DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

RIN 0648–XW13

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

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

ACTION: Notice; proposed incidental harassment authorization; request for comments.

SUMMARY: NMFS received an application from Statoil USA E&P Inc. (Statoil) for an Incidental Harassment Authorization (IHA) to take marine mammals, by harassment, incidental to a proposed open water marine seismic survey in the Chukchi Sea, Alaska, between July through November 2010. Pursuant to the Marine Mammal Protection Act (MMPA), NMFS is requesting comments on its proposal to issue an IHA to Statoil to take, by Level B harassment only, twelve species of marine mammals during the specified activity.

DATES: Comments and information must be received no later than July 8, 2010.

ADDRESSES: Comments on the application should be addressed to Michael Payne, Chief, Permits, Conservation and Education Division, Office of Protected Resources, National Marine Fisheries Service, 1315 East West Highway, Silver Spring, MD 20910. The mailbox address for providing email comments is *PR1.0648–XW13@noaa.gov*. NMFS is not responsible for e mail comments sent to addresses other than the one provided here. Comments sent via e mail, including all attachments, must not exceed a 10 megabyte file size.

Instructions: All comments received are a part of the public record and will generally be posted to *http://www.nmfs.noaa.gov/pr/permits/incidental.htm* without change. All Personal Identifying Information (for example, name, address, etc.) voluntarily submitted by the commenter may be publicly accessible. Do not submit Confidential Business Information or otherwise sensitive or protected information.

A copy of the application used in this document 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*. Documents cited in this notice may also be viewed, by appointment, during regular business hours, at the aforementioned address.

FOR FURTHER INFORMATION CONTACT: Shane Guan, Office of Protected Resources, NMFS, (301) 713 2289, ext 137.

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.

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."

Section 101(a)(5)(D) of the MMPA established an expedited process by which citizens of the U.S. can apply for an authorization to incidentally take small numbers of marine mammals by harassment. Section 101(a)(5)(D) establishes a 45 day time limit for NMFS review of an application followed by a 30 day public notice and comment period on any proposed authorizations for the incidental harassment of marine mammals. Within 45 days of the close of the comment period, NMFS must either issue or deny the authorization.

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

NMFS received an application on December 24, 2009, from Statoil for the taking, by harassment, of marine mammals incidental to a 3D marine seismic surveys in the Chukchi Sea, Alaska, during the 2010 open-water season. After addressing comments from NMFS, Statoil modified its application and submitted a revised application on April 12, 2010. The April 12, 2010, application is the one available for public comment (see **ADDRESSES**) and considered by NMFS for this proposed IHA.

This proposed marine seismic survey will use two towed airgun array consisting of 26 active (10 spare) airguns with a maximum discharge volume of 3,000 cubic inch (in^3). The proposed 3D survey will take place in a 915 mi^2 (2,370 km^2) survey area approximately 150 mi (241 km) west of Barrow in water depth of approximately 100 to 165 ft (30 to 50 m). The seismic survey is designed to collect 3D data of the deep sub-surface in Statoil's Chukchi leases in support of future oil and gas development within the area of coverage. The data will help identify source rocks, migration pathways, and play types. In addition, a 2D tie line survey has been designed as a second priority program to acquire useful information in the region. The four stand alone 2D lines (with a total length of approximately 420 mi or 675 km) are designed to tie the details of the new high resolution 3D image to the surrounding regional geology to facilitate interpretation of more regional trends. The number of 2D km acquired will to some degree be dependent on the 2010 season's restrictive ice coverage and the 3D data acquisition progress.

Statoil intends to conduct these marine surveys during the 2010 Arctic open-water season (July through November). Impacts to marine mammals may occur from noise produced by airgun sources used in the surveys.

Description of the Specified Activity

Statoil plans to conduct geophysical data acquisition activities in the Chukchi Sea in the period July 15 through November 30, 2010. Data acquisition is expected to take approximately 60 days (including anticipated downtime), but the total period for this request is from July 15 through November 30 to allow for unexpected downtime. The project area

encompasses approximately 915 mi^2 (2,370 km^2) in Statoil lease holdings in the Minerals Management Service (MMS) Outer Continental Shelf (OCS) Lease Sale 193 area in the northern Chukchi Sea (Figure 1 of the Statoil IHA application). The activities consist of 3D seismic data acquisition and a 2D tie line survey as a second priority program.

The entire 3D program, if it can be completed, will consist of approximately 3,100 mi (4,990 km) of production line, not including line turns. A total of four 2D well tie lines with a total length of approximately 420 mi (675 km) are included in the survey plan as a second priority program. The 3D seismic data acquisition will be conducted from the M/V Geo Celtic. The M/V Geo Celtic will tow two identical airgun arrays at approximately 20 ft (6 m) depth and at a distance of about 902 ft (275 m) behind the vessel. Each array is composed of three strings for a total of 26 active G-guns (4 60 in^3, 8 70 in^3, 6 100 in^3, 4 150 in^3, and 4 250 in^3) with a total discharge volume of 3000 in^3. Each array also consists of 5 clusters of 10 inactive airguns that will be used as spares. One of the smallest guns in the array (60 in^3) will be used as the mitigation gun. More details of the airgun array and its components are described in Appendix B of Statoil's IHA application. In addition to the airgun array, pinger systems (DigiRANGE II, or similar systems) will be used to position the streamer array relative to the vessel.

The estimated source level for the full 3000 in^3 array is 245 dB re 1 µPa (rms) at 1 m. The maximum distances to received levels of 190, 180 160, and 120 dB re 1 µPa (rms) from sound source verification (SSV) measurements of the 3,147 in^3 airgun array used in the Chukchi Sea during 2006–2008 were used to model the received levels at these distances, which show that the maximum distances are 700, 2,500, 13,000, and 120,000 m, respectively.

The estimated source level of this single 60 in^3 airgun is 230 dB re 1 µPa (rms) at 1 m, and the modeled distances to received levels of 190, 180 160, and 120 dB re 1 µPa (rms) are 75, 220, 1,800, and 50,000 m, respectively.

The DigiRANGE II pinger system produces very short pulses, occurring for 10 ms, with source level approximately 180 dB re 1 µPa (rms) at 1 m at 55 kHz, 188 dB re 1 µPa (rms) at 1 m at 75 kHz, and 184 dB re 1 µPa (rms) at 1 m at 95 kHz. One pulse is emitted on command from the operator aboard the source vessel, which under normal operating conditions is once every 10 s. Most of the energy in the sound pulses emitted by this pinger is between 50 and 100 kHz. The signal is omnidirectional. Using simple spherical spreading modeling for sound propagation, the calculated distances to received levels of 180, 160, and 120 dB re 1 µPa (rms) are 2.5 m, 25 m, and 2,512 m, respectively. These distances are well within the radii for airgun arrays and that of a single mitigation gun.

The vessel will travel along pre-determined lines at a speed of about 4 - 5 knots while one of the airgun arrays discharges every 8 - 10 seconds (shot interval 61.52 ft [18.75 m]). The streamer hydrophone array will consist of twelve streamers of up to approximately 2.2 mi (4 km) in length, with a total of 20,000 - 25,000 hydrophones at 6.6 ft (2 m) spacing. This large hydrophone streamer receiver array, designed to maximize efficiency and minimize the number of source points, will receive the reflected signals from the airgun array and transfer the data to an on-board processing system.

A 2D tie line survey has been designed as a second priority program to allow the vessel to acquire useful information in the region. The four stand alone 2D lines have a total length of approximately 420 mi (675 km) and are designed to tie the details of the new high resolution 3D image to known surrounding regional geology.

The approximate boundaries of the total surface area are between 71° 30' N and 72° 00' N and between 165° W and 162° 30' W. The water depth in the survey area varies from 100 to 165 ft (30 to 50 m).

The vessels involved in the seismic survey activities will consist of at least three vessels as listed below. Specifications of these vessels (or equivalent vessels if availability changes) are provided in Appendix A of Statoil's IHA application.

- One (1) seismic source vessel, the M/V Geo Celtic or similar equipped vessel, to tow the two 3,000 in^3 airgun arrays and hydrophone streamer for the 3D (and 2D) seismic data acquisition and to serve as a platform for marine mammal monitoring;
- One (1) chase/monitoring vessel, the M/V Gulf Provider or similar equipped vessel, for marine mammal monitoring, crew transfer, support and supply duties.
- One (1) chase/monitoring vessel, the M/V Thor Alpha or similar equipped vessel, for marine mammal monitoring, support and supply duties.

The M/V Geo Celtic, or similar vessel, will arrive in Dutch Harbor around mid July 2010. The vessels will be resupplied and the crew changed at this port. Depending on ice conditions, all three vessels will depart Dutch Harbor around mid/end July with an expected transit time of approximately 5 days (weather depending). Directly upon arrival in the 3D survey area, depending on ice conditions, the M/V Geo Celtic will deploy the airgun array and start operating their guns for the purpose of sound source verification measurements (see Statoil IHA application for more details). The startup date of seismic data acquisition is expected to be early/mid August but depends on local ice conditions.

Upon completion of these measurements the seismic data acquisition in the Chukchi Sea will start and, depending on the start date, is expected to be completed in the first half of October. This is based on an estimated duration of 60 days from first to last shot point (including anticipated downtime). The data acquisition is a 24–hour operation.

Description of Marine Mammals in the Area of the Specified Activity

Eight cetacean and four pinniped species under NMFS jurisdiction could occur in the general area of Statoil's open water marine seismic survey area in the Chukchi Sea. These species most likely to occur in the general area project vicinity include two cetacean species: beluga (*Delphinapterus leucas*) and bowhead whales (*Balaena mysticetus*), and three seal species: ringed (*Phoca hispida*), spotted (*P. largha*), and bearded seals (*Erignathus barbatus*). Most encounters are likely to occur in nearshore shelf habitats or along the ice edge. The marine mammal species that is likely to be encountered most widely (in space and time) throughout the period of the open water seismic survey is the ringed seal. Encounters with bowhead and beluga whales are expected to be limited to particular regions and seasons, as discussed below.

Other marine mammal species that have been observed in the Chukchi Sea but are less frequent or uncommon in the project area include harbor porpoise (*Phocoena phocoena*), narwhal (*Monodon monoceros*), killer whale (*Orcinus orca*), fin whale (*Balaenoptera physalus*), minke whale (*B. acutorostrata*), humpback whale (*Megaptera novaeangliae*), gray whale (*Eschrichtius robustus*), and ribbon seal (*Histriophoca fasciata*). These species could occur in the project area, but each of these species is uncommon or rare in the area and relatively few encounters with these species are expected during the proposed marine seismic survey. The narwhal occurs in Canadian waters

and occasionally in the Beaufort Sea, but it is rare there and is not expected to be encountered. There are scattered records of narwhal in Alaskan waters, including reports by subsistence hunters, where the species is considered extralimital (Reeves *et al.* 2002). Point Barrow, Alaska, is the approximate northeastern extent of the harbor porpoise's regular range (Suydam and George 1992). Humpback, fin, and minke whales have recently been sighted in the Chukchi Sea but very rarely in the Beaufort Sea. Greene *et al.* (2007) reported and photographed a humpback whale cow/calf pair east of Barrow near Smith Bay in 2007, which is the first known occurrence of humpbacks in the Beaufort Sea. Savarese *et al.* (2009) reported one minke whale sighting in the Beaufort Sea in 2007 and 2008. Ribbon seals do not normally occur in the Beaufort Sea; however, two ribbon seal sightings were reported during vessel-based activities near Prudhoe Bay in 2008 (Savarese *et al.* 2009).

The bowhead, fin, and humpback whales are listed as "endangered" under the Endangered Species Act (ESA) and as depleted under the MMPA. Certain stocks or populations of gray, beluga, and killer whales and spotted seals are listed as endangered or proposed for listing under the ESA; however, none of those stocks or populations occur in the proposed activity area. Additionally, the ribbon seal is considered a "species of concern" under the ESA, and the bearded and ringed seals are "candidate species" under the ESA, meaning they are currently being considered for listing.

Statoil's application contains information on the status, distribution, seasonal distribution, and abundance of each of the species under NMFS jurisdiction mentioned in this document. Please refer to the application for that information (see **ADDRESSES**). Additional information can also be found in the NMFS Stock Assessment Reports (SAR). The Alaska 2009 SAR is available at: *http://www.nmfs.noaa.gov/pr/pdfs/sars/ak2009.pdf*.

Potential Effects of the Specified Activity on Marine Mammals

Operating active acoustic sources such as an airgun array has the potential for adverse effects on marine mammals.

Potential Effects of Airgun Sounds on Marine Mammals

The effects of sounds from airgun pulses might include one or more of the following: tolerance, masking of natural sounds, behavioral disturbance, and temporary or permanent hearing impairment or non-auditory effects (Richardson *et al.* 1995). As outlined in previous NMFS documents, the effects of noise on marine mammals are highly variable, and can be categorized as follows (based on Richardson *et al.* 1995):

(1) Tolerance

Numerous studies have shown that pulsed sounds from airguns are often readily detectable in the water at distances of many kilometers. Numerous studies have shown that marine mammals at distances more than a few kilometers from operating seismic vessels often show no apparent response. That is often true even in cases when the pulsed sounds must be readily audible to the animals based on measured received levels and the hearing sensitivity of that mammal group. Although various baleen whales, toothed whales, and (less frequently) pinnipeds have been shown to react behaviorally to airgun pulses under some conditions, at other times, mammals of all three types have shown no overt reactions. In general, pinnipeds and small odontocetes seem to be more tolerant of exposure to airgun pulses than baleen whales.

