbances and temporary avoidance of the ensonified areas.

In their westward migration route, bowhead whales have been observed to feed in the vicinity of the survey area in the Beaufort Sea. Most of the feedings are observed in the September to October period as more bowhead whales are moving through the migratory corridor in the Beaufort Sea. Therefore, the areas in offshore Beaufort Sea are considered as biologically important areas for bowhead whales in September and October (Clarke *et al.* 2015). However, their habitat is in relatively deeper water > 15 m, which accounts for only 29% of SAE's proposed seismic survey area.

The proposed activity also partially overlaps with BIAs where bowhead whale mother/calf pairs are sighted in the summer and fall and BIAs of bowhead whale fall migration (Clarke *et al.*, 2015). However, as discussed previously, the majority of the survey areas (71%) are in shallow waters < 15 m, and are not considered bowhead habitat in the fall. In the summer, bowhead whale habitat extends to much shallower area of < 5 m, which counts for about 65% of the proposed 3D seismic survey areas.

Due to the relatively small airgun arrays to be used in the SAE's 3D seismic survey, noise exposure to bowhead whales is expected to be low and would in almost all cases cause Level B harassment in the form of mild and temporary behavioral modification and/or

avoidance. Moreover, the majority of the ensonified areas (67%) would fall between 160 and 166 dB re 1 µPa for impulse noise, which at the low-end of the range for Level B behavioral harassment by noise exposure.

It is estimated that up to 1 bowhead whale could be exposed to received noise levels above 180 dB re 1 µPa (rms) for durations long enough to cause PTS, if the animal does not avoid the area for some reason and is not detected in time to have mitigation measures implemented. Marine mammals that are taken by TTS (which is a form of Level B harassment) are expected to receive minor (in the order of several dBs) and brief (minutes to hours) temporary hearing impairment because (1) animals are not likely to remain for prolonged periods within high intensity sound fields, and (2) both the seismic vessel and the animals are constantly moving, and it is unlikely that the animal will be moving along with the vessel during the survey. Although repeated experience to TTS (Level B harassment) could result in PTS (Level A harassment), for the same reasons discussed above, even if marine mammals experience PTS, the degree of PTS is expected to be mild, resulting in a few dB elevation of hearing threshold, and are not expected to be biologically significant for the population or species.

Beluga whale

Odontocete reactions to seismic airgun pulses are generally assumed to be limited to shorter distances from the airgun than are those of mysticetes (e.g., bowhead whales), in part because odontocete low-frequency hearing is assumed to be less sensitive than that of mysticetes. However, at least when in the Canadian Beaufort Sea in summer, belugas appear to be fairly responsive to seismic energy, with few being sighted within 6–12 mi (10–20 km) of seismic vessels during aerial surveys (Miller *et al.* 2005). Belugas will likely occur in small numbers in the Beaufort Sea during the survey period and few will likely be affected by the survey activity.

Beluga whales are less likely to occur in the proposed project area in July and early August, as they are found mostly in the Canadian Beaufort Sea at this time. The animals are more likely to occur later in the season (late-August through October), as they head west towards Chukchi Sea. However, most beluga whales are expected to occur in much deeper water offshore in the Beaufort Sea during its migration. The beluga whale fall migration BIAs are approximately 75 km offshore from the SAE's proposed seismic survey area (Clarke *et al.*, 2015). No other beluga whale BIAs overlap with SAE's proposed survey area.

It is estimated that a maximum of 27 beluga whales (0.07% from the Beaufort Sea stock if all animals taken are from the Beaufort Sea stock, or 0.73% from the East Chukchi Sea stock if all animals taken are from the East Chukchi Sea stock) could be taken by Level B harassment. Potential impacts to beluga whales from SAE's 3D seismic survey activity include brief behavioral disturbances and temporary avoidance of the ensonified areas.

