

mammals from Northstar construction activities, which included vessel traffic similar to the currently proposed action by FEX. NMFS is currently evaluating the FEIS to determine whether the proposed activity and its likely effects have been analyzed in the FEIS adopted in 2000. NMFS will make a determination as to the need for additional NEPA analysis prior to issuing the IHA.

### Preliminary Conclusions

NMFS has determined preliminarily that the short-term impact of conducting a barging operation between West Dock and either Cape Simpson or Point Lonely, in the U.S. Beaufort and associated activities will result, at worst, in a Level B harassment of temporary modification in behavior by a small number of certain species of whales and pinnipeds.

In addition, no take by injury and/or death is anticipated or authorized, and there is no potential for temporary or permanent hearing impairment as a result of the activities. No rookeries, mating grounds, areas of concentrated feeding, or other areas of special significance for marine mammals occur within or near the barge transit route.

The principal measures undertaken to ensure that the barging operation will not have an unmitigable adverse impact on subsistence activities are a CAA between FEX, the AEWC and the Whaling Captains Association; a Plan of Cooperation; and an operation schedule that avoids barging operations during the traditional bowhead whaling season as much as possible.

### Proposed Authorization

NMFS proposes to issue an IHA for the harassment of marine mammals incidental to FEX conducting a barging operation from West Dock through the U.S. Beaufort Sea to either Cape Simpson or Point Lonely. This proposed IHA is contingent upon incorporation of the previously mentioned mitigation, monitoring, and reporting requirements.

Dated: June 1, 2007.

#### James H. Lecky,

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

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## DEPARTMENT OF COMMERCE

### National Oceanic and Atmospheric Administration

[I.D. 010207A]

#### Small Takes of Marine Mammals Incidental to Specified Activities; Seismic Surveys in the Beaufort and Chukchi Seas off Alaska

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

**ACTION:** Notice of receipt of application and proposed incidental take authorization; request for comments.

**SUMMARY:** NMFS has received an application from Shell Offshore, Inc. (SOI) and WesternGeco for an Incidental Harassment Authorization (IHA) to take small numbers of marine mammals, by harassment, incidental to conducting marine geophysical programs, including deep seismic surveys, on oil and gas lease blocks located on Outer Continental Shelf (OCS) waters in the mid and eastern Beaufort and on pre-lease areas in the Northern Chukchi Sea. Under the Marine Mammal Protection Act (MMPA), NMFS is requesting comments on its proposal to issue an IHA to SOI and WesternGeco to incidentally take, by harassment, small numbers of several species of marine mammals between mid-July and November, 2007 incidental to conducting seismic surveys.

**DATES:** Written comments and information must be received no later than July 9, 2007.

**ADDRESSES:** Written comments on the application should be addressed to P. 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 [PR1.010207A@noaa.gov](mailto:PR1.010207A@noaa.gov). Comments sent via e-mail, including all attachments, must not exceed a 10-megabyte file size. A copy of the application (containing a list of the references used in this document) may be obtained by writing to this address or by telephoning the contact listed here and are also available at: <http://www.nmfs.noaa.gov/pr/permits/incidental.htm#iha>. Documents cited in this document, that are not available through standard public library access methods, may be viewed, by appointment, during regular business hours at the address provided here.

A copy of the NMFS/Minerals Management Service's (MMS) Draft Programmatic Environmental Impact Statement (Draft PDEIS) is available on CD from the person listed below (see **ADDRESSES**) and at: <http://www.mms.gov/alaska/>.

**FOR FURTHER INFORMATION CONTACT:** Kenneth Hollingshead, Office of Protected Resources, NMFS, (301) 713-2289 or Brad Smith, NMFS Anchorage (907)271-3023.

#### 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 marine mammals by U.S. citizens who engage in a specified activity (other than commercial fishing) within a specified geographical region if certain findings are made and either regulations are issued or, if the taking is limited to harassment, a notice of a proposed authorization is provided to the public for review.

An authorization shall be granted if NMFS finds that the taking will have a negligible impact on the species or stock(s) and will not have an unmitigable adverse impact on the availability of the species or stock(s) for subsistence uses and 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 United States can apply for an authorization to incidentally take small numbers of marine mammals by 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].

Section 101(a)(5)(D) establishes a 45-day time limit for NMFS review of a complete 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.

#### Summary of Request

On November 22, 2006, NMFS received an application from SOI for the taking, by harassment, of several species of marine mammals incidental to conducting a marine seismic survey program during 2007 in the mid- and eastern-Beaufort and northern Chukchi seas. SOI's 2007 open water seismic program includes: (1) Chukchi Sea Deep 3D Seismic, (2) Beaufort Sea Deep 3D Seismic; and (3) Beaufort Sea Marine Surveys (including site clearance and shallow hazards (sonar, shallow seismic, acoustic monitoring studies, seabed topography and environmental monitoring)).

The deep seismic survey component of the program will be conducted from WesternGeco's vessel *M/V Gilavar*. Detailed specifications on this seismic survey vessel are provided in Attachment A of SOI's IHA application. These specifications include: (1) complete descriptions of the number and lengths of the streamers which form the air gun and hydrophone arrays; (2) airgun size and sound propagation properties; and (3) additional detailed data on the *M/V Gilavar*'s characteristics. In summary, the *M/V Gilavar* will tow two source arrays, comprising three identical subarrays each, which will be fired alternately as the ship progresses downline in the survey area. The *M/V Gilavar* will tow up to 6 streamer cables up to 5.4 kilometers (km)(3.4 mi) long. With this configuration each pass of the *Gilavar* can record 12 subsurface lines spanning a swath of up to 360 meters (1181 ft). The seismic acquisition vessel will be supported by the *M/V Kilabuk*, or similar ice-class vessel. The *Kilabuk* will serve as a resupply, fueling support of acoustic and marine mammal monitoring, and seismic chase vessel. It also is capable of assisting in ice management operations but will not deploy seismic acquisition gear.

#### Plan for Seismic Operations

SOI plans for the *M/V Gilavar* to be in the Chukchi Sea in early July to begin deploying the acquisition equipment. Seismic acquisition is planned to begin on or about July 15, 2007. However, the proposed commencement date of July 15 will not occur earlier than that even if marine conditions allow since the timing is designed to ensure that there will be no conflict with the spring

bowhead whale migration and subsistence hunts conducted by Barrow, Pt. Hope, or Wainwright or the beluga subsistence hunt conducted by the village of Pt. Lay in July.

The approximate area of operations are shown in Figure 1 in SOI's IHA application. Data acquisition will continue in the Chukchi Sea until ice conditions permit a transit into the Beaufort Sea around early August. Seismic acquisition is planned to continue in the Beaufort at one of three 3-D areas until early October depending on ice conditions. For each of the 3-D areas, the *M/V Gilavar* will traverse the area multiple times until data over the area of interest has been recorded. While SOI's application notes that at the conclusion of seismic acquisition in the Beaufort Sea, the *M/V Gilavar* will return to the Chukchi Sea and resume recording data there until near the end of October, SOI has confirmed that it does not plan to return to the Chukchi Sea following completion of its seismic work in the Beaufort Sea.

The proposed Beaufort Sea activities are proposed to commence in August and continue until weather precludes further seismic work. The deep seismic program will take place in OCS waters on SOI's leases beginning east of the Colville River delta to east of the village of Kaktovik. Within this area, SOI has acquired four separate groups of lease blocks, totaling 85 leases. The timing of activities is scheduled to avoid any conflict with the Beaufort Sea bowhead whale subsistence hunt conducted by the Alaska Eskimo Whaling Commission's (AEWC) villages.