(2) Behavioral Disturbance

Marine mammals may behaviorally react to sound when exposed to anthropogenic noise. These behavioral reactions are often shown as: changing durations of surfacing and dives, number of blows per surfacing, or moving direction and/or speed; reduced/increased vocal activities, changing/cessation of certain behavioral activities (such as socializing or feeding); visible startle response or aggressive behavior (such as tail/fluke slapping or jaw clapping), avoidance of areas where noise sources are located, and/or flight responses (e.g., pinnipeds flushing into water from haulouts or rookeries).

The biological significance of many of these behavioral disturbances is difficult to predict, especially if the detected disturbances appear minor. However, the consequences of behavioral modification could be expected to be biologically significant if the change affects growth, survival, and reproduction. Some of these significant behavioral modifications include:

- Drastic change in diving/surfacing patterns (such as those thought to be causing beaked whale stranding due to exposure to military mid-frequency tactical sonar);
- Habitat abandonment due to loss of desirable acoustic environment; and
- Cease feeding or social interaction.

The onset of behavioral disturbance from anthropogenic noise depends on both external factors (characteristics of noise sources and their paths) and the receiving animals (hearing, motivation, experience, demography) and is also difficult to predict (Southall *et al.* 2007).

Currently NMFS uses 160 dB re 1 μPa at received level for impulse noises (such as airgun pulses) as the onset of marine mammal behavioral harassment.

(3) Masking

Chronic exposure to excessive, though not high-intensity, noise could cause masking at particular frequencies for marine mammals that utilize sound for vital biological functions. Masking can interfere with detection of acoustic signals such as communication calls, echolocation sounds, and environmental sounds important to marine mammals. Since marine mammals depend on acoustic cues for vital biological functions, such as orientation, communication, finding prey, and avoiding predators, marine mammals that experience severe acoustic masking will have reduced fitness in survival and reproduction.

Masking occurs when noise and signals (that animal utilizes) overlap at both spectral and temporal scales. For the airgun noise generated from the proposed marine seismic survey, these are low frequency (under 1 kHz) pulses with extremely short durations (in the scale of milliseconds). Lower frequency man-made noises are more likely to affect detection of communication calls and other potentially important natural sounds such as surf and prey noise. There is little concern regarding masking due to the brief duration of these pulses and relatively longer silence between airgun shots (9 - 12 seconds) near the noise source, however, at long distances (over tens of kilometers away), due to multipath propagation and reverberation, the durations of airgun pulses can be "stretched" to seconds with long decays (Madsen *et al.* 2006). Therefore it could affect communication signals used by low frequency mysticetes when they occur near the noise band and thus reduce the communication space of animals (e.g., Clark *et al.* 2009) and cause increased stress levels (e.g., Foote *et al.* 2004; Holt *et al.* 2009). Nevertheless, the intensity of the noise is also greatly reduced at such long distances (for example, the modeled received level drops below 120 dB re 1 μPa rms at 14,900 m from the source).

Marine mammals are thought to be able to compensate for masking by adjusting their acoustic behavior such as

shifting call frequencies, increasing call volume and vocalization rates. For example, blue whales are found to increase call rates when exposed to seismic survey noise in the St. Lawrence Estuary (Di Iorio and Clark 2010). The North Atlantic right whales (Eubalaena glacialis) exposed to high shipping noise increase call frequency (Parks *et al.* 2007), while some humpback whales respond to low-frequency active sonar playbacks by increasing song length (Miller el al. 2000).

(4) Hearing Impairment

Marine mammals exposed to high intensity sound repeatedly or for prolonged periods can experience hearing threshold shift (TS), which is the loss of hearing sensitivity at certain frequency ranges (Kastak *et al.* 1999; Schlundt *et al.* 2000; Finneran *et al.* 2002; 2005). TS can be permanent (PTS), in which case the loss of hearing sensitivity is unrecoverable, or temporary (TTS), in which case the animal's hearing threshold will recover over time (Southall *et al.* 2007). Just like masking, marine mammals that suffer from PTS or TTS will have reduced fitness in survival and reproduction, either permanently or temporarily. Repeated noise exposure that leads to TTS could cause PTS. For transient sounds, the sound level necessary to cause TTS is inversely related to the duration of the sound.

Experiments on a bottlenose dolphin (Tursiops truncates) and beluga whale showed that exposure to a single watergun impulse at a received level of 207 kPa (or 30 psi) peak-to-peak (p-p), which is equivalent to 228 dB re 1 μPa (p-p), resulted in a 7 and 6 dB TTS in the beluga whale at 0.4 and 30 kHz, respectively. Thresholds returned to within 2 dB of the pre-exposure level within 4 minutes of the exposure (Finneran *et al.* 2002). No TTS was observed in the bottlenose dolphin. Although the source level of pile driving from one hammer strike is expected to be much lower than the single watergun impulse cited here, animals being exposed for a prolonged period to repeated hammer strikes could receive more noise exposure in terms of SEL than from the single watergun impulse (estimated at 188 dB re 1 μPa2–s) in the aforementioned experiment (Finneran *et al.* 2002).

For baleen whales, there are no data, direct or indirect, on levels or properties of sound that are required to induce TTS. The frequencies to which baleen whales are most sensitive are lower than those to which odontocetes are most sensitive, and natural ambient noise levels at those low frequencies tend to be higher (Urick 1983). As a result, auditory thresholds of baleen whales within their frequency band of best hearing are believed to be higher (less sensitive) than are those of odontocetes at their best frequencies (Clark and Ellison, 2004). From this, it is suspected that received levels causing TTS onset may also be higher in baleen whales. However, no cases of TTS are expected given the small size of the airguns proposed to be used and the strong likelihood that baleen whales (especially migrating bowheads) would avoid the approaching airguns (or vessel) before being exposed to levels high enough for there to be any possibility of TTS.

In pinnipeds, TTS thresholds associated with exposure to brief pulses (single or multiple) of underwater sound have not been measured. Initial evidence from prolonged exposures suggested that some pinnipeds may incur TTS at somewhat lower received levels than do small odontocetes exposed for similar durations (Kastak *et al.* 1999, 2005; Ketten *et al.* 2001). However, more recent indications are that TTS onset in the most sensitive pinniped species studied (harbor seal, which is closely related to the ringed seal) may occur at a similar SEL as in odontocetes (Kastak *et al.*, 2004).

NMFS (1995, 2000) concluded that cetaceans and pinnipeds should not be exposed to pulsed underwater noise at received levels exceeding, respectively, 180 and 190 dB re 1 μPa rms. The established 180- and 190–dB re 1 μPa rms criteria are not considered to be the levels above which TTS might occur. Rather, they are the received levels above which, in the view of a panel of bioacoustics specialists convened by NMFS before TTS measurements for marine mammals started to become available, one could not be certain that there would be no injurious effects, auditory or otherwise, to marine mammals. As summarized above, data that are now available to imply that TTS is unlikely to occur unless bow-riding odontocetes are exposed to airgun pulses much stronger than 180 dB re 1 μPa rms (Southall *et al.* 2007).

No cases of TTS are expected as a result of Statoil's proposed seismic activity due to the fact that much higher received levels than 180- and 190–dB would be needed to induce TTS. In addition, the strong likelihood that baleen whales (especially migrating bowheads) would avoid the approaching airguns (or vessel) before being exposed to levels high enough for there to be any possibility of TTS, and the mitigation and monitoring measures prescribed (described below in the document) will largely prevent marine mammals from being exposed to SPL above 180 and 190 dB re 1 μPa (rms).

There is no empirical evidence that exposure to pulses of airgun sound can cause PTS in any marine mammal, even with large arrays of airguns (see Southall *et al.*, 2007). However, given the possibility that mammals close to an airgun array might incur TTS, there has been further speculation about the possibility that some individuals occurring very close to airguns might incur PTS. Single or occasional occurrences of mild TTS are not indicative of permanent auditory damage in terrestrial mammals. Relationships between TTS and PTS thresholds have not been studied in marine mammals, but are assumed to be similar to those in humans and other terrestrial mammals. That is, PTS might occur at a received sound level magnitudes higher than the level of onset TTS, or by repeated exposure to the levels that cause TTS. Therefore, by means of preventing the onset of TTS, it is highly unlikely that marine mammals could receive sounds strong enough (and over a sufficient duration) to cause permanent hearing impairment during the proposed marine seismic survey in the Chukchi Sea.

(5) Non-auditory Physical Effects

Non-auditory physical effects might occur in marine mammals exposed to strong underwater pulsed sound. Possible types of non-auditory physiological effects or injuries that theoretically might occur in mammals close to a strong sound source include stress, neurological effects, bubble formation, and other types of organ or tissue damage. Some marine mammal species (i.e., beaked whales) may be especially susceptible to injury and/or stranding when exposed to strong pulsed sounds. However, there is no definitive evidence that any of these effects occur even for marine mammals in close proximity to large arrays of airguns, and beaked whales do not occur in the proposed project area. In addition, marine mammals that show behavioral avoidance of seismic vessels, including most baleen whales, some odontocetes (including belugas), and some pinnipeds, are especially unlikely to incur non-auditory impairment or other physical effects.

(6) Stranding and Mortality

Marine mammals close to underwater detonations of high explosive can be killed or severely injured, and the auditory organs are especially susceptible to injury (Ketten *et al.* 1993; Ketten 1995). Airgun pulses are less

energetic and their peak amplitudes have slower rise times. Up-to-date, there is no evidence that serious injury, death, or stranding by marine mammals can occur from exposure to airgun pulses, even in the case of large airgun arrays.

However, in numerous past IHA notices for seismic surveys, commenters have referenced two stranding events allegedly associated with seismic activities, one off Baja California and a second off Brazil. NMFS has addressed this concern several times, and, without new information, does not believe that this issue warrants further discussion. For information relevant to strandings of marine mammals, readers are encouraged to review NMFS' response to comments on this matter found in 69 FR 74905 (December 14, 2004), 71 FR 43112 (July 31, 2006), 71 FR 50027 (August 24, 2006), and 71 FR 49418 (August 23, 2006). In addition, a May-June 2008, stranding of 100–200 melon-headed whales (*Peponocephala electra*) off Madagascar that appears to be associated with seismic surveys is currently under investigation (IWC 2009).

It should be noted that strandings related to sound exposure have not been recorded for marine mammal species in the Beaufort and Chukchi seas. NMFS notes that in the Beaufort Sea, aerial surveys have been conducted by MMS and industry during periods of industrial activity (and by MMS during times with no activity). No strandings or marine mammals in distress have been observed during these surveys and none have been reported by North Slope Borough inhabitants. As a result, NMFS does not expect any marine mammals will incur serious injury or mortality in the Arctic Ocean or strand as a result of proposed seismic survey.

Potential Effects from Pinger System on Marine Mammals

A pinger system (DigiRANGE II) will be used during seismic operations to position the airgun array and hydrophone streamer relative to the vessel. The specifications of the DigiRANGE II pinger system (source levels and frequency ranges) are provided above. The pinger produces sounds that are above the range of frequencies produced or heard by mysticetes. However, the beluga whales and other odontocetes have good hearing sensitivity across the pingers major frequency range, which is at 50 - 100 kHz (Au *et al.* 1978; Johnson *et al.* 1989). Some seals also can hear sounds at frequencies up to somewhat above 55 kHz. In general, the potential effects of the pulse pinger on marine mammals are similar to those from the airgun, but the magnitude of the impacts is expected to be much less due to much lower intensity and higher frequencies. Estimated source levels and zones of influence from the pinger system are discussed above.

Vessel Sounds

In addition to the noise generated from seismic airguns, various types of vessels will be used in the operations, including source vessels and support vessels. Sounds from boats and vessels have been reported extensively (Greene and Moore 1995; Blackwell and Greene 2002; 2005; 2006). Numerous measurements of underwater vessel sound have been performed in support of recent industry activity in the Chukchi and Beaufort Seas. Results of these measurements were reported in various 90–day and comprehensive reports since 2007 (e.g., Aerts *et al.* 2008; Hauser *et al.* 2008; Brueggeman 2009; Ireland *et al.* 2009). For example, Garner and Hannay (2009) estimated sound pressure levels of 100 dB at distances ranging from approximately 1.5 to 2.3 mi (2.4 to 3.7 km) from various types of barges. MacDonald *et al.* (2008) estimated higher underwater SPLs from the seismic vessel *Gilavar* of 120 dB at approximately 13 mi (21 km) from the source, although the sound level was only 150 dB at 85 ft (26 m) from the vessel. Compared to airgun pulses, underwater sound from vessels is generally at relatively low frequencies.