It is estimated that up to 4 beluga whales could be exposed to received noise levels above 180 dB re 1 μPa (rms) for durations long enough to cause PTS, if the animals do not avoid are area for some reason and are not detected in time to have mitigation measures implemented. Marine mammals that are taken by TTS (which is a form of Level B harassment) are expected to receive minor (in the order of several dBs) and brief (minutes to hours) temporary hearing impairment because (1) animals are not likely to remain for prolonged periods within high intensity sound fields, and (2) both the seismic vessel and the animals are constantly moving, and it is unlikely that the animal will be moving along with the vessel during the survey. Although repeated experience to TTS (Level B harassment) could result in PTS (Level A harassment), for the same reasons discussed above, even if marine mammals experience PTS, the degree of PTS

is expected to be mild, resulting in a few dB elevation of hearing threshold, and are not expected to be biologically significant for the population or species.

Gray Whales

Gray whales are not commonly encountered in the Beaufort Sea coast, though occasional sightings have occurred in the past. It is estimated that a maximum of 2 gray whales (0.01%) could be taken by Level B harassment. Potential impacts to gray whales from SAE's 3D seismic survey will be limited to brief behavioral disturbances and temporary avoidance of the ensonified areas. No Level A takes of gray whale is expected, and none is authorized.

No BIA for gray whales overlaps with SAE's 3D seismic survey in the Beaufort Sea (the gray whale reproduction and feeding BIAs during the summer and fall are in the Chukchi Sea (Clarke *et al.* 2015)).

Pinnipeds

Ringed, spotted, and bearded are regularly encountered in the proposed SAE's seismic survey area, with the first two species being most common. Ringed seals were recently listed under the ESA as threatened species, and are considered depleted under the MMPA. On July 25, 2014, the U.S. District Court for the District of Alaska vacated NMFS' rule listing the Beringia bearded seal DPS as threatened and remanded the rule to NMFS to correct the deficiencies identified in the opinion.

As stated in the **Federal Register** notice (80 FR 20084; April 14, 2015) for the proposed IHA, they appear to be more tolerant of anthropogenic sound, especially at lower received levels, than other marine mammals, such as mysticetes. SAE's proposed activities would occur at a time of year when these seal species found in the region are not molting, breeding, or pupping. Therefore, these important life functions would not be impacted by SAE's proposed activities.

The exposure of pinnipeds to sounds produced by SAE's proposed 3D seismic survey operations in the Beaufort Sea is not expected to result in more than Level B harassment of individuals from pinnipeds in most cases, with a few by Level A harassment in the form of TTS (Level B harassment) and PTS (Level A harassment).

It is estimated that maxima of 459 ringed seals (0.15%), 500 spotted seals (0.35%), and 115 bearded seals (0.07%) could be taken by Level B harassment. Level B behavioral harassment to these species from SAE's 3D seismic survey activity include brief behavioral disturbances and temporary avoidance of the ensonified areas.

In addition, it is estimated that up to 20 ringed and spotted seals and 10 bearded seals could be exposed to received noise levels above 190 dB re 1 μPa (rms) for durations long enough to cause TTS, if the animals do not avoid are area for some reason and are not detected in time to have mitigation measures implemented (or even PTS if such exposures occurred repeatedly). Marine mammals that are taken by TTS are expected to receive minor (in the order of several dBs) and brief (minutes to hours) temporary hearing impairment because (1) animals are not likely to remain for prolonged periods within high intensity sound fields, and (2) both the seismic vessel and the animals are constantly moving, and it is unlikely that the animal will be moving along with the vessel during the survey. Although repeated experience to TTS could result in PTS (Level A harassment), for the same reasons discussed above, even if marine mammals experience PTS, the degree of PTS is expected to be mild, resulting in a few dB elevation of hearing threshold. Therefore, even if a few marine mammals receive TTS or PTS, the degree of these effects are expected to be minor and, in the case of TTS, brief, and are not expected to be biologically significant for the population or species.

No biologically important area exists for seals in the vicinity of SAE's 3D seismic survey activities.

Taking into account the mitigation measures that are planned, effects on marine mammals are generally expected to be restricted to avoidance of a limited area around SAE's proposed open-water activities and short-term changes in behavior, falling within the MMPA definition of "Level B harassments." The many reported cases of apparent tolerance by marine mammals to seismic exploration, vessel traffic, and some other human activities show that co-existence is possible. Mitigation measures, such as controlled vessel speed, dedicated marine mammal observers, non-pursuit, ramp up procedures, and shut downs or power downs when marine mammals are seen within defined ranges, will further reduce short-term reactions and minimize any effects on hearing sensitivity. In all cases, the effects are expected to be short-term, with no lasting biological consequence.