#### Chukchi Sea Deep 3D Seismic

The proposed deep seismic survey in the Chukchi Sea will occur before the survey activity in the Beaufort Sea. As sea ice coverage conditions allow, seismic activity will begin approximately July 15 and continue to early-to-mid August when the *M/V Gilavar* and *M/V Kilabuk*, or similar vessel, will transit to the Beaufort Sea to start work on a deep seismic survey on SOI lease-holdings in the mid and eastern Beaufort. The *M/V Peregrine* or similar vessel will conduct crew change transfers. After mid-October when sea ice conditions in the mid and eastern Beaufort Sea make further survey work there impractical, the survey activity will leave the Arctic Ocean. The dates indicated here represent what might occur under ideal conditions for performing marine seismic work whereas the actual dates will depend on sea ice and weather conditions as they occur in summer and mid-autumn of 2007.

The geographic region where the proposed deep seismic survey will occur is the Chukchi Sea MMS OCS Program Area designated as Chukchi Sea Sale 193 (1989) and the proposed 2002–2007 Chukchi Sea Program Area (See Figure 1, MMS Chukchi Sea Sale 193). Since the Chukchi deep seismic program is being conducted most likely as a pre-lease activity, the exact locations where operations will occur remain confidential for business competitive reasons. That is, the seismic data acquired will be used by SOI to determine what leases it will bid on in a forth-coming competitive lease sale. In general, however, seismic acquisition will take place well offshore from the Alaska coast beyond any exclusion areas stipulated in the MMS Chukchi Sea Planning Area Oil and Gas Lease Sale EIS 193 on OCS waters averaging greater than 40 meter (m) depths.

#### Beaufort Sea Deep 3D Seismic

The deep seismic program will take place in OCS waters on SOI leases beginning east of the Colville River delta to east of the village of Kaktovik (see Figure 2 in SOI's application). Within this area, SOI has acquired four separate groups of lease blocks, totaling 85 leases. The program is planned to occur during open-water from late July to the end of October.

SOI plans to run approximately 6,437 km (4000 mi) of seismic surveys in the Chukchi and Beaufort Seas.

#### Beaufort Sea Marine Surveys

Marine surveys will include site clearance and shallow hazards surveys of potential exploratory drilling locations within SOI's OCS lease areas and a potential pipeline corridor within and outside of SOI OCS lease blocks as required by MMS regulations. Site clearance surveys are confined to small specific areas within OCS blocks. Site clearance surveys are to take place at specific sites on various SOI leases from the Sivulliq lease block north of Pt. Thomson east to the Olympia block north of Barter Island (Figure 2 in SOI's IHA application). All of these sites are in OCS waters. Additional site clearance studies are planned over a corridor from the center of the Sivulliq lease block south to Pt. Thomson, a distance of approximately 22.4 km (14 mi). Site clearance surveys will be conducted contemporaneously with SOI's 3D seismic survey program.

The site clearance and shallow hazards surveys will be conducted by the *M/V Henry Christoffersen*, the same vessel used during SOI's 2006 site clearance and shallow hazard surveys). It is proposed that the same acoustic

instrumentation during 2006 will again be used during 2007: (1) Dual frequency subbottom profiler Datasonics CAP6000 Chirp II (2–7kHz or 8–23 kHz); Medium penetration subbottom profiler, Datasonics SPR–1200 Bubble Pulser (400 hertz [Hz]); (2) hi-resolution multi-channel 2D system, 240 cubic inches (in<sup>3</sup>)(4X60) gun array (0–150 Hz); (3) multi-beam bathymetric sonar, Seabat 8101 (240 Hz); and (4) side-scan sonar system, Datasonics SIS–1500 (190 - 210 kHz). These systems are described in SOI's IHA application.

These systems will be used in order to examine and measure bathymetry, seabed topography, potential geohazards and other seabed characteristics (i.e. boulder patches). The site-specific locations of site clearance and shallow hazard surveys have not been definitively set, although they will occur within the area outlined in Figure 2 in SOI's IHA application. In addition, several (more than 10) sonabouys (passive acoustic monitoring equipment) are to be positioned in and around potential drilling locations within the Sivulliq lease block. SOI states that the timing of the activity is scheduled to avoid conflict with the Beaufort Sea subsistence hunts conducted by the Whaling Captain's Associations of Barrow, Kaktovik, and Nuiqsut (see Mitigation).

The multi-beam bathymetric sonar and the side-scan sonar systems operate at frequencies greater than 180 kHz, the highest frequency considered by knowledgeable marine mammal biologists to be of possible influence to marine mammals. No measurements of those two sources are planned, as the recording equipment has a practical upper limit of 90 kHz. As determined during the sound measurement process, there should be no exclusion zones for seals or whales during operation of those two sources.

Acoustic systems similar to the ones proposed for use by SOI have been described in detail by NMFS previously (see 66 FR 40996 (August 6, 2001), 70 FR 13466 (March 21, 2005)). NMFS encourages readers to refer to these documents for additional information on these systems.

A detailed description of the work proposed by SOI for 2007 is contained in SOI's application which is available for review (see ADDRESSES). A description of SOI's data acquisition program and WesternGeco's air-gun array has been provided in previous IHA notices on SOI's seismic program (see 71 FR 26055, May 3, 2006; 71 FR 50027, August 24, 2006) and is no different than previous programs.

### Description of Marine 3-D Seismic Data Acquisition

In the seismic method, reflected sound energy produces graphic images of seafloor and sub-seafloor features. The seismic system consists of sources and detectors, the positions of which must be accurately measured at all times. The sound signal comes from arrays of towed energy sources. These energy sources store compressed air which is released on command from the towing vessel. The released air forms a bubble which expands and contracts in a predictable fashion, emitting sound waves as it does so. Individual sources are configured into arrays. These arrays have an output signal, which is more desirable than that of a single bubble, and also serve to focus the sound output primarily in the downward direction, which is useful for the seismic method. This array effect also minimizes the sound emitted in the horizontal direction.

The downward propagating sound travels to the seafloor and into the geologic strata below the seafloor. Changes in the acoustic properties between the various rock layers result in a portion of the sound being reflected back toward the surface at each layer. This reflected energy is received by detectors called hydrophones, which are housed within submerged streamer cables which are towed behind the seismic vessel. Data from these hydrophones are recorded to produce seismic records or profiles. Seismic profiles often resemble geologic cross-sections along the course traveled by the survey vessel.

### Description of WesternGeco's Air-Gun Array

Shell will use WesternGeco's 3147 in<sup>3</sup> Bolt-Gun Array for its 3-D seismic survey operations in the Chukchi and Beaufort Seas. WesternGeco's source arrays are composed of 3 identically tuned Bolt-gun sub-arrays operating at an air pressure of 2,000 psi. In general, the signature produced by an array composed of multiple sub-arrays has the same shape as that produced by a single sub-array while the overall acoustic output of the array is determined by the number of sub-arrays employed.

The gun arrangement for each of the three 1049-in<sup>3</sup> sub-array is detailed in Shell's application. As indicated in the application's diagram, each sub-array is composed of six tuning elements; two 2-gun clusters and four single guns. The standard configuration of a source array for 3D surveys consists of one or more 1049-in<sup>3</sup> sub-arrays. When more than one sub-array is used, as here, the

strings are lined up parallel to each other with either 8 m or 10 m (26 or 33 ft) cross-line separation between them. This separation was chosen so as to minimize the areal dimensions of the array in order to approximate point source radiation characteristics for frequencies in the nominal seismic processing band. For the 3147 in<sup>3</sup> array the overall dimensions of the array are 15 m (49 ft) long by 16 m (52.5 ft) wide.