The primary sources of sounds from all vessel classes are propeller cavitation, propeller singing, and propulsion or other machinery. Propeller cavitation is usually the dominant noise source for vessels (Ross 1976). Propeller cavitation and singing are produced outside the hull, whereas propulsion or other machinery noise originates inside the hull. There are additional sounds produced by vessel activity, such as pumps, generators, flow noise from water passing over the hull, and bubbles breaking in the wake. Icebreakers contribute greater sound levels during ice-breaking activities than ships of similar size during normal operation in open water (Richardson *et al.* 1995). This higher sound production results from the greater amount of power and propeller cavitation required when operating in thick ice. Source levels from various vessels would be empirically measured before the start of marine surveys.

Anticipated Effects on Habitat

The primary potential impacts to marine mammals and other marine species are associated with elevated sound levels produced by airguns and other active acoustic sources. However, other potential impacts to the surrounding habitat from physical disturbance are also possible.

Potential Impacts on Prey Species

With regard to fish as a prey source for cetaceans and pinnipeds, fish are known to hear and react to sounds and to use sound to communicate (Tavolga *et al.* 1981) and possibly avoid predators (Wilson and Dill 2002). Experiments have shown that fish can sense both the strength and direction of sound (Hawkins, 1981). Primary factors determining whether a fish can sense a sound signal, and potentially react to it, are the frequency of the signal and the strength of the signal in relation to the natural background noise level.

The level of sound at which a fish will react or alter its behavior is usually well above the detection level. Fish have been found to react to sounds when the sound level increased to about 20 dB above the detection level of 120 dB (Ona 1988); however, the response threshold can depend on the time of year and the fish's physiological condition (Engas *et al.* 1993). In general, fish react more strongly to pulses of sound rather than a continuous signal (Blaxter *et al.* 1981), and a quicker alarm response is elicited when the sound signal intensity rises rapidly compared to sound rising more slowly to the same level.

Investigations of fish behavior in relation to vessel noise (Olsen *et al.* 1983; Ona 1988; Ona and Godo 1990) have shown that fish react when the sound from the engines and propeller exceeds a certain level. Avoidance reactions have been observed in fish such as cod and herring when vessels approached close enough that received sound levels are 110 dB to 130 dB (Nakken 1992; Olsen 1979; Ona and Godo 1990; Ona and Toresen 1988). However, other researchers have found that fish such as polar cod, herring, and capeline are often attracted to vessels (apparently by the noise) and swim toward the vessel (Rostad *et al.* 2006). Typical sound source levels of vessel noise in the audible range for fish are 150 dB to 170 dB (Richardson *et al.* 1995).

Some mysticetes, including bowhead whales, feed on concentrations of zooplankton. Some feeding bowhead whales may occur in the Alaskan Beaufort Sea in July and August, and others feed intermittently during their westward migration in September and October (Richardson and Thomson [eds.] 2002; Lowry *et al.* 2004). However, by the time most bowhead

whales reach the Chukchi Sea (October), they will likely no longer be feeding, or if it occurs it will be very limited. A reaction by zooplankton to a seismic impulse would only be relevant to whales if it caused concentrations of zooplankton to scatter. Pressure changes of sufficient magnitude to cause that type of reaction would probably occur only very close to the source. Impacts on zooplankton behavior are predicted to be negligible, and that would translate into negligible impacts on feeding mysticetes. Thus, the proposed activity is not expected to have any habitat-related effects that could cause significant or long-term consequences for individual marine mammals or their populations.

Proposed Mitigation

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 proposed Statoil open water marine seismic survey in the Chukchi Sea, Statoil worked with NMFS and proposed the following mitigation measures to minimize the potential impacts to marine mammals in the project vicinity as a result of the marine seismic survey activities.

As part of the application, Statoil submitted to NMFS a Marine Mammal Monitoring and Mitigation Program (4MP) for its open water seismic survey in the Chukchi Sea during the 2010 open-water season. The objectives of the 4MP are:

- to ensure that disturbance to marine mammals and subsistence hunts is minimized and all permit stipulations are followed,
- to document the effects of the proposed survey activities on marine mammals, and
- to collect baseline data on the occurrence and distribution of marine mammals in the study area.

The 4MP may be modified or supplemented based on comments or new information received from the public during the public comment period or from the peer review panel (see the "Monitoring Plan Peer Review" section later in this document).

Mitigation Measures Proposed in Statoil's IHA Application

For the proposed mitigation measures, Statoil listed the following protocols to be implemented during its marine seismic survey in the Chukchi Sea.

(1) Sound Source Measurements

As described above, previous measurements of similar airgun arrays in the Chukchi Sea were used to model the distances at which received levels are likely to fall below 120, 160, 180, and 190 dB re 1 μPa (rms) from the planned airgun sources. These modeled distances will be used as temporary safety radii until measurements of the airgun sound source are conducted. The measurements will be made at the beginning of the field season and the measured radii used for the remainder of the survey period.

The objectives of the sound source verification measurements planned for 2010 in the Chukchi Sea will be to measure the distances in the broadside and endfire directions at which broadband received levels reach 190, 180, 170, 160, and 120 dB re 1 μPa (rms) for the energy source array combinations that may be used during the survey activities. The configurations will include at least the full array and the operation of a single mitigation source that will be used during power downs. The measurements of energy source array sounds will be made by an acoustics contractor at the beginning of the survey and the distances to the various radii will be reported as soon as possible after recovery of the equipment. The primary radii of concern will be the 190 and 180 dB safety radii for pinnipeds and cetaceans, respectively, and the 160 dB radii for zone of influence (ZOI). In addition to reporting the radii of specific regulatory concern, nominal distances to other sound isopleths down to 120 dB (rms) will be reported in increments of 10 dB.

Data will be previewed in the field immediately after download from the ocean bottom hydrophone (OBH) instruments. An initial sound source analysis will be supplied to NMFS and the airgun operators within 120 hours of completion of the measurements, if possible. The report will indicate the distances to sound levels between 190 dB re 1 μPa (rms) and 120 dB re 1 μPa (rms) based on fits of empirical transmission loss formulae to data in the endfire and broadside directions. The 120–hour report findings will be based on analysis of measurements from at least three of the OBH systems. A more detailed report including analysis of data from all OBH systems will be issued to NMFS as part of the 90–day report following completion of the acoustic program.

(2) Safety and Disturbance Zones

Under current NMFS guidelines, "safety radii" for marine mammal exposure to impulse sources are customarily defined as the distances within which received sound levels are μ180 dB re 1 μPa (rms) for cetaceans and μ190 dB re 1 μPa (rms) 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 that 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 safety radii (Richardson *et al.* 1995).

Initial safety and disturbance radii for the sound levels produced by the survey activities have been estimated from measurements of similar seismic arrays used in the Chukchi Sea in previous years. These radii will be used for mitigation purposes until results of direct measurements are available early during the exploration activities.

The basis for the estimation of distances to the four received sound levels from the proposed 3000 in^3 airgun array operating at a depth of 20 ft (6 m) are the 2006, 2007 and 2008 sound source verification (SSV) measurements in the Chukchi Sea of a similar array, towed at a similar depth. The measured airgun array had a total discharge volume of 3,147 in^3 and was composed of three identically-tuned Bolt airgun sub-arrays, totaling 24 airguns (6 clusters of 2 airguns and 12 single airguns). The proposed 3,000 in^3 array is also composed of three strings with a total of 26 active airguns in 13 clusters. The difference in discharge volume would lead to an expected loss of less than 0.2 dB and is neglected in this assessment. The estimated source level for the full 3,000 in^3 array is 245 dB re 1 μPA (rms). Without measurement data for the specific site to be surveyed, it is reasonable to adopt the maximum distances obtained from a similar array during previous measurements in the Chukchi Sea. Table 1 summarizes the distances to received levels of 190, 180 160, and 120 dB re 1 μPa (rms) that are adopted for the analysis for the proposed survey. Distances for received levels of 120 dB are highly variable, in part because the bottom geoacoustic properties will have a major effect on received levels at such distances.

To estimate the distances to various received levels from the 60 in^3 mitigation gun the data from previous measurements of a 30 in^3 gun were used. In general the pressure increase relative to a 30 in^3 gun can be derived by calculating the square root of (60/30), which is 1.41. This means that the dB levels for the sound pressure levels of a 60 in^3 will increase by approximately 3 dB (20Log[1.41]) compared to the 30 in^3 gun. The distances as summarized in Table 1 were derived by adding 3 dB to the constant term of the equation RL = 226.6 - 21.2log(R) - 0.00022R. The estimated source level of this single 60 in^3 airgun is 230 dB re 1 μPa (rms).

TABLE 1. ESTIMATED DISTANCES TO RECEIVED SOUND LEVELS μ190, 180, 170, 160, AND 120 DB RE 1 μPA (RMS) FROM THE 3,000 IN^3 AIRGUN ARRAY AND THE 60 IN^3 MITIGATION GUN OF THE PROPOSED SEISMIC SURVEY. THESE DISTANCES ARE BASED ON MEASUREMENTS IN THE CHUKCHI SEA FROM A SIMILAR AIRGUN ARRAY.

Received Levels (dB re 1 μPa rms)	Distance (m)	
	3,000 in^3 (full airgun array)	60 in^3 (mitigation airgun)
190	700	70
180	2,500	220
160	13,000	1,800
120	70,000 - 120,000	50,000

An acoustics contractor will perform the direct measurements of the received levels of underwater sound versus distance and direction from the energy source arrays using calibrated hydrophones. The acoustic data will be analyzed as quickly as reasonably practicable in the field and used to verify (and if necessary adjust) the safety distances. The field report will be made available to NMFS and the MMOs within 120 hrs of completing the measurements. The mitigation measures to be implemented at the 190 and 180 dB sound levels will include power downs and shut downs as described below.

(3) Power Downs and Shut Downs

A power-down is the immediate reduction in the number of operating energy sources from all firing to some smaller number. A shutdown is the immediate cessation of firing of all energy sources. The arrays will be immediately powered down whenever a marine mammal is sighted approaching close to or within the applicable safety zone of the full arrays but is outside or about to enter the applicable safety zone of the single mitigation source. If a marine mammal is sighted within the applicable safety zone of the single mitigation airgun, the entire array will be shut down (i.e., no sources firing).

Following a power-down or shutdown, operation of the airgun array will not resume until the marine mammal has cleared the applicable safety zone. The animal will be considered to have cleared the safety zone if it:

- Is visually observed to have left the safety zone;
- Has not been seen within the zone for 15 min in the case of small odontocetes and pinnipeds; or
- Has not been seen within the zone for 30 min in the case of mysticetes.

(4) Ramp Ups

A ramp up of an airgun array provides a gradual increase in sound levels, and involves a stepwise 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 proposed seismic survey, the seismic operator will ramp up the airgun arrays slowly. Full ramp ups (i.e., from a cold start after a shut down, when no airguns have been firing) will begin by firing a single airgun in the array. The minimum duration of a shut-down period, i.e., without air guns firing, which must be followed by a ramp up, is typically the amount of time it would take the source vessel to cover the 180–dB safety radius. The actual time period depends on ship speed and the size of the 180–dB safety radius. That period is estimated to be about 15 - 20 minutes based on the modeling results described above and a survey speed of 4 knots.

A full ramp up, after a shut down, will not begin until there has been a minimum of 30 min of observation of the safety zone by MMOs to assure that no marine mammals are present. The entire safety zone must be visible during the 30–minute lead-in to a full ramp up. If the entire safety zone is not visible, then ramp up from a cold start cannot begin. If a marine mammal(s) is sighted within the safety zone during the 30–minute watch prior to ramp up, ramp up will be delayed until the marine mammal(s) is sighted outside of the safety zone or the animal(s) is not sighted for at least 15 - 30 minutes: 15 minutes for small odontocetes and pinnipeds, or 30 minutes for baleen whales and large odontocetes.

During turns and transit between seismic transects, at least one airgun will remain operational. The ramp-up procedure still will be followed when increasing the source levels from one airgun to the full arrays. However, keeping one airgun firing will avoid the prohibition of a cold start during darkness or other periods of poor visibility. Through use of this approach, seismic operations can resume upon entry to a new transect without a full ramp up and the associated 30–minute lead-in observations. MMOs will be on duty whenever the airguns are firing during daylight, and during the 30–min periods prior to ramp-ups as well as during ramp-ups. Daylight will occur for 24 h/day until mid-August, so until that date MMOs will automatically be observing during the 30–minute period preceding a ramp up. Later in the season, MMOs will be called out at night to observe prior to and during any ramp up. The seismic operator and MMOs will maintain records of the times when ramp-ups start, and when the airgun arrays reach full power.

Additional Mitigation Measures Proposed by NMFS

Besides Statoil's proposed mitigation measures discussed above, NMFS proposes the following additional protective measures to address some uncertainties regarding the impacts of

bowhead cow-calf pairs and aggregations of whales from seismic surveys. Specifically, NMFS proposes that

• A 160–dB vessel monitoring zone for large whales will be established and monitored in the Chukchi Sea during all seismic surveys. Whenever an aggregation of bowhead whales or gray whales (12 or more whales of any age/sex class that appear to be engaged in a nonmigratory, significant biological behavior (e.g., feeding, socializing)) are observed during an aerial or vessel monitoring program within the 160–dB safety zone around the seismic activity, the seismic operation will not commence or will shut down, until two consecutive surveys (aerial or vessel) indicate they are no longer present within the 160–dB safety zone of seismic-surveying operations.