Potential impacts to marine mammal habitat were discussed previously in the **Federal Register** notice (80 FR 20084; April 14, 2015) for the proposed IHA (see the "**Anticipated Effects on Habitat**" section of that document). Although some disturbance of food sources of marine mammals is possible, any impacts are anticipated to be minor enough as to not affect rates of recruitment or survival of marine mammals in the area. The marine survey activities would occur in a localized area, and given the vast area of the Arctic Ocean where feeding by marine mammals occurs, any missed feeding opportunities in the direct project area could be offset by feeding opportunities in other available feeding areas.

In addition, no critical habitat of ESA-listed marine mammal species occurs in the Beaufort Sea.

Based on the analysis contained herein of the likely effects of the specified activity on

marine mammals and their habitat, and taking into consideration the implementation of the proposed monitoring and mitigation measures, NMFS finds that the total marine mammal take from SAE's proposed 3D seismic survey in the Beaufort Sea, Alaska, will have a negligible impact on the affected marine mammal species or stocks.

Small Numbers

The requested takes proposed to be authorized represent less than 2.31% for all populations or stocks potentially impacted (see Table 6 in this document). These take estimates represent the maximum percentage of each species or stock that could be taken by Level B behavioral harassment and Level A harassment if each animal is taken only once, and each take represents a different individual animal. However, it is likely that many, if not most, individual animals could be taken multiple times due to their short term movement patter and home range. Therefore, the percentages of takes of marine mammals among their populations are likely to be much lower. The numbers of marine mammals estimated to be taken are small proportions of the total populations of the affected species or stocks. In addition, the mitigation and monitoring measures (described previously in this document) prescribed in the IHA are expected to reduce even further any potential disturbance and injuries to marine mammals.

Based on the analysis contained herein of the likely effects of the specified activity on marine mammals and their habitat, and taking into consideration the implementation of the mitigation and monitoring measures, NMFS finds that small numbers of marine mammals will be taken relative to the populations of the affected species or stocks.

Impact on Availability of Affected Species or Stock for Taking for Subsistence Uses

Relevant Subsistence Uses

The proposed seismic activities will occur within the marine subsistence area used by the village of Nuiqsut. Nuiqsut was established in 1973 at a traditional location on the Colville River providing equal access to upland (e.g., caribou, Dall sheep) and marine (e.g., whales, seals, and eiders) resources (Brown 1979). Although Nuiqsut is located 40 km (25 mi) inland, bowhead whales are still a major fall subsistence resource. Although bowhead whales have been harvested in the past all along the barrier islands, Cross Island is the site currently used as the fall whaling base, as it includes cabins and equipment for butchering whales. However, whalers must travel about 160 km (100 mi) to annually reach the Cross Island whaling camp, which is located in a direct line over 110 km (70 mi) from Nuiqsut. Whaling activity usually begins in late August with the arrival whales migrating from the Canadian Beaufort Sea, and may occur as late as early October, depending on ice conditions and quota fulfillment. Most whaling occurs relatively near (<16 km or <10 mi) the island, largely to prevent meat spoilage that can occur with a longer tow back to Cross Island. Since 1993, Cross Island hunters have harvested one to four whales annually, averaging three.

Cross Island is located 70 km (44 mi) east of the eastern boundary of the seismic survey box. (Point Barrow is over 180 km [110 mi] outside the potential survey box.) Seismic activities are unlikely to affect Barrow or Cross Island based whaling, especially if the seismic operations temporarily cease during the fall bowhead whale hunt.

Although Nuiqsut whalers may incidentally harvest beluga whales while hunting bowheads, these whales are rarely seen and are not actively pursued. Any harvest that would occur would most likely be in association with Cross Island.