### Characteristics of Airgun Pulses

Discussion of the characteristics of airgun pulses was provided in several previous **Federal Register** documents (see 69 FR 31792 (June 7, 2004) or 69 FR 34996 (June 23, 2004)) and is not repeated here as there are no differences. Additional information can be found in the NMFS/MMS Draft PEIS (see ADDRESSES). Reviewers are encouraged to read these earlier documents for additional background information.

### Description of Habitat and Marine Mammals Affected by the Activity

A detailed description of the Beaufort and Chukchi sea ecosystems and their associated marine mammal populations can be found in the NMFS/MMS Draft PEIS and the MMS Final Programmatic Environmental Assessment (Final PEA) on Seismic Surveys (see ADDRESSES for availability).

### Marine Mammals

The Beaufort/Chukchi Seas support a diverse assemblage of marine mammals, including bowhead whales, gray whales, beluga whales, killer whales, harbor porpoise, ringed seals, spotted seals, bearded seals, walrus and polar bears. These latter two species are under the jurisdiction of the U.S. Fish and Wildlife Service (USFWS) and are not discussed further in this document. Descriptions of the biology and distribution of the marine mammal species under NMFS' jurisdiction can be found in SOI's IHA application, the 2007 NMFS/MMS Draft PEIS on Arctic Seismic Surveys, and the MMS 2006 PEA. Information on these marine mammal species can also be found in NMFS Stock Assessment Reports (SARS). The Alaska SARS document is available at: <http://www.nmfs.noaa.gov/pr/pdfs/sars/ak2005.pdf>. Please refer to those documents for information on these species.

### Potential Effects of Seismic Surveys on Marine Mammals

Disturbance by seismic noise is the principal means of taking by this activity. Support vessels and aircraft may provide a potential secondary

source of noise. The physical presence of vessels and aircraft could also lead to non-acoustic disturbance or avoidance effects on marine mammals involving visual or other cues.

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) The noise may be too weak to be heard at the location of the animal (i.e., lower than the prevailing ambient noise level, the hearing threshold of the animal at relevant frequencies, or both);

(2) The noise may be audible but not strong enough to elicit any overt behavioral response;

(3) The noise may elicit reactions of variable conspicuousness and variable relevance to the well being of the marine mammal; these can range from temporary alert responses to active avoidance reactions such as vacating an area at least until the noise event ceases;

(4) Upon repeated exposure, a marine mammal may exhibit diminishing responsiveness (habituation), or disturbance effects may persist; the latter is most likely with sounds that are highly variable in characteristics, infrequent and unpredictable in occurrence, and associated with situations that a marine mammal perceives as a threat;

(5) Any anthropogenic noise that is strong enough to be heard has the potential to reduce (mask) the ability of a marine mammal to hear natural sounds at similar frequencies, including calls from conspecifics, and underwater environmental sounds such as surf noise;

(6) If mammals remain in an area because it is important for feeding, breeding or some other biologically important purpose even though there is chronic exposure to noise, it is possible that there could be noise-induced physiological stress; this might in turn have negative effects on the well-being or reproduction of the animals involved; and

(7) Very strong sounds have the potential to cause temporary or permanent reduction in hearing sensitivity. In terrestrial mammals, and presumably marine mammals, received sound levels must far exceed the animal's hearing threshold for there to be any temporary threshold shift (TTS) in its hearing ability. For transient sounds, the sound level necessary to cause TTS is inversely related to the duration of the sound. Received sound levels must be even higher for there to be risk of permanent hearing impairment. In addition, intense acoustic or explosive events may cause

trauma to tissues associated with organs vital for hearing, sound production, respiration and other functions. This trauma may include minor to severe hemorrhage.

#### *Effects of Seismic Survey Sounds on Marine Mammals*

SOI (2006) states that the only anticipated impacts to marine mammals associated with noise propagation from vessel movement, seismic airgun operations, and seabed profiling would be the temporary and short term displacement of seals and whales from within ensonified zones produced by such noise sources. In the case of bowhead whales, that displacement might well take the form of a deflection of the swim paths of migrating bowheads away from (seaward of) received noise levels lower than 160 db (Richardson *et al.*, 1999). The cited and other studies conducted to test the hypothesis of the deflection response of bowheads have determined that bowheads return to the swim paths they were following at relatively short distances after their exposure to the received sounds. SOI believes that there is no evidence that bowheads so exposed have incurred injury to their auditory mechanisms. Additionally, SOI cites Richardson and Thomson [eds]. (2002) that there is no conclusive evidence that exposure to sounds exceeding 160 db have displaced bowheads from feeding activity.

Results from the 1996–1998 BP and Western Geophysical seismic monitoring programs in the Beaufort Sea indicate that most fall migrating bowheads deflected seaward to avoid an area within about 20 km (12.4 mi) of an active nearshore seismic operation, with the exception of a few closer sightings when there was an island or very shallow water between the seismic operations and the whales (Miller *et al.*, 1998, 1999). The available data do not provide an unequivocal estimate of the distance (and received sound levels) at which approaching bowheads begin to deflect, but this may be on the order of 35 km (21.7 mi). It is also uncertain how far beyond (west of) the seismic operation the seaward deflection persists (Miller *et al.*, 1999). In one study, although very few bowheads approached within 20 km (12.4 mi) of the operating seismic vessel, the number of bowheads sighted within that area returned to normal within 12–24 hours after the airgun operations ended (Miller *et al.*, 1999).

Although NMFS believes that some limited masking of low-frequency sounds (e.g., whale calls) is a possibility during seismic surveys, the intermittent

nature of seismic source pulses (1 second in duration every 16 to 24 seconds (i.e., less than 7 percent duty cycle)) will limit the extent of masking. Bowhead whales are known to continue calling in the presence of seismic survey sounds, and their calls can be heard between seismic pulses (Greene *et al.*, 1999, Richardson *et al.*, 1986). Masking effects are expected to be absent in the case of belugas, given that sounds important to them are predominantly at much higher frequencies than are airgun sounds (Western Geophysical, 2000).

Hearing damage is not expected to occur during the SOI seismic survey project. It is not definitively known whether the hearing systems of marine mammals very close to an airgun would be at risk of temporary or permanent hearing impairment, but TTS is a theoretical possibility for animals within a few hundred meters of the source (Richardson *et al.*, 1995). However, planned monitoring and mitigation measures to detect marine mammals occurring near the array (described later in this document) are designed to avoid sudden onsets of seismic pulses at full power. These measures are likely to prevent animals from being exposed to sound pulses that have any possibility of causing hearing impairment.

When the received levels of noise exceed some threshold, cetaceans will show behavioral disturbance reactions. The levels, frequencies, and types of noise that will elicit a response vary among and within species, individuals, locations, and seasons. Behavioral changes may be subtle alterations in surface, respiration, and dive cycles. More conspicuous responses include changes in activity or aerial displays, movement away from the sound source, or complete avoidance of the area. The reaction threshold and degree of response also are related to the activity of the animal at the time of the disturbance. Whales engaged in active behaviors, such as feeding, socializing, or mating, are less likely than resting animals to show overt behavioral reactions, unless the disturbance is directly threatening.

The following species summaries are provided by NMFS to facilitate understanding of our knowledge of impulsive noise impacts on the principal marine mammal species that are expected to be affected.