• Survey information, especially information about bowhead whale cow/calf pairs or feeding bowhead or gray whales, shall be provided to NMFS as required in MMPA authorizations, and will form the basis for NMFS determining whether additional mitigation measures, if any, will be required over a given time period.

Furthermore, NMFS proposes the following measures be included in the IHA, if issued, in order to ensure the least practicable impact on the affected species or stocks:

(1) All vessels should reduce speed when within 300 yards (274 m) of whales, and those vessels capable of steering around such groups should do so. Vessels may not be operated in such a way as to separate members of a group of whales from other members of the group;

(2) Avoid multiple changes in direction and speed when within 300 yards (274 m) of whales; and

(3) When weather conditions require, such as when visibility drops, support vessels must adjust speed accordingly to avoid the likelihood of injury to whales.

Mitigation Conclusions

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

• the manner in which, and the degree to which, the successful implementation of the measure is 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.

Based on our evaluation of the applicant's proposed measures, as well as other measures considered by NMFS, NMFS has preliminarily determined that the proposed mitigation measures provide the means of effecting the least practicable impact on marine mammal species or stocks and their habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance.

Proposed 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 proposed action area.

Monitoring Measures Proposed in Statoil's IHA Application

The monitoring plan proposed by Statoil can be found in the 4MP. The plan may be modified or supplemented based on comments or new information received from the public during the public comment period or from the peer review panel (see the "Monitoring Plan Peer Review" section later in this document). A summary of the primary components of the plan follows.

(1) Vessel-Based MMOs

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

A sufficient number of MMOs will be required onboard the survey vessel to meet the following criteria: (1) 100% monitoring coverage during all periods of survey operations in daylight; (2) maximum of 4 consecutive hours on watch per MMO; and (3) maximum of 12 hours of watch time per day per MMO.

MMO teams will consist of Inupiat observers and experienced field biologists. An experienced field crew leader will supervise the MMO team onboard the survey vessel. The total number of MMOs may decrease later in the season as the duration of daylight decreases.

Statoil anticipates one crew change to occur approximately half-way through the season. During crew rotations detailed hand-over notes will be provided to the incoming crew leader by the outgoing leader. Other communications such as email, fax, and/or phone communication between the current and oncoming crew leaders during each rotation will also occur when possible. In the event of an unexpected crew change Statoil will facilitate such communications to insure monitoring consistency among shifts.

Crew leaders and most other biologists serving as observers in 2010 will be individuals with experience as observers during one or more of the 1996–2009 seismic or shallow hazards monitoring projects in Alaska, the Canadian Beaufort, or other offshore areas in recent years.

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, familiar with the marine mammals of the area, and complete a NMFS approved observer training course designed to familiarize individuals with monitoring and data collection procedures. A marine mammal observers' handbook, adapted for the specifics of the planned survey program, will be prepared and distributed beforehand to all MMOs.

Most observers, including Inupiat observers, will also complete a two or three-day training and refresher session on marine mammal monitoring, to be conducted shortly before the anticipated start of the 2010 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.

Primary objectives of the training include:

• review of the marine mammal monitoring plan for this project, including any amendments specified by NMFS in the IHA (if issued), by USFWS and by MMS, or by other agreements in which Statoil may elect to participate;
• review of marine mammal sighting, identification, and distance estimation methods;
• review of operation of specialized equipment (reticle binoculars, night vision devices, and GPS system);
• review of, and classroom practice with, data recording and data entry systems, including procedures for recording data on marine mammal sightings, monitoring operations, environmental conditions, and entry error control. These procedures will be implemented through use of a customized computer database and laptop computers;
• review of the specific tasks of the Inupiat Communicator.

The MMOs will watch for marine mammals from the best available vantage point on the survey vessels, typically the bridge. The MMOs will scan systematically with the unaided eye and 7 50 reticle binoculars, supplemented during good visibility conditions with Fujinon 25x150 "Big-eye" binoculars mounted on a bride wing or flying bridge (seismic vessel only), and night-vision equipment when needed (see below). Personnel on the bridge will assist the marine mammal observer(s) in watching for marine mammals. Data from the infrared radar will be monitored in order to investigate if this could improve the detection and record keeping of mammals, especially during periods of low visibility.

Information to be recorded by marine mammal observers will include the same types of information that were recorded during recent monitoring programs associated with industry activity in the Arctic (e.g., Ireland *et al.* 2009). When a mammal sighting is made, the following information about the sighting will be recorded:

(A) Species, group size, age/size/sex categories (if determinable), behavior when first sighted and after initial sighting, heading (if consistent), bearing and distance from the MMO, apparent reaction to activities (e.g., none, avoidance, approach, paralleling, etc.), closest point of approach, and behavioral pace;

(B) Time, location, speed, activity of the vessel, sea state, ice cover, visibility, and sun glare; and

(C) The positions of other vessel(s) in the vicinity of the MMO location.

The ship's position, speed of support vessels, and water temperature, water depth, sea state, ice cover, visibility, and sun glare will also be recorded at the start and end of each observation watch, every 30 minutes during a watch, and whenever there is a change in any of those variables.

Distances to nearby marine mammals will be estimated with binoculars (Fujinon 7 x 50 binoculars) containing a reticle to measure the vertical angle of the line of sight to the animal relative to the horizon. MMOs may use a laser rangefinder to test and improve their abilities for visually estimating distances to objects in the water. However, previous experience showed that a Class 1 eye-safe device was not able to measure distances to seals more than about 230 ft (70 m) away. The device was very useful in improving the distance estimation abilities of the observers at distances up to about 1,968 ft (600 m)-the maximum range at which the device could measure distances to highly reflective objects such as other vessels. Humans observing objects of more-or-less known size via a standard observation protocol, in this case from a standard height above water, quickly become able to estimate distances within about =20% when given immediate feedback about actual distances during training.

Monitoring At Night and In Poor Visibility

Night-vision equipment (Generation 3 binocular image intensifiers, or equivalent units) will be available for use when/if 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).

A prototype infrared radar will be mounted on the source vessel in order to try to improve the visual observations during times of poor visibility. The infrared radar detects thermal contrasts and its ability to sense these differences is not dependent on daylight. It may therefore improve the ability to detect marine mammals during nighttime. The ability of the IR radar to detect marine mammals is not yet proven and the intent is to collect data that can help determine if it can be used as an effective monitoring tool in the future. However, if during the course of testing, a reliable detection of a marine mammal within a safety zone requiring a mitigation action is made using the radar system, the necessary actions will be taken by the MMOs. That is, even if the system is not entirely proven, reliable results made during testing that may provide protection to marine mammals will not be ignored.

(2) Acoustic Monitoring

Sound Source Measurements

As described above, previous measurements of airguns in the Chukchi Sea were used to estimate the distances at which received levels are likely to fall below 120, 160, 180, and 190 dB re 1 μPa (rms) from the planned airgun sources. These modeled distances will be used as temporary safety radii until measurements of the airgun sound source are conducted. The measurements will be made at the beginning of the field season and the measured radii used for the remainder of the survey period. An acoustics contractor with experience in the Arctic conducting similar measurements in recent years will use their equipment to record and analyze the underwater sounds and write the summary reports as described below.

The objectives of the sound source verification measurements planned for 2010 in the Chukchi Sea will be (1) to measure the distances in the broadside and endfire directions at which broadband received levels reach 190, 180, 170, 160, and 120 dB re 1 μPa (rms) for the energy source array combinations that may be used during the survey activities. The configurations will include at least the full array and the operation of a single mitigation source that will be used during power downs. The measurements of energy source array sounds will be made by an acoustics contractor at the beginning of the survey and the distances to the various radii will be reported as soon as possible after recovery of the equipment. The primary radii of concern will be the 190 and 180 dB safety radii for pinnipeds and cetaceans, respectively, and the 160 dB disturbance radii. In addition to reporting the radii of specific regulatory concern, nominal distances to other sound isopleths down to 120 dB re 1 μPa (rms) will be reported in increments of 10 dB.

Data will be previewed in the field immediately after download from the hydrophone instruments. An initial sound source analysis will be supplied to NMFS and the airgun operators within 120 hours of completion of the measurements, if possible. The report will indicate the distances to sound levels based on fits of empirical transmission loss formulae to data in the endfire and broadside directions. A more detailed report will be issued to NMFS as part of the 90–day report following completion of the acoustic program.

2010 Shared Science Program

Statoil, Shell, and ConocoPhillips (CPAI) are jointly funding an extensive science program in the Chukchi Sea. This program will be carried out by Olgoonik-Fairweather LLC (OFJV) with the vessels Norseman II and Westward Wind during the 2010 open water season. The science program is not part of the Statoil seismic program, but worth mentioning in this context due to the acoustic monitoring array deployed within the seismic survey area as shown in Figures 1 and 2 of Statoil's IHA application. The science program components include:

- Acoustics Monitoring
- Fisheries Ecology
- Benthic Ecology
- Plankton Ecology
- Mammals
- Seabirds
- Physical Oceanography

The 2010 program continues the acoustic monitoring programs of 2006–2009 with a total of 44 acoustic recorders distributed both broadly across the Chukchi lease area and nearshore environment and intensively on the Statoil, Burger (Shell), and Klondike (CPAI) lease holdings. The recorders will be deployed in late July or early August and will be retrieved in early to mid-October, depending on ice conditions. The recorders will be the Advanced Multi-Channel Acoustic Recorder (AMAR) and the Autonomous Underwater Recorder for Acoustic Listening (AURAL) model acoustic buoys set to record at 16 kHz sample rate. These are the same recorder models and same sample rates that have been used for this program from 2006 - 2009. The broad area arrays are designed to capture both general background soundscape data, seismic survey sounds and marine mammal call data across the lease area. From these recordings we have been able to gain insight into large-scale distributions of marine mammals, identification of marine mammal species present, movement and migration patterns, and general abundance data.

The site specific focused arrays are designed to also support localization of marine mammal calls on and around the leaseholdings. In the case of the Statoil prospect, where Statoil intends to conduct seismic data acquisition in 2010, localized calls will enable investigators to understand responses of marine mammals to survey operations both in terms of distribution around the operation and behavior (i.e. calling behavior). The site specific array will consist of 7 AMAR recorders deployed in a hexagonal configuration as shown in Figure 2 of Statoil's 4MP, with inter-recorder spacing of 8 km (12.9 mi). These recorders are the same types that were used successfully in the 2009 site-specific acoustic monitoring program on Shell and CPAI prospects. The recorded sample resolution is 24–bits and sample frequency is 16 kHz, which is sufficient to capture part or all of the sounds produced by the marine mammal species known to be present, with the exception of harbor porpoise. The recorders will be synchronized to support localization of calling bowhead whales. Other species' calls are typically detected from distances less than the 8 km recorder separation. Consequently the multi-sensor triangulation method, that is used for bowheads calls, will not be used to determine calling locations of other species; however, detection of other species' calls indicates the animal position within a circular region of radius equal to the maximum detection distances of a few kilometers.

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 convened an independent peer review panel to review Statoil's mitigation and monitoring plan in its IHA application for taking marine mammals incidental to the proposed marine seismic survey in the Chukchi Sea, during 2010. The panel met and reviewed the plan in late March 2010, and provided comments to NMFS in late April 2010. NMFS will consider all recommendations made by the panel, incorporate appropriate changes into the monitoring requirements of the IHA (if issued) and publish the panel's findings and recommendations in the final IHA notice of issuance or denial document.

Reporting Measures

(1) SSV Report

A report on the preliminary results of the acoustic verification measurements, including as a minimum the measured 190-, 180-, 160-, and 120–dB re 1 μPa (rms) radii of the source vessel(s) and the support vessels, will be submitted within 120 hr after collection and analysis of those measurements at the start of the field season. This report will specify the distances of the safety zones that were adopted for the marine survey activities.

(2) Field Reports

Statoil states that throughout the survey program, the observers will prepare a report each day or at such other interval as the IHA (if issued), or Statoil may require summarizing the recent results of the monitoring program. The field reports will summarize the species and numbers of marine mammals sighted. These reports will be provided to NMFS and to the survey operators.

(3) Technical Reports

The results of Statoil's 2010 open water marine survey monitoring program (i.e., vessel-based, aerial, and acoustic), including estimates of "take" by harassment, will be presented in the "90–day" and Final Technical reports. Statoil proposes that the Technical Reports 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) analyses of the effects of survey operations;

- 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.

This information will be reported for both the vessel-based and aerial monitoring.

(4) Comprehensive Report

Following the 2010 open-water season a comprehensive report describing the

vessel-based, aerial, and acoustic monitoring programs will be prepared. The comprehensive report will describe the methods, results, conclusions and limitations of each of the individual data sets in detail. The report will also integrate (to the extent possible) the studies into a broad based assessment of industry activities, and other activities that occur in the Beaufort and/or Chukchi seas, and their impacts on marine mammals during 2010. The report will help to establish long-term data sets that can assist with the evaluation of changes in the Chukchi and Beaufort sea ecosystems. The report will attempt to provide a regional synthesis of available data on industry activity in offshore areas of northern Alaska that may influence marine mammal density, distribution and behavior.