The potential seismic survey area is also used by Nuiqsut villagers for hunting seals. All three seal species that are likely to be taken – ringed, spotted, and bearded – are hunted. Sealing

begins in April and May when villagers hunt seals at breathing holes in Harrison Bay. In early June, hunting is concentrated at the mouth of the Colville River, where ice breakup flooding results in the ice thinning and seals becoming more visible.

Once the ice is clear of the Delta (late June), hunters will hunt in open boats along the ice edge from Harrison Bay to Thetis Island in a route called "round the world." Thetis Island is important as it provides a weather refuge and a base for hunting bearded seals. During July and August, ringed and spotted seals are hunted in the lower 65 km (40 mi) of the Colville River proper.

In terms of pounds, approximately one-third of the village of Nuiqsut's annual subsistence harvest is marine mammals (fish and caribou dominate the rest), of which bowhead whales contribute by far the most (Fuller and George 1999). Seals contribute only 2 to 3% of annual subsistence harvest (Brower and Opie 1997, Brower and Hepa 1998, Fuller and George 1999). Fuller and George (1999) estimated that 46 seals were harvested in 1992. The more common ringed seals appear to dominate the harvest, although the larger and thicker-skinned bearded seals are probably preferred. Spotted seals occur in the Colville River Delta in small numbers, which is reflected in the harvest.

Available harvest records suggest that most seal harvest occurs in the months preceding the proposed August start of the seismic survey, when waning ice conditions provide the best opportunity to approach and kill hauled out seals. Much of the late summer seal harvest occurs in the Colville River as the seals follow fish runs upstream. Still, open-water seal hunting could occur coincident with the seismic surveys, especially bearded seal hunts based from Thetis Island. In general, however, given the relatively low contribution of seals to the Nuiqsut

subsistence, and the greater opportunity to hunt seals earlier in the season, any potential impact by the seismic survey on seal hunting is likely remote.

Potential Impacts to Subsistence Uses

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

Noise and general activity during SAE's proposed 3D OBN seismic survey have the potential to impact marine mammals hunted by Native Alaskans. In the case of cetaceans, the most common reaction to anthropogenic sounds (as noted previously) is avoidance of the ensonified area. In the case of bowhead whales, this often means that the animals divert from their normal migratory path by several kilometers. Additionally, general vessel presence in the vicinity of traditional hunting areas could negatively impact a hunt. Native knowledge indicates that bowhead whales become increasingly "skittish" in the presence of seismic noise. Whales are more wary around the hunters and tend to expose a much smaller portion of their back when surfacing, which makes harvesting more difficult. Additionally, natives report that bowheads exhibit angry behaviors, such as tail-slapping, in the presence of seismic activity, which translate to danger for nearby subsistence harvesters.

Responses of seals to seismic airguns are expected to be negligible. Bain and Williams (2006) studied the responses of harbor seals, California sea lions, and Steller sea lions to seismic

airguns and found that seals at exposure levels above 170 dB re 1 μPa (peak-peak) often showed avoidance behavior, including generally staying at the surface and keeping their heads out of the water, but that the responses were not overt, and there were no detectable responses at low exposure levels.

Plan of Cooperation or Measures to Minimize Impacts to Subsistence Hunts

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

SAE has prepared a POC, which was developed by identifying and evaluating any potential effects the proposed seismic survey might have on seasonal abundance that is relied upon for subsistence use. For the proposed project, SAE worked closely with the North Slope Borough (NSB) and its partner Kuukpik Corporation, to identify subsistence communities and activities that may take place within or near the project area.

As a joint venture partner with Kuukpik, SAE is working closely with them and the communities on the North Slope to plan operations that will include measures that are environmentally suitable and that do not impact local subsistence use. In addition, SAE signed a Conflict Avoidance Agreement (CAA) with the AEWC and other subsistence whaling communities.

SAE adopted a three-stage process to develop its POC:

Stage 1: To open communications SAE attended and presented the program description to the Alaska Eskimo Whaling Commission (AEWC) during their mini-convention in December, 2014, in Anchorage. Collaboration meetings were held in March and April 2015 with Kuukpik

Corporation leaders. Kuukpik Corporation is SAE's joint venture partners in the project and on the North Slope of Alaska.