#### *Bowhead Whales*

Seismic pulses are known to cause strong avoidance reactions by many of the bowhead whales occurring within a distance of a few kilometers, including changes in surfacing, respiration and

dive cycles, and may sometimes cause avoidance or other changes in bowhead behavior at considerably greater distances (Richardson *et al.*, 1995; Rexford, 1996; MMS, 1997). Studies conducted prior to 1996 (Reeves *et al.*, 1984, Fraker *et al.*, 1985, Richardson *et al.*, 1986, Ljungblad *et al.*, 1988) have reported that, when an operating seismic vessel approaches within a few kilometers, most bowhead whales exhibit strong avoidance behavior and changes in surfacing, respiration, and dive cycles. In these studies, bowheads exposed to seismic pulses from vessels more than 7.5 km (4.7 mi) away rarely showed observable avoidance of the vessel, but their surface, respiration, and dive cycles appeared altered in a manner similar to that observed in whales exposed at a closer distance (Western Geophysical, 2000). In three studies of bowhead whales and one of gray whales during this period, surfacing-dive cycles were unusually rapid in the presence of seismic noise, with fewer breaths per surfacing and longer intervals between breaths (Richardson *et al.*, 1986; Koski and Johnson, 1987; Ljungblad *et al.*, 1988; Malme *et al.*, 1988). This pattern of subtle effects was evident among bowheads 6 km to at least 73 km (3.7 to 45.3 mi) from seismic vessels. However, in the pre-1996 studies, active avoidance usually was not apparent unless the seismic vessel was closer than about 6 to 8 km (3.7 to 5.0 mi) (Western Geophysical, 2000).

Inupiat whalers believe that migrating bowheads are sometimes displaced at distances considerably greater than suggested by pre-1996 scientific studies (Rexford, 1996) previously mentioned in this document. Also, whalers believe that avoidance effects can extend out to distances on the order of 30 miles (48.3 km), and that bowheads exposed to seismic also are "skittish" and more difficult to approach. The "skittish" behavior may be related to the observed subtle changes in the behavior of bowheads exposed to seismic pulses from distant seismic vessels (Richardson *et al.*, 1986).

#### Gray Whales

The reactions of gray whales to seismic pulses are similar to those documented for bowheads during the 1980s. Migrating gray whales along the California coast were noted to slow their speed of swimming, turn away from seismic noise sources, and increase their respiration rates. Malme *et al.* (1983, 1984, 1988) concluded that approximately 50 percent of the migrating gray whales showed avoidance when the average received

pulse level was 170 dB (re 1 microPa). By some behavioral measures, clear effects were evident at average pulse levels of 160+dB; less consistent results were suspected at levels of 140–160 dB. Recent research on migrating gray whales showed responses similar to those observed in the earlier research when the source was moored in the migration corridor 2 km (1.2 mi) from shore. However, when the source was placed offshore (4 km (2.5 mi) from shore) of the migration corridor, the avoidance response was not evident on track plots (Tyack and Clark, 1998).

#### Beluga

The beluga is the only species of toothed whale (Odontoceti) expected to be encountered in the Beaufort Sea. Belugas have poor hearing thresholds at frequencies below 200 Hz, where most of the energy from airgun arrays is concentrated. Their thresholds at these frequencies (as measured in a captive situation), are 125 dB re 1 microPa or more depending upon frequency (Johnson *et al.*, 1989). Although not expected to be significantly affected by the noise, given the high source levels of seismic pulses, airgun sounds sometimes may be audible to beluga at distances of 100 km (62.1 mi) (Richardson and Wursig, 1997), and perhaps further if actual low-frequency hearing thresholds in the open sea are better than those measured in captivity (Western Geophysical, 2000). The reaction distance for beluga, although presently unknown, is expected to be less than that for bowheads, given the presumed poorer sensitivity of belugas than that of bowheads for low-frequency sounds (Western Geophysical, 2000).

#### Ringed, Larga and Bearded Seals

No detailed studies of reactions by seals to noise from open water seismic exploration have been published (Richardson *et al.*, 1995). However, there are some data on the reactions of seals to various types of impulsive sounds (LGL and Greeneridge, 1997, 1998, 1999a; J. Parsons as quoted in Greene, *et al.* 1985; Anon., 1975; Mate and Harvey, 1985). These studies indicate that ice seals typically either tolerate or habituate to seismic noise produced from open water sources.

Underwater audiograms have been obtained using behavioral methods for three species of phocinid seals, ringed, harbor, and harp seals. These audiograms were reviewed in Richardson *et al.* (1995) and Kastak and Schusterman (1998). Below 30–50 kHz, the hearing threshold of phocinids is essentially flat, down to at least 1 kHz, and ranges between 60 and 85 dB (re 1

microPa @ 1 m). There are few data on hearing sensitivity of phocinid seals below 1 kHz. NMFS considers harbor seals to have a hearing threshold of 70–85 dB at 1 kHz (60 FR 53753, October 17, 1995), and recent measurements for a harbor seal indicate that, below 1 kHz, its thresholds deteriorate gradually to 97 dB (re 1 microPa @ 1 m) at 100 Hz (Kastak and Schusterman, 1998).

While no detailed studies of reactions of seals from open-water seismic exploration have been published (Richardson *et al.*, 1991, 1995), some data are available on the reactions of seals to various types of impulsive sounds (see LGL and Greeneridge, 1997, 1998, 1999a; Thompson *et al.* 1998). These references indicate that it is unlikely that pinnipeds would be harassed or injured by low frequency sounds from a seismic source unless they were within relatively close proximity of the seismic array. For permanent injury, pinnipeds would likely need to remain in the high-noise field for extended periods of time. Existing evidence also suggests that, while seals may be capable of hearing sounds from seismic arrays, they appear to tolerate intense pulsatile sounds without known effect once they learn that there is no danger associated with the noise (see, for example, NMFS/ Washington Department of Wildlife, 1995). In addition, they will apparently not abandon feeding or breeding areas due to exposure to these noise sources (Richardson *et al.*, 1991) and may habituate to certain noises over time.

#### Numbers of Marine Mammals Expected to Be Taken

The methodology used by SOI to estimate incidental take by harassment by seismic and the numbers of marine mammals that might be affected in the proposed seismic acquisition activity area in the Chukchi and Beaufort seas are presented here. The density estimates for the species covered under this proposed IHA are based on the estimates developed by LGL (2005) and used here for consistency. Density estimates are based on the data from Moore *et al.* (2000) on summering bowhead, gray, and beluga whales in the Beaufort and Chukchi Seas, and relevant studies on ringed seal estimates including Stirling *et al.* (1982) and Kingsley (1986).

In its application, SOI provides estimates of the number of potential "exposures" to sound levels greater than 160 dB re 1 microPa (rms) and greater than 170 dB. SOI states that while the 160-dB criterion applies to all species of cetaceans and pinnipeds, SOI believes that a 170-dB criterion should

be considered appropriate for delphinid cetaceans and pinnipeds, which tend to be less responsive, whereas the 160-dB criterion is considered appropriate for other cetaceans (LGL, 2005). However, NMFS has noted in the past that it is unaware of any empirical evidence to indicate that some delphinid species do not respond at the lower level (i.e., 160 dB). As a result, NMFS will estimate Level B harassment take levels based on the 160 dB criterion.