(5) Notification of Injured or Dead Marine Mammals

In addition to the reporting measures proposed by Statoil, NMFS will require that Statoil notify NMFS' Office of Protected Resources and NMFS' Stranding Network within 48 hours of sighting an injured or dead marine mammal in the vicinity of marine survey operations. Statoil shall provide NMFS with the species or description of the animal(s), the condition of the animal(s) (including carcass condition if the animal is dead), location, time of first discovery, observed behaviors (if alive), and photo or video (if available).

In the event that an injured or dead marine mammal is found by Statoil that is not in the vicinity of the proposed open water marine survey program, Statoil will report the same information as listed above as soon as operationally feasible to NMFS.

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]. Only take by Level B behavioral harassment is anticipated as a result of the proposed open water marine survey program. Anticipated impacts to marine mammals are associated with noise propagation from the seismic airgun(s) used in the seismic survey.

The full suite of potential impacts to marine mammals was described in detail in the "Potential Effects of the Specified Activity on Marine Mammals" section found earlier in this document. The potential effects of sound from the proposed open water marine survey programs might include one or more of the following: tolerance; masking of natural sounds; behavioral disturbance; non-auditory physical effects; and, at least in theory, temporary or permanent hearing impairment (Richardson *et al.* 1995). As discussed earlier in this document, the most common impact will likely be from behavioral disturbance, including avoidance of the ensonified area or changes in speed, direction, and/or diving profile of the animal. For reasons discussed previously in this document, hearing impairment (TTS and PTS) are highly unlikely to occur based on the proposed mitigation and monitoring measures that would preclude marine mammals being exposed to noise levels high enough to cause hearing impairment.

For impulse sounds, such as those produced by airgun(s) used in the seismic survey, NMFS uses the 160 dB re 1 µPa (rms) isopleth to indicate the onset of Level B harassment. Statoil provided calculations for the 160–dB isopleths produced by these active acoustic sources and then used those isopleths to estimate takes by harassment. NMFS used the calculations to make the necessary MMPA preliminary findings. Statoil provided a full description of the methodology used to estimate takes by harassment in its IHA application (see **ADDRESSES**), which is also provided in the following sections.

Statoil has requested an authorization to take 13 marine mammal species by Level B harassment. These 13 marine mammal species are: beluga whale (*Delphinapterus leucas*), narwhal (*Monodon monoceros*), killer whale (*Orcinus orca*), harbor porpoise (*Phocoena phocoena*), bowhead whale (*Balaena mysticetus*), gray whale (*Eschrichtius robustus*), humpback whale (*Megaptera novaeangliae*), minke whale (*Balaenoptera acutorostrata*), fin whale (*B. physalus*), bearded seal (*Erignathus barbatus*), ringed seal (*Phoca hispida*), spotted seal (*P. largha*), and ribbon seal (*Histriophoca fasciata*). However, NMFS consider that narwhals are not likely to occur in the proposed survey area during the time of the proposed marine seismic survey. Therefore, NMFS considers that only the other 12 marine mammal species could be affected by Level B behavioral harassment as a result of the proposed marine surveys.

Basis for Estimating "Take by Harassment"

As stated previously, it is current NMFS policy to estimate take by Level B harassment for impulse sounds at a received level of 160 dB re 1µPa (rms). However, not all animals react to sounds at this low level, and many will not show strong reactions (and in some cases any reaction) until sounds are much stronger. Southall *et al.* (2007) provide a severity scale for ranking observed behavioral responses of both free-ranging marine mammals and laboratory subjects to various types of anthropogenic sound (see Table 4 in Southall *et al.* (2007)). Tables 7, 9, and 11 in Southall *et al.* (2007) outline the numbers of low-frequency cetaceans, mid-frequency cetaceans, and pinnipeds in water, respectively, reported as having behavioral responses to multi-pulses in 10–dB received level increments. These tables illustrate that the more severe reactions did not occur until sounds were much higher than 160 dB re 1µPa (rms).

As described earlier in the document, the proposed open water marine seismic survey would use two airgun arrays with a total discharge volume of 3,000 in^3. The modeled 160 dB zone of influence reaches to 13 km from the airgun source. The estimated number of animals potentially harassed was calculated by multiplying the expected densities (in number/km^2) by the anticipated area ensonified by levels of µ160 dB re 1µPa. Estimates of the number of animals potentially impacted were conducted separately for the 3D survey area and the 2D survey lines. For the 3D survey area, the anticipated area ensonified by sound levels of µ160 dB was calculated as an area encompassing a 8.1 mi (13 km) radius extending from each point of the survey area perimeter (hereafter called the 160 dB exposed survey area). This approach was taken because closely spaced survey lines and large cross-track distances of the µ160 dB radii result in repeated exposure of the same area of water. Excessive amounts of repeated exposure leads to an overestimation of the number of animals potentially exposed. For the 2D survey lines the area ensonified by sound levels of µ160 dB was calculated as the total line kilometers multiplied by 2 times the 8.1 mi (13 km) µ160 dB safety radius. The following subsections describe in more detail the data and methods used in deriving the estimated number of animals potentially "taken by harassment" during the proposed survey. It provides information on the

expected marine mammal densities, estimated distances to received levels of 190, 180, 160, and 120 dB re 1µPa and the calculation of anticipated areas ensonified by levels of µ160 dB.

It is important to understand that not all published results from visual observations have applied correction factors that account for detectability and availability bias. Detectability bias, quantified in part by f(0), is associated with diminishing sightability with increasing lateral distance from the survey trackline. Availability bias [g(0)] refers to the fact that not all animals are at the surface and that there is therefore <100% probability of sighting an animal that is present along the survey trackline. Some sources below included correction factors in the reported densities (e.g., ringed seals in Bengtson *et al.* 2005) and the best available correction factors were applied to reported results when they had not already been included (e.g., Moore *et al.* 2000b).

(1) Cetaceans

Eight species of cetaceans are known to occur in the Chukchi Sea area of the proposed Statoil project. Only four of these (bowhead, beluga, and gray whales, and harbor porpoise) are likely to be encountered during the proposed survey activities. Three of the eight species (bowhead, fin, and humpback whales) are listed as endangered under the ESA. Of these, only the bowhead is likely to be found within the survey area.

Beluga Whales - Summer densities of beluga in offshore waters are expected to be low. Aerial surveys have recorded few belugas in the offshore Chukchi Sea during the summer months (Moore *et al.* 2000b). Aerial surveys of the Chukchi Sea in 2008–2009 flown by the NMML as part of the Chukchi Offshore Monitoring in Drilling Area project (COMIDA) have only reported 5 beluga sightings during >8,700 mi (>14,000 km) of on-transect effort, only 2 of which were offshore (COMIDA 2009). Additionally, only one beluga sighting was recorded during >37,904 mi (>61,000 km) of visual effort during good visibility conditions from industry vessels operating in the Chukchi Sea in JulyµAugust of 2006µ2008 (Haley *et al.* 2009b). If belugas are present during the summer, they are more likely to occur in or near the ice edge or close to shore during their northward migration. Expected densities were calculated from data in Moore *et al.* (2000b). Data from Moore *et al.* (2000b: Figure 6 and Table 6) used as the average open-water density estimate included two on-transect beluga sightings during 6,639 mi (10,684 km) of on-transect effort in the Chukchi Sea during summer. A mean group size of 7.1 (CV=1.7) was calculated from 10 Chukchi Sea summer sightings present in the BWASP database. A f(0) value of 2.841 and g(0) value of 0.58 from Harwood *et al.* (1996) were also used in the calculation. The CV associated with group size was used to select an inflation factor of 2 to estimate the maximum density that may occur in both open-water and ice-margin habitats. Specific data on the relative abundance of beluga in open-water versus ice-margin habitat during the summer in the Chukchi Sea is not available. However, Moore *et al.* (2000b) reported higher than expected beluga sighting rates in open-water during fall surveys in the Beaufort and Chukchi Seas. This would suggest that densities near ice may actually be lower than open water, but belugas are commonly associated with ice, so an inflation factor of only 2 (instead of 4) was used to estimate the average ice-margin density from the open-water density. Based on the very low densities observed from vessels operating in the Chukchi Sea during non-seismic periods and locations in JulyµAugust of 2006–2008 (0.0001/km^2; Haley *et al.* 2009b), the densities shown in Table 1 are likely biased high.

In the fall, beluga whale densities in the Chukchi Sea are expected to be somewhat higher than in the summer because individuals of the eastern Chukchi Sea stock and the Beaufort Sea stock will be migrating south to their wintering grounds in the Bering Sea (Angliss and Allen 2009). Consistent with this, the number of on-effort beluga sightings reported during COMIDA flights in September-October of 2008–2009 was over 3 times more than during July-August with a very similar amount of on-transect effort (COMIDA 2009). However, there were no beluga sightings reported during >11,185 mi (>18,000 km) of vessel based effort in good visibility conditions during 2006–2008 industry operations in the Chukchi Sea. Densities derived from survey results in the northern Chukchi Sea in Moore *et al.* (2000b) were used as the average density for open-water and ice-margin fall season estimates (see Table 2). Data from Moore *et al.* (2000b: Table 8) used in the average open-water density estimate included 123 beluga sightings and 27,559 mi (44,352 km) of on-transect effort in water depths 118–164 ft (36–50 m). A mean group size of 2.39 (CV=0.92) came from the average group size of 82 Chukchi Sea fall sightings in waters 115–164 ft (35–50 m) deep present in the BWASP database. A f(0) value of 2.841 and g(0) value of 0.58 from Harwood *et al.* (1996) were used in the calculation. The CV associated with group size was used to select an inflation factor of 2 to estimate the maximum density that may occur in both open-water and ice-margin habitats. Moore *et al.* (2000b) reported higher than expected beluga sighting rates in open-water during fall surveys in the Beaufort and Chukchi seas, so an inflation value of only 2 was used to estimate the average ice-margin density from the open-water density. There were no beluga sightings from vessels operating in the Chukchi Sea during non-seismic periods in September-October of 2006–2008 (Haley *et al.* 2009b).

TABLE 1. EXPECTED DENSITIES OF CETACEANS AND SEALS IN AREAS OF THE CHUKCHI SEA, ALASKA, DURING THE PLANNED SUMMER (JULY - AUGUST) PERIOD OF THE SEISMIC SURVEY PROGRAM.

Species	Nearshore Average Density (#/km^2)	Ice Margin Average Density (#/ km^2)
Beluga whale	0.0033	0.0162
Killer whale	0.0001	0.0001
Harbor porpoise	0.0011	0.0011
Bowhead whale	0.0018	0.0018
Fin whale	0.0001	0.0001

TABLE 1. EXPECTED DENSITIES OF CETACEANS AND SEALS IN AREAS OF THE CHUKCHI SEA, ALASKA, DURING THE PLANNED SUMMER (JULY - AUGUST) PERIOD OF THE SEISMIC SURVEY PROGRAM.—Continued

Species	Nearshore Average Density (#/km²)	Ice Margin Average Density (#/ km²)
Gray whale	0.0081	0.0081
Humpback whale	0.0001	0.0001
Minke whale	0.0001	0.0001
Bearded seal	0.0107	0.0142
Ribbon seal	0.0003	0.0003
Ringed seal	0.3668	0.4891
Spotted seal	0.0073	0.0098

TABLE 2. EXPECTED DENSITIES OF CETACEANS AND SEALS IN AREAS OF THE CHUKCHI SEA, ALASKA, DURING THE PLANNED FALL (SEPTEMBER - OCTOBER) PERIOD OF THE SEISMIC SURVEY PROGRAM.

Species	Nearshore Average Density (#/km²)	Ice Margin Average Density (#/ km²)
Beluga whale	0.0162	0.0324
Killer whale	0.0001	0.0001
Harbor porpoise	0.0010	0.0010
Bowhead whale	0.0174	0.0348
Fin whale	0.0001	0.0001
Gray whale	0.0062	0.0062
Humpback whale	0.0001	0.0001
Minke whale	0.0001	0.0001
Bearded seal	0.0107	0.0142
Ribbon seal	0.0003	0.0003
Ringed seal	0.2458	0.3277
Spotted seal	0.0049	0.0065

Bowhead Whales - By July, most bowhead whales are northeast of the Chukchi Sea, within or migrating toward their summer feeding grounds in the eastern Beaufort Sea. No bowheads were reported during 6,639 mi (10,684 km) of on-transect effort in the Chukchi Sea by Moore *et al.* (2000b). Aerial surveys in 2008–2009 by the NMML as part of the COMIDA project reported four sightings during >8,699 mi (>14,000 km) of on-transect effort. Two of the four sightings were offshore, both of which occurred near the end of August. Bowhead whales were also rarely reported in July-August of 2006–2008 during aerial surveys of the Chukchi Sea coast (Thomas *et al.* 2009). This is consistent with movements of tagged whales (see ADFG 2009; Quakenbush 2009), all of which moved through the Chukchi Sea by early May 2009, and tended to travel relatively close to shore, especially in the northern Chukchi Sea.