Prior to offshore activities, SAE met and consulted with nearby communities, the North Slope Borough (NSB) planning department and the Fish and Wildlife division. SAE has also presented its project during a community meeting in the village of Nuiqsut, to discuss the planned activities. The discussions included SAE's project description, the POC, resolution of potential conflicts, and proposed operational window. These meetings helped to identify any subsistence conflicts. The following meetings were conducted:

- Nuiqsut: November, 2014 (Job Fair)
- Nuiqsut: January, 2015 (Project Presentation)
- AEWC: December, 2014 (2015 planned projects)
- Barrow (NSB): March, 2015 (Pre Application Meeting)
- Barrow: March, 2015 (Planning Commission Meeting)
- AEWC: February, 2015 (Project Presentation)

In addition, SAE scheduled the following meeting in the near future:

- Nuqsut: July, 2015 (update Meeting)
- KSOP: July 2015 (Presentation)

Stage 2: SAE incorporated meaningful requests to mitigate concerns into operations, including signing a CAA and providing weekly updates to the Kuukpikmiut Subsistence Oversight Panel (KSOP). SAE plans to have a review of permit stipulations and a permit matrix developed for the crews. The means of communications and contacts list have been developed and implemented into operations. Communications will be handled within the CAA and directly with Nuiqsut Whalers. The use of scientific and Inupiat PSOs/Communicators on board the

vessels will ensure that appropriate precautions are taken to avoid harassment of marine mammals, including whales, seals, walruses or polar bears. SAE will coordinate the timing and location of operations with the Com-Centers in Deadhorse and Kaktovik to minimize impact to the subsistence activities or the Nuiqsut/Kaktovik Bowhead Whale Hunt.

Stage 3: If a conflict does occur with project activities and subsistence hunting, the SAs will immediately contact the project manager and the Com Center. If avoidance is not possible, the project manager will initiate communication with a representative from the impacted subsistence hunter group(s) to resolve the issue and to plan an alternative course of action (which may include ceasing operations during the whale hunt).

In addition, the following mitigation measures will be imposed in order to effect the least practicable adverse impact on the availability of marine mammal species for subsistence uses:

(i) Establishment and operations of Communication and Call Centers (Com-Center) Program

- For the purposes of reducing or eliminating conflicts between subsistence whaling activities and SAE's survey program, SAE will participate with other operators in the Com-Center Program. Com-Centers will be operated to facilitate communication of information between SAE and subsistence whalers. The Com-Centers will be operated 24 hours/day during the 2015 fall subsistence bowhead whale hunt.
- All vessels shall report to the appropriate Com-Center at least once every six hours, commencing each day with a call at approximately 06:00 hours.
- 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 that Com-Center shall notify all whalers of such changes. The

appropriate Com-Center also shall be called regarding any unsafe or unanticipated ice conditions.

(ii) SAE shall monitor the positions of all of its vessels and exercise due care in avoiding any areas where subsistence activity is active.

(iii) Routing barge and transit vessels:

- Vessels transiting in the Beaufort Sea east of Bullen Point to the Canadian border shall remain at least 5 miles offshore during transit along the coast, provided ice and sea conditions allow. During transit in the Chukchi Sea, vessels shall remain as far offshore as weather and ice conditions allow, and at all times at least 5 miles offshore.
- 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, unless ice conditions or an emergency that threatens the safety of the vessel or crew prevents compliance with this requirement. This condition shall not apply to vessels actively engaged in transit to or from a coastal community to conduct crew changes or logistical support operations.
- Vessels shall be operated at speeds necessary to ensure no physical contact with whales occurs, and to make any other potential conflicts with bowheads or whalers unlikely. Vessel speeds shall be less than 10 knots in the proximity of feeding whales or whale aggregations.
- 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:

- Reducing vessel speed to less than 5 knots within 900 feet of the whale(s);
- Steering around the whale(s) if possible;
- Operating the vessel(s) in such a way as to avoid separating members of a group of whales from other members of the group;
- Operating the vessel(s) to avoid causing a whale to make multiple changes in direction; and
- Checking the waters immediately adjacent to the vessel(s) to ensure that no whales will be injured when the propellers are engaged.