The estimates for marine mammal exposure are based on a consideration of the number of marine mammals that might be disturbed appreciably by as much as 6,437 km (4000 mi) of seismic surveys in Beaufort Sea and/or the Chukchi Sea. Source arrays are composed of identically tuned Bolt gun sub-arrays operating at 2,000 psi, air pressure. In general, the signature produced by an array composed of multiple sub-arrays has the same shape as that produced by a single sub-array while the overall acoustic output of the array is determined by the number of sub-arrays employed. The gun arrangement for the 1,049 square inches (in<sup>2</sup>) sub-array is detailed below and is comprised of three subarrays comprising a total 3,147 in<sup>3</sup> sound source. The anticipated radii of influence of the bathymetric sonars and pinger are less than those for the air gun configurations described in Attachment A in SOI's IHA application. It is assumed that, during simultaneous operations of those additional sound sources and the air gun(s), any marine mammals close enough to be affected by the sonars or pinger would already be affected by the air gun(s). In this event, SOI believes that marine mammals are not expected to exhibit more than short-term and inconsequential responses, and such responses have not been considered to constitute "taking" therefore, potential taking estimates only include noise disturbance from the use of air guns. The specifications of the equipment, including site clearance activities, to be used and areas of ensonification are described more fully in SOI's IHA application (see Attachment B in SOI's IHA application).

### Cetaceans

For belugas and gray whales, in both the Beaufort and Chukchi Seas and bowhead whales in the Chukchi Sea, Moore *et al.* (2000b and c) offer the most current data to estimate densities during

summer. Density estimates for bowhead whale in the Beaufort Sea were taken from Miller *et al.*, 2002. Table 6-1 in SOI's IHA application gives the average and maximum densities for each cetacean species likely to occur within the project areas based on the density estimates developed and corrected as needed by LGL for the Beaufort and Chukchi Seas (LGL, 2005), however, these estimates were based on surveys of offshore waters (less than 100 m (328 ft) in depth). However, all seismic activities within the seismic activity areas proposed under this IHA will occur in waters between 20 and 40 m (65.6 and 131.2 ft) in depth. The estimated numbers of potential exposures presented in Tables 1 and 2 (Tables 6-3 and 6-4 in SOI's IHA application) are based on the 160 dB re 1 microPa (rms) criteria for most cetaceans (except for this geographic area, bowhead whales), because this range is assumed to be the sound source level at which marine mammals may change their behavior sufficiently to be considered "taken by harassment."

### Pinnipeds

Ringed, spotted, and bearded seals are all associated with sea ice, and most census methods used to determine density estimates for pinnipeds are associated with counting the number of seals hauled out on ice. Correction factors have been developed for most pinniped species that address biases associated with detectability and availability of a particular species. Although extensive surveys of ringed and bearded seals have been conducted in the Beaufort Sea, the majority of the surveys have been conducted over the landfast ice and few seal surveys have been in open water. The most comprehensive survey data set on ringed seals (and bearded seal) from the central and eastern Beaufort Sea was conducted on offshore pack ice in late spring (Kingsley 1986). It is important to note that all proposed activities will be conducted during the open-water season and density estimates used here were based on counts of seals on ice. Therefore, densities and potential take numbers will overestimate the numbers of seals that would likely be encountered and/or exposed because only the animals in the water would be exposed to the seismic and clearance activity sound sources. Although the

estimated numbers of potential exposures presented in Tables 1 and 2 (Tables 6-3 and 6-4 in the IHA application) are based on two sound source ranges (greater than 160 dB and greater than 170 dB re 1 microPa [rms]), for most pinnipeds, SOI believes that the 170 dB threshold should be used to determine "take by harassment" because this range is assumed to be the sound source level at which most pinnipeds may change their behavior in reaction to increased sound exposure.

### Exposure Calculations for Cetaceans and Pinnipeds

Except for bowheads in the Beaufort Sea, number of exposures of a particular species to sound levels between 160 dB and 180 dB re 1 microPa (rms) was calculated by multiplying: (1) the expected species density average and maximum, taken from LGL (2005); (2) the maximum anticipated total line-km of operations in the Chukchi and/or Beaufort Seas the three 1,049 in<sup>3</sup> subarrays (6,437 km); and (3) the cross-track distances within which received sound levels are predicted to be greater than 160 dB and greater than 170 dB.

Distances of sound propagation are taken from direct measurement of sound levels at distances from the *M/V Gilavar* in the Chukchi Sea during the 2006 open water season. Shell estimates the sound level output radii (rms) for a 3147 in<sup>3</sup> source array at a depth of 6 m (20 ft):

160 dB (rms) :: 8400 m/27559 ft  
180 dB (rms) :: 1200 m/3937 ft  
190 dB (rms) :: 440 m/1444 ft.

For bowhead whales in the Beaufort Sea, Richardson *et al.* (2002) provide estimates of densities specific to a given area (subdivided east to west and by depth) and time (two week intervals during summer and fall). The total number of individuals expected to be in the specific area where seismic operations are to occur in the Beaufort Sea is multiplied by that portion of the area expected to be ensonified above 160 dB.

Estimates of numbers of cetaceans and pinnipeds exposed to sound levels greater than 160 and 170 dB resulting from seismic acquisition activities in the Chukchi Sea are presented in Table 1 (Table 6-3 in SOI's IHA application). Estimates of exposure levels for the Beaufort Sea are presented in Table 2 (Table 6-4 in SOI's IHA application).

TABLE 1. ESTIMATED EXPOSURES AND REQUESTED TAKE LEVELS FOR CHUKCHI SEA OPERATIONS

	Average Density	190 dB	180 dB	170 dB	160 dB	Maximum Density	190 dB	180 dB	170 dB	160 dB	Requested Take
<b>Cetaceans</b>											
bowhead whales	0.0011		17	47	119	0.006		93	255	649	649
gray whale	0.0018		28	77	195	0.0072		112	306	779	779
Beluga	0.0034		53	145	368	0.0135		209	574	1,460	1,460
killer whale	0.0001		2	5	11	0.0004		7	17	44	44
Minke whale	0.0001		2	5	11	0.0004		7	17	44	44
Fin whale	0		0	0	0	0.0001		2	5	11	11
<b>Pinnipeds</b>											
ringed seal	0.0234	14	362	995		0.0935	53	1,445	3,973		3,973
spotted seal	0.0002	1	4	9		0.0009	1	14	39		39
bearded seal	0.0093	6	144	396		0.037	21	572	1573		1573

TABLE 2. ESTIMATED EXPOSURES AND REQUESTED TAKE LEVELS FOR BEAUFORT SEA OPERATIONS

	Average Density	190 dB	180 dB	170 dB	160 dB	Maximum Density	190 dB	180 dB	170 dB	160 dB	Requested Take
<b>Cetaceans</b>											
bowhead whales	NA					2,004.236		172	473	1203	1203
gray whale	0.0001		2	5	11	0.0004		7	17	44	44
Beluga	0.0068		106	289	736	0.0135		209	574	1,460	1,460
Harbor Porpoise	0		0	0	0	0.0002		4	9	22	22
<b>Pinnipeds</b>											
ringed seal	0.3547	201	5481	15071		0.7094	402	10,961	30,141		30,141
spotted seal	0.0037	3	58	158		0.0149	9	231	634		634
bearded seal	0.0181	11	280	770		0.0362	21	560	1,539		1,539

TABLE 3. ESTIMATED EXPOSURES AND REQUESTED TAKE LEVELS FOR BEAUFORT SEA HENRY "C" OPERATIONS

	Average Density	190 dB	180 dB	170 dB	160 dB	Maximum Density	190 dB	180 dB	170 dB	160 dB
<b>Cetaceans</b>										
bowhead whales	NA					2004.236		48	126	315
gray whale	0.0001		1	1	1	0.0004		1	1	2
Beluga	0.0068		3	7	18	0.0135		6	14	35
Harbor Porpoise	0		0	0	0	0.0002		1	1	1
<b>Pinnipeds</b>										
ringed seal	0.3547	49	135	359	898	0.7094	98	270	718	
spotted seal	0.0037	1	2	4		0.0149	3	6	16	
bearded seal	0.0181	3	7	19		0.0362	5	14	37	