The estimate of bowhead whale density in the Chukchi Sea was calculated by assuming that there was one bowhead sighting during the 6,639 mi (10,684 km) survey effort in the Chukchi Sea during the summer, although no bowheads were actually observed (Moore *et al.* 2000b). The more recent COMIDA data were not used because the NMML has not released a final report summarizing the data. Only two sightings are present in the BWASP database during July and August in the Chukchi Sea, both of which were of individual whales. The mean group size from combined July-August sightings in the BWASP, COMIDA, and 2006–2008 industry database is 1.33 (CV=0.58). This value, along with a f(0) value of 2 and a g(0) value of 0.07, both from Thomas *et al.* (2002) were used to estimate a summer density of bowhead whales. The CV of group size and standard errors reported in Thomas *et al.* (2002) for f(0) and g(0) correction factors suggest that an inflation factor of 2 is appropriate for deriving a maximum density from the average density. Bowheads are not expected to be encountered in higher densities near ice in the summer (Moore *et al.* 2000b), so the same density estimates are used for open-water and ice-margin habitats. Densities from vessel based surveys in the Chukchi Sea during non-seismic periods and locations in July-August of 2006–2008 (Haley *et al.* 2009b) ranged from 0.0001/km² to 0.0005/km² with a

maximum 95 percent confidence interval (CI) of 0.0019 km². This suggests that the densities used in the calculations and shown in Table 1 might be somewhat higher than expected to be observed from vessels near the area of planned operations.

During the fall, bowhead whales migrate west and south from their summer feeding grounds in the Beaufort Sea and Amundsen Gulf to their wintering grounds in the Bering Sea. During this fall migration bowheads are more likely to be encountered in the Chukchi Sea. Moore *et al.* (2000b: Table 8) reported 34 bowhead sightings during 27,560 mi (44,354 km) of on-transect survey effort in the Chukchi Sea during September-October. Thomas *et al.* (2009) also reported increased sightings on coastal surveys of the Chukchi Sea during September and October of 2006–2008. Aerial surveys in 2008–2009 (COMIDA 2009) reported 20 bowhead sightings during 8,803 mi (14,167 km) of on-transect effort, eight of which were offshore. GPS tagging of bowheads show that migration routes through the Chukchi Sea are more variable than through the Beaufort Sea (ADFG 2009; Quakenbush 2009). Some of the routes taken by bowheads remain well north or south of the planned survey activities while others have passed near to or through the area. Kernel densities estimated from GPS locations of whales suggest that bowheads do not spend much time (e.g., feeding or resting) in the north-central Chukchi Sea near the area of planned activities (ADFG 2009). The mean group size from September-October Chukchi Sea bowhead sightings in the BWASP database is 1.59 (CV=1.08). This is slightly below the mean group size of 1.85 from all the preliminary COMIDA sightings during the same months, but above the value of 1.13 from only on-effort COMIDA sightings (COMIDA 2009). The same f(0) and g(0) values that were used for the summer estimates above were used for the fall estimates. As with the summer estimates, an inflation factor of 2 was used to estimate the maximum density from the average density in both habitat types. Moore *et al.* (2000b) found that bowheads were detected more often than expected in association with ice in the Chukchi Sea in September-October, so a density of twice the average open-water density was used as the average ice-margin density. Densities from vessel based surveys in the Chukchi Sea during non-seismic periods and locations in SeptemberµOctober of 2006–2008 (Haley *et al.* 2009b) ranged from 0.0001/km² to 0.0050/km² with a maximum 95 percent CI of 0.0480 km². This suggests the densities used in the calculations and shown in Table 2 are somewhat higher than are likely to be observed from vessels near the area of planned operations.

Gray Whales - The average open-water summer density was calculated from effort and sightings in Moore *et al.* (2000b: Table 6) for water depths 118–164 ft (36–50 m) including 4 sightings during 3,901 mi (6,278 km) of on-transect effort. An average group size of 3.11 (CV=0.97) was calculated from all July-August Chukchi Sea gray whale sightings in the BWASP database and used in the summer density estimate. This value was higher than the average group size in the preliminary COMIDA data (1.71; COMIDA 2009) and from coastal aerial surveys in 2006–2008 (1.27; Thomas *et al.* 2009). Correction factors f(0) = 2.49 (Forney and Barlow 1998) and g(0) = 0.30 (Forney and Barlow 1998; Mallonee 1991) were also used in the density calculation. Since the group size used in the average density estimate was relatively high compared to other data sources and the CV was near to one, an inflation factor of 2 was used to estimate the maximum densities from average densities in both habitat types. Gray whales are not commonly associated with sea ice, but may occur close to sea ice, so the densities for open-water habitat were also used for ice-margin habitat. Densities from vessel based surveys in the Chukchi Sea during non-seismic periods and locations in July-August of 2006–2008 (Haley *et al.* 2009b) ranged from 0.0009/km² to 0.0034/km² with a maximum 95 percent CI of 0.0146 km². This suggests that the densities used in the calculations and shown in Table 1 are somewhat higher than are expected to be observed from vessels near the area of planned operations.

Gray whale densities are expected to be much higher in the summer months than during the fall when most whales start their southbound migration. Moore *et al.* (2000b) found that the distribution of gray whales was more widely dispersed through the northern Chukchi Sea and limited to nearshore areas where most whales were observed in water less than 115 ft (35 m) deep. With similar amounts of on-transect effort between summer and fall aerial surveys in 2008–2009, gray whale sightings were three times higher in July-August than in September-October, and five times higher taking into account all effort and sightings (COMIDA 2009). Thomas *et al.* (2009) also reported decreased sighting rates of gray whales in the fall.

The on-transect effort and associated gray whale sightings (27 sightings during 44,352 km of on-transect effort) in water depth of 118–164 ft (36–50 m) during autumn (Moore *et al.* 2000b; 12) was used as the average density estimate for the Chukchi Sea during the fall period. A group size value of 2.49 (CV=1.37) calculated from the BWASP database was used in the density calculation, along with the same f(0) and g(0) values described above. The group size value of 2.49 was again higher than the average group size calculated from preliminary COMIDA data (1.24; COMIDA 2009) and as reported from coastal aerial surveys in 2006–2008 (1.12; Thomas *et al.* 2009). Densities from vessel based surveys in the Chukchi Sea during non-seismic periods and locations in September-October of 2006–2008 (Haley *et al.* 2009b) ranged from 0.0011/km² to 0.0024/km² with a maximum 95 percent CI of 0.0183 km². This suggests the densities used in the calculations and shown in Table 2 are somewhat higher than are likely to be observed from vessels near the area of planned operations.

Harbor Porpoise - Harbor Porpoise densities were estimated from industry data collected during 2006–2008 activities in the Chukchi Sea. Prior to 2006, no reliable estimates were available for the Chukchi Sea and harbor porpoise presence was expected to be very low and limited to nearshore regions. For this reason, the data collected from industry vessels was considered to be the best available data. Observers on industry vessels in 2006–2008, however, recorded sightings throughout the Chukchi Sea during the summer and early fall months. Density estimates from 2006–2008 observations during non-seismic periods and locations in July-August ranged from 0.0009/km² to 0.0016/km² with a maximum 95 percent CI of 0.0016/km² (Haley *et al.* 2009b). The median value from the summer season of those three years (0.0011/km²) was used as the average open-water density estimate while the high value (0.0016/km²) was used as the maximum estimate (Table 1). Harbor porpoise are not expected to be present in higher numbers near ice, so the open-water densities were used for ice-margin habitat in both seasons. Harbor porpoise densities recorded during industry operations in the fall months of 2006–2008 were slightly lower and ranged from 0.0002/km² to 0.0013/km² with a maximum 95 percent CI of 0.0044/km². The median value (0.0010/km²) was again used as the average density estimate and the high value (0.0013/km²) was used as the maximum estimate (Table 2).

Other Cetaceans - The remaining four cetacean species that could be

encountered in the Chukchi Sea during Statoil's planned seismic survey include the humpback whale, killer whale, minke whale, and fin whale. Although there is evidence of the occasional occurrence of these animals in the Chukchi Sea, it is unlikely that more than a few individuals will be encountered during the proposed activities. George and Suydam (1998) reported killer whales, Brueggeman *et al.* (1990) and Haley *et al.* (2009b) reported minke whale, and COMIDA (2009) and Haley *et al.* (2009b) reported fin whales off of Ledyard Bay in the Chukchi Sea.

(2) Pinnipeds

Four species of pinnipeds may be encountered in the Chukchi Sea: ringed seal, bearded seal, spotted seal, and ribbon seal. Each of these species, except the spotted seal, is associated with both the ice margin and the nearshore area. The ice margin is considered preferred habitat (as compared to the nearshore areas) during most seasons.

Ringed and Bearded Seals - Ringed seal and bearded seal average summer ice-margin densities (Table 1) were available in Bengtson *et al.* (2005) from spring surveys in the offshore pack ice zone (zone 12P) of the northern Chukchi Sea. However, corrections for bearded seal availability, g(0), based on haulout and diving patterns were not available. Densities of ringed and bearded seals in open water are expected to be somewhat lower in the summer when preferred pack ice habitat may still be present in the Chukchi Sea. Average and maximum open-water densities have been estimated as 3/4 of the ice margin densities during the summer for both species. The fall density of ringed seals in the offshore Chukchi Sea has been estimated as 2/3 the summer densities because ringed seals begin to reoccupy nearshore fast ice areas as it forms in the fall. Bearded seals may begin to leave the Chukchi Sea in the fall, but less is known about their movement patterns so fall densities were left unchanged from summer densities. For comparison, the ringed seal density estimates calculated from data collected during summer 2006µ2008 industry operations ranged from 0.0082/km^2 to 0.0221/km^2 with a maximum 95 percent CI of 0.0577/km^2 (Haley *et al.* 2009b). These estimates are lower than those made by Bengtson *et al.* (2005) which is not surprising given the different survey methods and timing.

Spotted Seal - Little information on spotted seal densities in offshore areas of the Chukchi Sea is available. Spotted seals are often considered to be predominantly a coastal species except in the spring when they may be found in the southern margin of the retreating sea ice, before they move to shore. However, satellite tagging has shown that they sometimes undertake long excursions into offshore waters during summer (Lowry *et al.* 1994, 1998). Spotted seal densities in the summer were estimated by multiplying the ringed seal densities by 0.02. This was based on the ratio of the estimated Chukchi populations of the two species. Chukchi Sea spotted seal abundance was estimated by assuming that 8% of the Alaskan population of spotted seals is present in the Chukchi Sea during the summer and fall (Rugh *et al.* 1997), the Alaskan population of spotted seals is 59,214 (Angliss and Allen 2009), and that the population of ringed seals in the Alaskan Chukchi Sea is ≤208,000 animals (Bengtson *et al.* 2005). In the fall, spotted seals show increased use of coastal haulouts so densities were estimated to be 2/3 of the summer densities.

Ribbon Seal - Ribbon seals have been reported in very small numbers within the Chukchi Sea by observers on industry vessels (two sightings; Haley *et al.* 2009b). The resulting density estimate of 0.0003/km^2 was used as the average density and a multiplier of 4 was used as the estimated maximum density for both seasons and habitat zones.

Potential Number of Takes by Harassment

This subsection provides estimates of the number of individuals potentially exposed to sound levels µ160 dB re 1 µPa (rms). The estimates are based on a consideration of the number of marine mammals that might be disturbed appreciably by operations in the Chukchi Sea and the anticipated area exposed to rms sound levels of 160 dB.

As described above, marine mammal density estimates for the Chukchi Sea have been derived for two time periods, the summer period (July-August), and the fall period (September-October). Animal densities encountered in the Chukchi Sea during both of these time periods will further depend on the habitat zone within which the source vessel is operating, i.e., open water or ice margin. The seismic source vessel is not an icebreaker and cannot tow survey equipment through pack ice. Under this assumption, densities of marine mammals expected to be observed near ice margin areas have been applied to 10% of the proposed 3D survey area and 2D tracklines in both seasons. Densities of marine mammals expected to occur in open water areas have been applied to the remaining 90% of the 3D survey and 2D tracklines area in both seasons.

The number of individuals of each species potentially exposed to received levels µ160 dB re 1 µPa (rms) within each season and habitat zone was estimated by multiplying

- the anticipated area to be ensonified to the specified level in each season and habitat zone to which that density applies, by
- the expected species density.

The numbers of individuals potentially exposed were then summed for each species across the two seasons and habitat zones. Some of the animals estimated to be exposed, particularly migrating bowhead whales, might show avoidance reactions before being exposed to ≥160 dB re 1 µPa (rms). Thus, these calculations actually estimate the number of individuals potentially exposed to µ160 dB that would occur if there were no avoidance of the area ensonified to that level.