(iv) Limitation on seismic surveys in the Beaufort Sea

- Kaktovik: No seismic survey from the Canadian Border to the Canning River from around August 25 to close of the fall bowhead whale hunt in Kaktovik and Nuiqsut, based on the actual hunt dates. From around August 10 to August 25, based on the actual hunt dates, SAE will communicate and collaborate with the Alaska Eskimo Whaling Commission (AEWC) on any planned vessel movement in and around Kaktovik and Cross Island to avoid impacts to whale hunting.
- Nuiqsut:
  - Pt. Storkerson to Thetis Island: No seismic survey prior to July 25 inside the Barrier Islands. No seismic survey from around August 25 to close of fall bowhead whale hunting outside the Barrier Island in Nuiqsut, based on the actual hunt dates.
  - Canning River to Pt. Storkerson: No seismic survey from around August 25 to

the close of bowhead whale subsistence hunting in Nuiqsut, based on the actual hunt dates.

- Barrow: No seismic survey from Pitt Point on the east side of Smith Bay to a location about half way between Barrow and Peard Bay from September 15 to the close of the fall bowhead whale hunt in Barrow.

(v) SAE 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, 2015. Any vessel that encounters weather or ice that will prevent compliance with this date shall coordinate its transit through the Bering Strait to a point south of 59 degrees North latitude with the appropriate Com-Centers. SAE 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.

Unmitigable Adverse Impact Analysis and Preliminary Determination

SAE has adopted a spatial and temporal strategy for its 3D OBN seismic survey that should minimize impacts to subsistence hunters and ensure the sufficient availability of species for hunters to meet subsistence needs. SAE will temporarily cease seismic activities during the fall bowhead whale hunt, which will allow the hunt to occur without any adverse impact from SAE's activities. Although some seal hunting co-occurs temporally with SAE's proposed seismic survey, the locations do not overlap, so SAE's activities will not impact the hunting areas and will not directly displace sealers or place physical barriers between the sealers and the seals. In addition, SAE is conducting the seismic surveys in a joint partnership agreement with Kuukpik Corporation, which allows SAE to work closely with the native communities on the North Slope to plan operations that include measures that are environmentally suitable and that do not impact local subsistence use, and to adjust the operations, if necessary, to minimize any

potential impacts that might arise. Based on the description of the specified activity, the measures described to minimize adverse effects on the availability of marine mammals for subsistence purposes, and the proposed mitigation and monitoring measures, NMFS has determined that there will not be an unmitigable adverse impact on subsistence uses from SAE's proposed activities.

Endangered Species Act (ESA)

Within the project area, the bowhead whale is listed as endangered and the ringed seal is listed as threatened under the ESA. NMFS' Permits and Conservation Division initiated consultation with staff in NMFS' Alaska Region Protected Resources Division under section 7 of the ESA on the issuance of an IHA to SAE under section 101(a)(5)(D) of the MMPA for this activity. In June 2015, NMFS issued a Biological Opinion, and concluded that the issuance of the IHA associated with SAE's 2015 3D seismic survey in the Beaufort Sea is not likely to jeopardize the continued existence of the endangered bowhead, humpback and the threatened Arctic sub-species of ringed seal. No critical habitat has been designated for these species, therefore none will be affected.

National Environmental Policy Act (NEPA)

NMFS prepared an EA that includes an analysis of potential environmental effects associated with NMFS' issuance of an IHA to SAE to take marine mammals incidental to conducting a 3D seismic survey in the Beaufort Sea, Alaska. NMFS has finalized the EA and prepared a Finding of No Significant Impact for this action. Therefore, preparation of an Environmental Impact Statement is not necessary. NMFS' draft EA was available to the public for a 30-day comment period before it was finalized.

Authorization

As a result of these determinations, NMFS has issued an IHA to SAE for the take of marine mammals, by Level B and Level A harassments, incidental to conducting a 3D OBN seismic survey in the Beaufort Sea during the 2015 open-water season, provided the previously mentioned mitigation, monitoring, and reporting requirements are incorporated.

Dated: July 6, 2015.

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Perry Gayaldo,
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