#### Beaufort Sea: Marine Surveys

In addition to potential impacts from seismic surveys on Beaufort Sea marine mammals, SOI and NMFS anticipate that there is also a potential for marine mammals to be impacted by SOI's marine surveys (as described previously in this document). SOI determined that the air gun cluster on the *M/V Henry Christoffersen* was the strongest sound source on the vessel. Based on sound field measurements, the following distances were calculated: 190 dB - 89 m (292 ft); 180 dB - 248 m (814 ft); and 160 dB - 1,750 m (5741 ft). As explained in SOI's application, SOI has calculated a 50 percent margin factor and recommends that these zones be amended to the following: 190 dB - 120 m (394 ft), 180 dB - 330 m (1083 ft); and 160 dB - 2,220 m (7218 ft). Using similar methodology as for the *M/V Gillivar*,

Table 3 (Table 6–6 in SOI's IHA application) provides estimates of marine mammal sound exposures at these SPLs for the *M/V Henry Christoffersen*.

#### Potential Impacts on Affected Species and Stocks of Marine Mammals

According to SOI, the only anticipated impacts to marine mammals associated with SOI's seismic activities with respect to noise propagation are from vessel movements, and seismic air gun operations. SOI states that these impacts would be temporary and short term displacement of seals and whales from within ensonified zones produced by such noise sources. Any impacts on the whale and seal populations of the Beaufort Sea activity area are likely to be short term and transitory arising from the temporary displacement of individuals or small groups from

locations they may occupy at the times they are exposed to seismic sounds at the 160–190 db received levels. As noted elsewhere, it is highly unlikely that animals will be exposed to sounds of such intensity and duration as to physically damage their auditory mechanisms. In the case of bowhead whales that displacement might well take the form of a deflection of the swim paths of migrating bowheads away from (seaward of) received noise levels greater than 160 db (Richardson *et al.*, 1999). This study and others conducted to test the hypothesis of the deflection response of bowheads have determined that bowheads return to the swim paths they were following at relatively short distances after their exposure to the received sounds. There is no evidence that bowheads so exposed have incurred injury to their auditory mechanisms. Additionally, there is no conclusive

evidence that exposure to sounds exceeding 160 db have displaced bowheads from feeding activity (Richardson, W.J. and D.H. Thomson [eds]. 2002).

There is no evidence that seals are more than temporarily displaced from ensonified zones and no evidence that seals have experienced physical damage to their auditory mechanisms even within ensonified zones.

During the period of seismic acquisition, most marine mammals would be dispersed throughout the area. The peak of the bowhead whale migration through the Chukchi Sea typically occurs in October, and efforts to reduce potential impacts during this time will be addressed with the actual start of the migration and with the whaling communities. The timing of seismic activities in the Chukchi Sea will take place when the whales are widely distributed and would be expected to occur in very low numbers within the seismic activity area. Starting in late August bowheads may travel in proximity to the aforementioned activity area and hear sounds from vessel traffic and seismic activities, of which some might be displaced seaward by the planned activities.

The peak of the bowhead whale migration through the Beaufort Sea typically occurs in October, and efforts to reduce potential impacts during this time will be addressed with the actual start of the migration and with the whaling communities. The timing of seismic activities in the eastern U.S. Beaufort Sea will take place when the whales are not present, or in very low numbers. Starting in late August bowheads may travel in proximity to SOI's seismic activity areas and hear anthropogenic sounds from vessel traffic and seismic activities. Some bowheads may be displaced seaward by the planned activities.

In addition, feeding does not appear to be an important activity by bowheads migrating through the Chukchi Sea or the eastern and central part of the Alaskan Beaufort Sea in most years. Sightings of bowhead whales occur in the summer near Barrow (Moore and DeMaster, 2000) and there are suggestions that certain areas near Barrow are important feeding grounds. In addition, a few bowheads can be found in the Chukchi and Bering Seas during the summer and Rugh *et al.* (2003) suggests that this may be an expansion of the western Arctic stock, although more research is needed. In the absence of known important feeding areas in the U.S. Beaufort Sea, the potential diversion of a small number of bowheads away from seismic activities

is not expected to have any significant or long-term consequences for individual bowheads or their population. Bowheads, gray, or beluga whales are not predicted to be excluded from any habitat.

#### *Potential Impact on Habitat*

SOI states that the proposed seismic activities will not result in any permanent impact on habitats used by marine mammals, or to their prey sources. Seismic activities will occur during the time of year when bowhead whales are widely distributed and would be expected to occur in very low numbers within the seismic activity area (mid- to late-July through September). Any effects would be temporary and of short duration at any one place. The primary potential impacts to marine mammals is associated with elevated sound levels from the proposed airguns were discussed previously in this document.

A broad discussion on the various types of potential effects of exposure to seismic on fish and invertebrates can be found in LGL (2005; University of Alaska-Fairbanks Seismic Survey across Arctic Ocean at <http://www.nmfs.noaa.gov/pr/permits/incidental.htm#iha>), and includes a summary of direct mortality (pathological/physiological) and indirect (behavioral) effects.

Mortality to fish, fish eggs and larvae from seismic energy sources would be expected within a few meters (0.5 to 3 m (1.6 to 9.8 ft)) from the seismic source. Direct mortality has been observed in cod and plaice within 48 hours that were subjected to seismic pulses two meters from the source (Matishov, 1992), however other studies did not report any fish kills from seismic source exposure (La Bella *et al.*, 1996; IMG, 2002; Hassel *et al.*, 2003). To date, fish mortalities associated with standard seismic operations are thought to be slight. Saetre and Ona (1996) modeled a worst-case mathematical approach on the effects of seismic energy on fish eggs and larvae, and concluded that mortality rates caused by exposure to seismic are so low compared to natural mortality that issues relating to stock recruitment should be regarded as insignificant.

Limited studies on physiological effects on marine fish and invertebrates to acoustic stress have been conducted. No significant increases in physiological stress from seismic energy were detected for various fish, squid, and cuttlefish (McCauley *et al.*, 2000) or in male snow crabs (Christian *et al.*, 2003). Behavioral changes in fish associated with seismic exposures are expected to

be minor at best. Because only a small portion of the available foraging habitat would be subjected to seismic pulses at a given time, fish would be expected to return to the area of disturbance anywhere from 15–30 minutes (McCauley *et al.*, 2000) to several days (Engas *et al.*, 1996).

Available data indicates that mortality and behavioral changes do occur within very close range to the seismic source, however, the proposed seismic acquisition activities in the Chukchi and Beaufort seas are predicted by SOI to have a negligible effect to the prey resource of the various life stages of fish and invertebrates available to marine mammals occurring during the project's duration.

#### *Effects of Seismic Noise and Other Related Activities on Subsistence*

The disturbance and potential displacement of marine mammals by sounds from seismic activities are the principal concerns related to subsistence use of the area. The harvest of marine mammals (mainly bowhead whales, but also ringed and bearded seals) is central to the culture and subsistence economies of the coastal North Slope and Western Alaskan communities. In particular, if fall-migrating bowhead whales are displaced farther offshore by elevated noise levels, the harvest of these whales could be more difficult and dangerous for hunters. The impact would be that whaling crews would necessarily be forced 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. The harvest could also be affected if bowheads become more skittish when exposed to seismic noise. Hunters related how whales also appear "angry" due to seismic noise, making whaling more dangerous.