(1) 3D Seismic Survey Area

The size of the proposed 3D seismic survey area is 915 mi^2 (2,370 km^2) and located ≤100 mi (160 km) offshore. Approximately 1/4 of the area (~234 mi^2, or ~606 km^2) is expected to be surveyed in August (weather depending). This area, with a 160 dB radius of 8 mi (13 km) along each point of its perimeter equals a total area of ~1,081 mi^2 (~2,799 km^2). Summer marine mammal densities from Table 1 have been applied to this area. The other 3/4 of the survey area (~687 mi^2, or ~1,779 km^2) is expected to be covered in September-October. This area, also with a 160 dB radius of 8 mi (13 km) along each point of its perimeter results in a total area of ~1,813 mi^2 (~4,695 km^2). Fall marine mammal densities from Table 2 have been applied to this area. Based on these assumptions and those described above, the estimates of marine mammals potentially exposed to sounds µ160 dB in the Chukchi Sea from seismic data acquisition in the 3D survey area were calculated in Table 3.

For the common species, the requested numbers were calculated as described above and based on the average and maximum densities reported. For less common species, for which minimum density estimates were assumed, the numbers were set to a minimum to allow for chance encounters. The mitigation gun (60 in^3) will be active during turns extending about 1.6 mi (2.5 km) outside the 3D survey area. The estimated 160 dB radius for the 60 in^3 mitigation gun is 5,906 ft (1,800 m) and therefore falls well within the area expected to be

exposed to received sound levels of ≥160 dB of the 3D survey area.

TABLE 3. SUMMARY OF THE NUMBER OF POTENTIAL EXPOSURES OF MARINE MAMMALS TO RECEIVED SOUND LEVELS IN THE WATER OF >160 DB DURING STATOIL'S PLANNED MARINE SEISMIC SURVEY IN THE CHUKCHI SEA, ALASKA, 2010.

Species	Number of Exposure to Sound Levels >160 dB re 1 μPa (rms) by 3D Seismic Survey	Number of Exposure to Sound Levels >160 dB re 1 μPa (rms) by 2D Seismic Survey	Total Number of Exposure to Sound Levels >160 dB re 1 μPa (rms)
Beluga whale	97	87	184
Killer whale	1	1	2
Harbor porpoise	8	13	21
Bowhead whale	95	63	158
Gray whale	52	92	144
Humpback whale	1	1	2
Fin whale	1	1	2
Minke whale	1	1	2
Bearded seal	82	132	214
Ribbon seal	2	4	6
Ringed seal	2,253	4,234	6,487
Spotted seal	45	85	130

(2) 2D Seismic Survey Lines

Seismic data along the ~420 mi (675 km) of four 2D survey tracklines might be acquired with the full airgun array if access to the 3D survey area is restricted (e.g., ice conditions), or 3D acquisition progress is better than anticipated. Under the assumption that these restrictive weather conditions will mainly be an issue in the early summer season, 80 % of the 2D tracklines are assumed to be acquired during August and 20% during the fall. The total area potentially exposed to μ160 dB from these tracklines was calculated with the trackline sections outside the 3D survey area. Excluding these sections results in a total trackline length of ~285 mi (460 km). With a 160 dB radius of ~8 mi (13 km) this results in a total exposed area of ~7,432 mi^2 (11,960 km^2). Such summer densities were used for 80% of the total area (5,945 mi^2, or 9,568 km^2) and fall densities for the remaining 20% (1,486 mi^2, or 2,392 km^2). Following a similar approach as for the 3D survey area, numbers of more common marine mammal species were calculated based on the average and maximum densities and for less common species the numbers were set to a minimum to allow for chance encounters. The results of estimates of marine mammals potentially exposed to sounds μ160 dB in the Chukchi Sea from seismic data acquisition along the 2D tracklines are presented in Table 3.

Estimated Take Conclusions

Cetaceans - Effects on cetaceans are generally expected to be restricted to avoidance of an area around the seismic survey and short-term changes in behavior, falling within the MMPA definition of "Level B harassment".

Using the 160 dB criterion, the average estimates of the numbers of individual cetaceans exposed to sounds ≥160 dB re 1 μPa (rms) represent varying proportions of the populations of each species in the Beaufort Sea and adjacent waters. For species listed as "Endangered" under the ESA, the estimates include approximately 158 bowheads. This number is approximately 1.11% of the Bering-Chukchi-Beaufort population of >14,247 assuming 3.4% annual population growth from the 2001 estimate of >10,545 animals (Zeh and Punt 2005). For other cetaceans that might occur in the vicinity of the marine seismic survey in the Chukchi Sea, they also represent a very small proportion of their respective populations. The average estimates of the number of belugas, killer whales, harbor porpoises, gray whales, fin whales, humpback whales, and minke whales that might be exposed to ≥160 dB re 1 μPa (rms) are 183, 2, 21, 144, 2, 2, and 2. These numbers represent 4.95%, 0.62%, 0.04%, 0.81%, 0.03%, 0.21%, and 0.19% of these species of their respective populations in the proposed action area.

Seals - A few seal species are likely to be encountered in the study area, but ringed seal is by far the most abundant in this area. The average estimates of the numbers of individuals exposed to sounds at received levels ≥160 dB re 1 μPa (rms) during the proposed seismic survey are as follows: ringed seals (6,487), bearded seals (215), spotted seals (129), and ribbon seals (6). These numbers represent 2.81%, 0.09%, 0.22%, and 0.01% of Alaska stocks of ringed, bearded, spotted, and ribbon seals.

Negligible Impact and Small Numbers Analysis and Preliminary Determination

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." In making a negligible impact determination, NMFS considers a variety of factors, including but not limited to: (1) the number of anticipated mortalities; (2) the number and nature of anticipated injuries; (3) the number, nature, intensity, and duration of Level

B harassment; and (4) the context in which the takes occur.

No injuries or mortalities are anticipated to occur as a result of Statoil's proposed 2010 open water marine seismic surveys in the Chukchi Seas, and none are proposed to be authorized. Additionally, animals in the area are not expected to incur hearing impairment (i.e., TTS or PTS) or non-auditory physiological effects. Takes will be limited to Level B behavioral harassment. Although it is possible that some individuals of marine mammals may be exposed to sounds from marine survey activities more than once, the expanse of these multi-exposures are expected to be less extensive since both the animals and the survey vessels will be moving constantly in and out of the survey areas.

Most of the bowhead whales encountered during the summer will likely show overt disturbance (avoidance) only if they receive airgun sounds with levels ≥160 dB re 1 μPa (rms). Odontocete reactions to seismic energy pulses are usually assumed to be limited to shorter distances from the airgun(s) than are those of mysticetes, probably 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 Chukchi Sea during the survey period and few will likely be affected by the survey activity. In addition, due to the constant moving of the seismic survey vessel, the duration of the noise exposure by cetaceans to seismic impulse would be brief. For the same reason, it is unlikely that any individual animal would be exposed to high received levels multiple times.

Taking into account the mitigation measures that are planned, effects on cetaceans are generally expected to be restricted to avoidance of a limited area around the survey operation and short-term changes in behavior, falling within the MMPA definition of "Level B harassment".

Furthermore, the estimated numbers of animals potentially exposed to sound levels sufficient to cause appreciable disturbance are very low percentages of the population sizes in the Bering-Chukchi-Beaufort seas, as described above.

The many reported cases of apparent tolerance by cetaceans of 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, 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.

Some individual pinnipeds may be exposed to sound from the proposed marine surveys more than once during the time frame of the project. However, as discussed previously, due to the constant moving of the survey vessel, the probability of an individual pinniped being exposed to multiple times is much lower than if the source is stationary. Therefore, NMFS has preliminarily determined that the exposure of pinnipeds to sounds produced by the proposed marine seismic survey in the Chukchi Sea is not expected to result in more than Level B harassment and is anticipated to have no more than a negligible impact on the animals.

Of the twelve marine mammal species likely to occur in the proposed marine survey area, only the bowhead, fin, and humpback whales are listed as endangered under the ESA. These species are also designated as "depleted" under the MMPA. Despite these designations, the Bering-Chukchi-Beaufort stock of bowheads has been increasing at a rate of 3.4 percent annually for nearly a decade (Allen and Angliss, 2010). 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, 2010). The occurrence of fin and humpback whales in the proposed marine survey areas is considered very rare. There is no critical habitat designated in the U.S. Arctic for the bowhead, fin, and humpback whale. The bearded and ringed seals are "candidate species" under the ESA, meaning they are currently being considered for listing but are not designated as depleted under the MMPA. None of the other three species that may occur in the project area are listed as threatened or endangered under the ESA or designated as depleted under the MMPA.

Potential impacts to marine mammal habitat were discussed previously in this document (see the "Anticipated Effects on Habitat" section). Although some disturbance is possible to food sources of marine mammals, the impacts are anticipated to be minor enough as to not affect rates of recruitment or survival of marine mammals in the area. Based on the vast size of the Arctic Ocean where feeding by marine mammals occurs versus the localized area of the marine survey activities, any missed feeding opportunities in the direct project area would be minor based on the fact that other feeding areas exist elsewhere.

The estimated takes proposed to be authorized represent 4.95% of the Eastern Chukchi Sea population of approximately 3,700 beluga whales (Angliss and Allen 2009), 0.62% of Aleutian Island and Bering Sea stock of approximately 340 killer whales, 0.04% of Bering Sea stock of approximately 48,215 harbor porpoises, 0.81% of the Eastern North Pacific stock of approximately 17,752 gray whales, 1.11% of the Bering-Chukchi-Beaufort population of 14,247 individuals assuming 3.4 percent annual population growth from the 2001 estimate of 10,545 animals (Zeh and Punt, 2005), 0.21% of the Western North Pacific stock of approximately 938 humpback whales, 0.03% of the North Pacific stock of approximately 5,700 fin whales, and 0.19% of the Alaska stock of approximately 1,003 minke whales. The take estimates presented for bearded, ringed, spotted, and ribbon seals represent 0.09, 2.81, 0.22, and 0.01 percent of U.S. Arctic stocks of each species, respectively. These estimates represent the percentage of each species or stock that could be taken by Level B behavioral harassment if each animal is taken only once. In addition, the mitigation and monitoring measures (described previously in this document) proposed for inclusion in the IHA (if issued) are expected to reduce even further any potential disturbance 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 preliminarily finds that Statoil's proposed 2010 open water marine seismic survey in the Chukchi Sea may result in the incidental take of small numbers of marine mammals, by Level B harassment only, and that the total taking from the marine surveys will have a negligible impact on the affected species or stocks.

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

Relevant Subsistence Uses

The disturbance and potential displacement of marine mammals by sounds from the proposed marine surveys are the principal concerns related to subsistence use of the area. Subsistence remains the basis for Alaska Native culture and community. Marine mammals are legally hunted in Alaskan waters by coastal Alaska Natives. In rural Alaska, subsistence activities are often central to many aspects of human existence, including patterns of family life, artistic expression, and community religious and celebratory activities. Additionally, the animals taken for subsistence provide a significant portion of the food that will last the community throughout the year. The main species that are hunted include bowhead and beluga whales, ringed, spotted, and bearded seals, walruses, and polar bears. (Both the walrus and the polar bear are under the USFWS' jurisdiction.) The importance of each of these species varies among the communities and is largely based on availability.

Subsistence hunting and fishing continue to be prominent in the household economies and social welfare of some Alaskan residents, particularly among those living in small, rural villages (Wolfe and Walker 1987). Subsistence remains the basis for Alaska Native culture and community. In rural Alaska, subsistence activities are often central to many aspects of human existence, including patterns of family life, artistic expression, and community religious and celebratory activities.

Marine mammals are legally hunted in Alaskan waters by coastal Alaska Natives; species hunted include bowhead and beluga whales; ringed, spotted, and bearded seals; walruses, and polar bears. The importance of each of the various species varies among the communities based largely on availability. Bowhead whales, belugas, and walruses are the marine mammal species primarily harvested during the time of the proposed seismic survey. There is little or no bowhead hunting by the community of Point Lay, so beluga and walrus hunting are of more importance there. Members of the Wainwright community hunt bowhead whales in the spring, although bowhead whale hunting conditions there are often more difficult than elsewhere, and they do not hunt bowheads during seasons when Statoil's seismic operation would occur. Depending on the level of success during the spring bowhead hunt, Wainwright residents may be very dependent on the presence of belugas in a nearby lagoon system during July and August. Barrow residents focus hunting efforts on bowhead whales during the spring and generally do not hunt beluga then. However, Barrow residents also hunt in the fall, when Statoil expects to be conducting seismic surveys (though not near Barrow).

(1) Bowhead Whales

Bowhead whale hunting is a key activity in the subsistence economies of northwest Arctic communities. The whale harvests have a great influence on social relations by strengthening the sense of Inupiat culture and heritage in addition to reinforcing family and community ties.

An overall quota system for the hunting of bowhead whales was established by the International Whaling Commission (IWC) in 1977. The quota is now regulated through an agreement between NMFS and the Alaska Eskimo Whaling Commission (AEWC). The AEWC allots the number of bowhead whales that each whaling community may harvest annually (USDI/BLM 2005). The annual take of bowhead whales has varied due to (a) changes in the allowable quota level and (b) year-to-year variability in ice and weather conditions, which strongly influence the success of the hunt.