This potential impact on subsistence uses of marine mammals is proposed to be mitigated by application of the procedures established in a Conflict Avoidance Agreement (CAA) between the seismic operators and the AEWC and the Whaling Captains' Associations of Kaktovik, Nuiqsut, Barrow, Pt. Hope and Wainwright. Under a CAA, the times and locations of seismic and other noise producing sources would likely to be curtailed during times of active bowhead whale scouting and actual whaling activities within the traditional subsistence hunting areas of the potentially affected communities. (See Mitigation for Subsistence). SOI states that survey activities will also be scheduled to avoid the traditional



subsistence beluga hunt which annually occurs in July in the community of Pt. Lay. As a result, SOI believes that there should be no adverse impacts on the availability of the whale species for subsistence uses.

In the Chukchi Sea, SOI's seismic work should not have unmitigable adverse impacts on the availability of the whale species for subsistence uses. The whale species normally taken by Inupiat hunters are the bowhead and belugas. SOI's Chukchi seismic operations will not begin until after July 15, 2007 by which time the majority of bowheads will have migrated to their summer feeding areas in Canada. Even if any bowheads remain in the northeastern Chukchi Sea after July 15, they are not normally hunted after this date until the return migration occurs around late September when a fall hunt by Barrow whalers takes place. In the past few years, a small number of bowheads have also been taken by coastal villages along the Chukchi coast. Seismic operations for the Chukchi Sea seismic program will be timed and located so as to avoid any possible conflict with the Barrow fall whaling, and specific provisions governing the timing and location have been incorporated into the CAA established between SOI and WesternGeco, the AEWC, and the Barrow Whaling Captains Association.

Beluga whales may also be taken sporadically for subsistence needs by coastal villages, but traditionally are taken in small numbers very near the coast. Because the seismic surveys will be conducted at least 12 miles (25 km) offshore, impacts to subsistence uses of bowheads are not anticipated. However, SOI will establish "communication stations" in the villages to monitor impacts. Gray whales, which will be abundant in the northern Chukchi Sea from spring through autumn, are not taken by subsistence hunters.

#### *Plan of Cooperation (POC)*

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. SOI notes in its IHA application that POC meetings occurred in Barrow and Nuiqsut on October 16 and 17, 2006, and follow-up meetings are planned for the period May or June 2007 in these communities. SOI is working with all public and private organizations to hold a series of meetings in Kaktovik during 2006/2007. The communities of Point Hope, Point

Lay and Wainwright have met with SOI to discuss the results of the 2006 survey activities in the Chukchi Sea, followed by another series of POC meetings in May or June 2007. Following those meetings, a POC report will be prepared.

SOI hopes that a CAA will result from these meetings. The CAA will incorporate all appropriate measures and procedures regarding the timing and areas of the operator's planned activities (e.g., times and places where seismic operations will be curtailed or moved in order to avoid potential conflicts with active subsistence whaling and sealing); a communications system between operator's vessels and whaling and hunting crews (i.e., the communications center will be located in strategic areas); provision for marine mammal observers/Inupiat communicators aboard all project vessels; conflict resolution procedures; and provisions for rendering emergency assistance to subsistence hunting crews. If requested, post season meetings will also be held to assess the effectiveness of the 2007 CAA, to address how well conflicts (if any) were resolved; and to receive recommendations on any changes (if any) might be needed in the implementation of future CAAs.

It should be noted that NMFS must make a determination under the MMPA that an activity would not have an unmitigable adverse impact on the subsistence needs for marine mammals. While this includes usage of both cetaceans and pinnipeds, the primary impact by seismic activities is expected to be impacts from noise on bowhead whales during its westward fall feeding and migration period in the Beaufort Sea. NMFS has defined unmitigable adverse impact 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 (50 CFR 216.103).

However, it should be understood that while a signed CAA assists NMFS in making a determination that the activity will not have an unmitigable adverse impact on the subsistence use of marine mammals, if one or both parties fail to sign the CAA, then NMFS will make the determination that the activity will or will not have an unmitigable adverse impact on subsistence use of marine

mammals. This determination may require that the IHA contain additional mitigation measures in order for this decision to be made.

#### **Proposed Mitigation and Monitoring**

As part of its application, SOI has proposed implementing a marine mammal mitigation and monitoring program during SOI's seismic and shallow-hazard survey activities. In conjunction with monitoring during SOI's exploratory drilling program (subject to a separate notice and review), monitoring will provide information on the numbers of marine mammals potentially affected by these activities and permit real time mitigation to prevent injury of marine mammals by industrial sounds or activities. These goals will be accomplished by conducting vessel-, aerial-, and acoustic-monitoring programs to characterize the sounds produced by the seismic airgun arrays and related equipment and to document the potential reactions of marine mammals in the area to those sounds and activities. Acoustic modeling will be used to predict the sound levels produced by the seismic, shallow hazards and drilling equipment in the U.S. Beaufort and Chukchi seas. For the seismic program, acoustic measurements will also be made to establish zones of influence (ZOIs) around the activities that will be monitored by observers. Aerial monitoring and reconnaissance of marine mammals and recordings of ambient sound levels, vocalizations of marine mammals, and received levels should they be detectable using bottom-founded acoustic recorders along the Beaufort Sea coast will be used to interpret the reactions of marine mammals exposed to the activities. The components of SOI's mitigation and monitoring programs are briefly described next. Additional information can be found in SOI's application.

#### *Proposed Mitigation Measures*

On February 7, 2007, SOI submitted its proposed mitigation and monitoring program for SOI's seismic programs in the Chukchi and Beaufort seas. SOI notes that the proposed seismic exploration program incorporates both design features and operational procedures for minimizing potential impacts on cetaceans and pinnipeds and on subsistence hunts. Seismic survey design features include: (1) Timing and locating seismic activities to avoid interference with the annual fall bowhead whale hunts; (2) configuring the airgun arrays to maximize the proportion of energy that propagates

downward and minimizes horizontal propagation; (3) limiting the size of the seismic energy source to only that required to meet the technical objectives of the seismic survey; and (4) conducting pre-season modeling and early season field assessments to establish and refine (as necessary) the appropriate 180 dB and 190 dB safety zones, and other radii relevant to behavioral disturbance. The potential disturbance of cetaceans and pinnipeds during seismic operations will be minimized further through the implementation of the following several ship-based mitigation measures.

#### Safety and Disturbance Zones

Safety radii for marine mammals around airgun arrays are customarily defined as the distances within which received pulse levels are  $\leq 180$  dB re 1 microPa (rms) for cetaceans and  $\leq 190$  dB re 1 microPa (rms) for pinnipeds. These safety criteria are based on an assumption that seismic pulses at lower received levels will not injure these animals or impair their hearing abilities, but that higher received levels might have some such effects.

SOI anticipates that monitoring similar to that conducted in the Chukchi Sea in 2006 will also be required in the Chukchi and the Beaufort seas in 2007. SOI plans to use marine mammal observers (MMOs) onboard the seismic vessel to monitor the 190 and 180 dB (rms) safety radii for pinnipeds and cetaceans, respectively and to implement appropriate mitigation as discussed below. SOI also plans to monitor the 160 dB (rms) disturbance zone with MMOs onboard the chase vessel in 2007 as was done in 2006. There has also been concern that received pulse levels as low as 120 dB (rms) may have the potential to disturb some whales. In 2006, there was a requirement in the IHA issued to SOI by NMFS to implement special mitigation measures if specified numbers of bowhead cow/calf pairs might be exposed to  $\geq 120$  dB rms or if large groups ( $>12$  individuals) of bowhead or gray whales might be exposed to  $\geq 160$  dB rms. Monitoring of the 120 dB (rms) zone was required in the Chukchi Sea after 25 September. SOI anticipates that it will not be operating in the Chukchi Sea after 25 September, and it is likely, therefore, that SOI will not need to monitor the 120 dB (rms) zone in the Chukchi Sea in 2007. However, it is likely that SOI will be operating in the Beaufort Sea after 1 September in 2007, and SOI anticipates the need to monitor the 120 dB zone in that region.