Bowhead whales migrate around northern Alaska twice each year, during the spring and autumn, and are hunted in both seasons. Bowhead whales are hunted from Barrow during the spring and the fall migration and animals are not successfully harvested every year. The spring hunt along Chukchi villages and at Barrow occurs after leads open due to the deterioration of pack ice; the spring hunt typically occurs from early April until the first week of June. The fall migration of bowhead whales that summer in the eastern Beaufort Sea typically begins in late August or September. Fall migration into Alaskan waters is primarily during September and October.

In the fall, subsistence hunters use aluminum or fiberglass boats with outboards. Hunters prefer to take bowheads close to shore to avoid a long tow during which the meat can spoil, but Braund and Moorehead (1995) report that crews may (rarely) pursue whales as far as 50 mi (80 km). The autumn bowhead hunt usually begins in Barrow in mid-September, and mainly occurs in the waters east and northeast of Point Barrow.

The scheduling of this seismic survey has been discussed with representatives of those concerned with the subsistence bowhead hunt, most notably the AEWC, the Barrow Whaling Captains' Association, and the North Slope Borough (NSB) Department of Wildlife Management.

The planned mobilization and start date for seismic surveys in the Chukchi Sea (~20 July and ~1 August) is well after the end of the spring bowhead migration and hunt at Wainwright and Barrow. Seismic operations will be conducted far offshore from Barrow and are not expected to conflict with subsistence hunting activities. Specific concerns of the Barrow whaling captains are addressed as part of the Plan of Cooperation with the AEWC (see below).

(2) Beluga Whales

Beluga whales are available to subsistence hunters along the coast of Alaska in the spring when pack-ice conditions deteriorate and leads open up. Belugas may remain in coastal areas or lagoons through June and sometimes into July and August. The community of Point Lay is heavily dependent on the hunting of belugas in Kasegaluk Lagoon for subsistence meat. From 1983–1992 the average annual harvest was ~40 whales (Fuller and George 1997). In Wainwright and Barrow, hunters usually wait until after the spring bowhead whale hunt is finished before turning their attention to hunting belugas. The average annual harvest of beluga whales taken by Barrow for 1962–1982 was five (MMS 1996). The Alaska Beluga Whale Committee recorded that 23 beluga whales had been harvested by Barrow hunters from 1987 to 2002, ranging from 0 in 1987, 1988 and 1995 to the high of 8 in 1997 (Fuller and George 1997; Alaska Beluga Whale Committee 2002 in USDI/BLM 2005). The seismic survey activities take place well offshore, far away from areas that are used for beluga hunting by the Chukchi Sea communities. It is possible, but unlikely, that accessibility to belugas during the subsistence hunt could be impaired during the survey.

(3) Ringed Seals

Ringed seals are hunted mainly from October through June. Hunting for these smaller mammals is concentrated during winter because bowhead whales, bearded seals and caribou are available through other seasons. In winter, leads and cracks in the ice off points of land and along the barrier islands are used for hunting ringed seals. The average annual ringed seal harvest was 49 seals in Point Lay, 86 in Wainwright, and 394 in Barrow (Braund *et al.* 1993; USDI/BLM 2003, 2005). Although ringed seals are available year-round, the seismic

survey will not occur during the primary period when these seals are typically harvested. Also, the seismic survey will be largely in offshore waters where the activities will not influence ringed seals in the nearshore areas where they are hunted.

(4) Spotted Seals

The spotted seal subsistence hunt peaks in July and August along the shore where the seals haul out, but usually involves relatively few animals. Spotted seals typically migrate south by October to overwinter in the Bering Sea. During the fall migration spotted seals are hunted by the Wainright and Point Lay communities as the seals move south along the coast (USDI/BLM 2003). Spotted seals are also occasionally hunted in the area off Point Barrow and along the barrier islands of Elson Lagoon to the east (USDI/BLM 2005). The seismic survey will remain offshore of the coastal harvest area of these seals and should not conflict with harvest activities.

(5) Bearded Seals

Bearded seals, although generally not favored for their meat, are important to subsistence activities in Barrow and Wainright, because of their skins. Six to nine bearded seal hides are used by whalers to cover each of the skin-covered boats traditionally used for spring whaling. Because of their valuable hides and large size, bearded seals are specifically sought. Bearded seals are harvested during the spring and summer months in the Chukchi Sea (USDI/BLM 2003, 2005). The animals inhabit the environment around the ice floes in the drifting nearshore ice pack, so hunting usually occurs from boats in the drift ice. Most bearded seals are harvested in coastal areas inshore of the proposed survey so no conflicts with the harvest of bearded seals are expected.

In the event that both marine mammals and hunters are near the 3D survey area when seismic surveys are in progress, the proposed project potentially could impact the availability of marine mammals for harvest in a small area immediately around the vessel, in the case of pinnipeds, and possibly in a large area in the case of migrating bowheads. However, the majority of marine mammals are taken by hunters within ~21 mi (~33 km) from shore (Figure 2 in Statoil's IHA application), and the seismic source vessel M/V Geo Celtic will remain far offshore, well outside the hunting areas. Considering the timing and location of the proposed seismic survey activities, as described earlier in the document, the proposed project is not expected to have any significant impacts to the availability of marine mammals for subsistence harvest. Specific concerns of the respective communities are addressed as part of the Plan of Cooperation between Statoil and the AEWC.

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 Statoil's proposed open water marine 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 in this document) 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.

In the case of subsistence hunts for bowhead whales in the Chukchi Sea, there could be an adverse impact on the hunt if the whales were deflected seaward (further from shore) in traditional hunting areas. The impact would be that whaling crews would have to travel greater distances to intercept westward migrating whales, thereby creating a safety hazard for whaling crews and/or limiting chances of successfully striking and landing bowheads.

Plan of Cooperation (POC or Plan)

Regulations at 50 CFR 216.104(a)(12) require IHA applicants for activities that take place in Arctic waters to provide a 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.

Statoil states that it intends to maintain an open and transparent process with all stakeholders throughout the life-cycle of activities in the Chukchi Sea. Statoil began the stakeholder engagement process in 2009 with meeting Chukchi Sea community leaders at the tribal, city, and corporate level. Statoil will continue to engage with leaders, community members, and subsistence groups, as well as local, state, and federal regulatory agencies throughout the exploration and development process.

As part of stakeholder engagement, Statoil is developing a Plan of Cooperation (POC) for the proposed 2010 seismic acquisition. The POC summarizes the actions Statoil will take to identify important subsistence activities, inform subsistence users of the proposed survey activities, and obtain feedback from subsistence users regarding how to promote cooperation between subsistence activities and the Statoil program.

Statoil has had the opportunity to engage with North Slope subsistence communities on several occasions:

- October 27, 2009, presentation to the NSB Planning Commission in Barrow;
- October 27 through November 5, 2009, Leadership Meetings in Barrow, Wainwright, Point Lay, and Kotzebue. Meetings with Native Village of Point Hope Executive Director;
- December 14, 2009, meeting the NSB Wildlife Department and members of the AEWC to discuss proposed activities, potential impacts, and measures for mitigating impacts;
- January 2010, POC meetings in Barrow, Wainwright, Point Lay, and Point Hope;
- March 22, 2010, Marine Mammal Co-Management Group Meeting; and
- April 13 - 16, 2010, Seminars presenting research work on oil spill contingencies in Arctic environmental conditions. Statoil took part and together with other operators brought Norwegian and international researchers to Anchorage, Barrow, and Kotzebue to present results from this research project (also called the SINTEF JIP study).

Statoil states that consultation, both formal and informal, will continue before, during and after the 2010 seismic survey activities. A final POC that documents all consultations with community leaders, subsistence users groups, individual subsistence users, and community members will be submitted to NMFS, USFWS, and MMS upon completion of consultation. The final POC will include feedback from the Leadership Meetings and POC meetings. Statoil will continue to document all consultation with the communities and subsistence stakeholders.

Subsistence Mitigation Measures

Statoil plans to introduce the following mitigation measures, plans and programs to potentially affected subsistence groups and communities. These measures, plans, and programs have been effective in past seasons of work in the Arctic and were developed in past consultations with these communities. These measures, plans, and programs will be implemented by Statoil during its 2010 open water marine seismic survey in the Chukchi Sea to monitor and mitigate potential impacts to subsistence users and resources. The mitigation measures Statoil has adopted and will implement during 2010 are listed and discussed below.

Statoil will not be entering the Chukchi Sea until early August, so there will be no potential conflict with spring bowhead whale or beluga subsistence whaling in the polynya zone. Statoil's seismic survey area is ~100 mi (~ 161 km) northwest of Wainwright which reduces the potential impact to subsistence hunting activities occurring along the Chukchi Sea coast.

The communication center in Wainwright will be jointly funded by Statoil and other operators, and Statoil will routinely call the communication center according to the established protocol while in the Chukchi Sea. Statoil plans to have one major crew change which will take place in Nome, AK, and will not involve the use of helicopters. Statoil does have a contingency plan for a potential transfer of a small number of crew via ship-to-shore vessel at Wainwright. If this should become necessary, the Wainwright communications center will be contacted to determine the appropriate vessel route and timing to avoid potential conflict with subsistence users.

Unmitigable Adverse Impact Analysis and Preliminary Determination

NMFS has preliminarily determined that Statoil's proposed 2010 open water marine seismic survey in the Chukchi Sea will not have an unmitigable adverse impact on the availability of species or stocks for taking for subsistence uses. This preliminary determination is supported by information contained in this document and Statoil's draft POC. Statoil has adopted a spatial and temporal strategy for its Chukchi Sea operations that should minimize impacts to subsistence hunters. Statoil will enter the Chukchi Sea far offshore, so as to not interfere with July hunts in the Chukchi Sea villages. After the close of the July beluga whale hunts in the Chukchi Sea villages, very little whaling occurs in Wainwright, Point Hope, and Point Lay. Although the fall bowhead whale hunt in Barrow will occur while Statoil is still operating (mid- to late September to October), Barrow is approximately 150 mi (241 km) east of the eastern boundary of the proposed marine seismic survey site. Based on these factors, Statoil's Chukchi Sea seismic survey is not expected to interfere with the fall bowhead harvest in Barrow. In recent years, bowhead whales have occasionally been taken in the fall by coastal villages along the Chukchi coast, but the total number of these animals has been small.

Adverse impacts are not anticipated on sealing activities since the majority of hunts for seals occur in the winter and spring, when Statoil will not be operating. Additionally, most sealing activities occur much closer to shore than Statoil's proposed marine seismic survey area.

Based on the measures described in Statoil's Draft POC, the proposed mitigation and monitoring measures (described earlier in this document), and the project design itself, NMFS has determined preliminarily that there will not be an unmitigable adverse impact on subsistence uses from Statoil's open water marine seismic survey in the Chukchi Sea.

Endangered Species Act (ESA)

There are three marine mammal species listed as endangered under the ESA with confirmed or possible occurrence in the proposed project area: the bowhead, humpback, and fin whales. NMFS' Permits, Conservation and Education Division has initiated consultation with NMFS' Protected Resources Division under section 7 of the ESA on the issuance of an IHA to Statoil under section 101(a)(5)(D) of the MMPA for this activity. Consultation will be concluded prior to a determination on the issuance of an IHA.

National Environmental Policy Act (NEPA)

NMFS is currently preparing an Environmental Assessment, pursuant to NEPA, to determine whether or not this proposed activity may have a significant effect on the human environment. This analysis will be completed prior to the issuance or denial of the IHA.

Proposed Authorization

As a result of these preliminary determinations, NMFS proposes to authorize the take of marine mammals incidental to Statoil's 2010 open water seismic survey in the Chukchi Sea, Alaska, provided the previously mentioned mitigation, monitoring, and reporting requirements are incorporated.

Dated: June 2, 2010.

James H. Lecky,

Director, Office of Protected Resources, National Marine Fisheries Service.

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DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

RIN 0648–XT25

Taking of Marine Mammals Incidental to Specified Activities; U.S. Marine Corps Training Exercises at Air Station Cherry Point

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

ACTION: Notice; proposed incidental harassment authorization; request for comments.

SUMMARY: NMFS has received an application from the U.S. Marine Corps (USMC) requesting authorization to take marine mammals incidental to various training exercises at Marine Corps Air Station (MCAS) Cherry Point Range Complex, North Carolina. The USMC's activities are considered military readiness activities pursuant to the Marine Mammal Protection Act (MMPA), as amended by the National Defense Authorization Act (NDAA) for Fiscal Year 2004. Pursuant to the MMPA, NMFS is requesting comments on its proposal to issue an incidental harassment authorization (IHA) to the USMC to take bottlenose dolphins (*Tursiops truncatus*), by Level B harassment only, from specified activities.

DATES: Comments and information must be received no later than July 8, 2010.

ADDRESSES: Comments on the application should be addressed to Michael Payne, Chief, Permits, Conservation and Education Division, Office of Protected Resources, National Marine Fisheries Service, 1315 East-West Highway, Silver Spring, MD 20910–3225. The mailbox address for providing e-mail comments is *PR1.0648–XT25@noaa.gov.* NMFS is not responsible for e-mail comments sent to addresses other than the one provided here. Comments sent via e-mail, including all attachments, must not exceed a 10-megabyte file size.