If, as expected, the seismic acquisition equipment used in 2007 is the same as

the equipment used during the 2006 field season, SOI plans to use the same safety radii developed during 2006 for marine mammal mitigation in the Chukchi Sea during 2007. Initial safety radii for the Chukchi and Beaufort seas were modeled and estimated by JASCO Research Ltd. prior to seismic exploration activities in 2006. Modeling of the sound propagation was based on the size and configuration of the airgun array and on available oceanographic data. (If the airgun array used in 2007 is different from the array used in 2006, JASCO will model and estimate new radii based on the specifications of the new array for both the Chukchi and Beaufort seas. Those safety zones will be used for mitigation purposes until direct measurements are available early during the seismic survey.) If the same seismic acquisition equipment used in 2006 is used during 2007, then measurements of the sound produced by the airgun array will only be conducted in the Beaufort Sea, where acoustic measurements were not conducted in 2006. An acoustics contractor will perform the direct measurements of the received levels of underwater sound versus distance and direction from the airgun 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 mitigation measures to be implemented will include ramp ups, power downs, and shut downs as described next.

#### Ramp-Up

A ramp up of an airgun array provides a gradual increase in sound levels, and involves a step-wise increase in the number and total volume of airguns firing until the full volume is achieved. The purpose of a ramp up (or "soft start") is to "warn" cetaceans and pinnipeds in the vicinity of the airguns and to provide the time for them to leave the area and thus avoid any potential injury or impairment of their hearing abilities. During the proposed seismic program, 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 small airgun in the arrays. The minimum duration of a shut-down period, i.e., without air guns firing, which must be followed by a ramp up typically is the amount of time it would take the source vessel to cover the 180-dB safety radius. That depends on ship speed and the size of the 180-dB safety radius, which are not known at this time. SOI estimates that period to be about 8–10 minutes.

A full ramp up, after a shut down, will not begin until there has been a minimum of a 30-minute period of observation by MMOs of the safety zone to assure that no marine mammals are present. The entire safety zone must be visible during the 30-minute leading up 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 periods of turn around 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 air gun to the full arrays. However, keeping one air gun 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-minute periods prior to ramp-ups as well as during ramp-ups. Daylight will occur for 24h/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.

#### Power Downs and Shut Downs

A power down is the immediate reduction in the number of operating airguns from all guns firing to some smaller number. A shut down is the immediate cessation of firing of all airguns. The airgun arrays will be immediately powered down whenever a marine mammal is sighted approaching close to or within the applicable safety zone of the full airgun arrays, but is outside the applicable safety zone of the single airgun. If a marine mammal is sighted within the applicable safety zone of the single airgun, the airgun array will be shut down (i.e., no airguns firing). Although observers will be located on the bridge ahead of the center of the airgun array, the shutdown criterion for animals ahead of the vessel

will be based on the distance from the bridge (vantage point for MMOs) rather than from the airgun array. For marine mammals sighted alongside or behind the airgun array, the distance is measured from the array.

#### Operations at Night and in Poor Visibility

When operating under conditions of reduced visibility attributable to darkness or to adverse weather conditions, infra-red or night-vision binoculars will be available for use. However, it is recognized that their effectiveness is limited. For that reason, MMOs will not routinely be on watch at night, except in periods before and during ramp-ups. Note that if one small airgun has remained firing, the rest of the array can be ramped up during darkness or in periods of low visibility. Seismic operations may continue under conditions of darkness or reduced visibility.

#### Proposed Marine Mammal Monitoring

SOI will implement a marine mammal monitoring program (MMMP) to collect data to address the following specific objectives: (1) improve the understanding of the distribution and abundance of marine mammals in the Chukchi and Beaufort sea project areas; (2) understand the propagation and attenuation of anthropogenic sounds in the waters of the project areas; (3) determine the ambient sound levels in the waters of the project areas; and (4) assess the effects of sound on marine mammals inhabiting the project areas and their distribution relative to the local people that depend on them for subsistence hunting.

These objectives and the monitoring and mitigation goals will be addressed by: (1) vessel-based marine mammal observers on the seismic source and other support vessels; (2) an acoustic program to predict and then measure the sounds produced by the seismic operations and the possible responses of marine mammals to those sounds; (3) an aerial monitoring and reconnaissance of marine mammals available for subsistence harvest along the Chukchi Sea coast; and (4) bottom-founded autonomous acoustic recorder arrays along the Alaskan coast and offshore in the Chukchi and Beaufort seas to record ambient sound levels, vocalizations of marine mammals, and received levels of seismic operations should they be detectable.

#### Vessel-based Visual Monitoring

##### Seismic Source Vessel Monitoring

SOI will have at least four observers (three trained biologists and at least one

Inupiat observer/communicator) based aboard the seismic vessel. MMOs will search for and observe marine mammals whenever seismic operations are in progress and for at least 30 minutes before the planned start of seismic transmissions or whenever the seismic array's operations have been suspended for more than 10 minutes. These observers will scan the area immediately around the vessels with reticle binoculars during the daytime. Laser rangefinding equipment will be available to assist with distance estimation. After mid-August, when the duration of darkness increases, image intensifiers will be used by observers and additional light sources may be used to illuminate the safety zone.

The seismic vessel-based work will provide the basis for real-time mitigation (airgun power downs and, as necessary, shut downs), as called for by the IHAs; information needed to estimate the "take" of marine mammals by harassment, which must be reported to NMFS; data on the occurrence, distribution, and activities of marine mammals in the areas where the seismic program is conducted; information to compare the distances, distributions, behavior; movements of marine mammals relative to the source vessels at times with and without seismic activity; a communication channel to Inupiat whalers through the Communications Coordination Center in coastal villages; and continued employment and capacity building for local residents, with one objective being to develop a larger pool of experienced Inupiat MMOs.

The use of four observers allows two observers to be on duty simultaneously for up to 50 percent of the active airgun hours. The use of two observers increases the probability of detecting marine mammals, and two observers will be on duty whenever the seismic array is ramped up. Individual watches will be limited to no more than 4 consecutive hours to avoid observer fatigue (and no more than 12 hours on watch per 24 hour day). When mammals are detected within or about to enter the safety zone designated to prevent injury to the animals (see Mitigation), the geophysical crew leader will be notified so that shutdown procedures can be implemented immediately. Details of the vessel-based marine mammal monitoring program are described in SOI's IHA application.

##### Chase Boat Monitoring

MMOs will also be present on smaller support vessels that travel with the seismic source vessel. These support vessels are commonly known as "guard

boats" or "chase boats." During seismic operations, a chase boat remains very near to the stern of the source vessel anytime that a member of the source vessel crew is on the back deck deploying or retrieving equipment related to the seismic array. Once the seismic array is deployed the chase boat then serves to keep other vessels away from the seismic source vessel and the seismic array itself (including hydrophone streamer) during production of seismic data and provide additional emergency response capabilities.

In the Chukchi and Beaufort seas in 2007, SOI's seismic source vessel will have one associated chase boat and possibly an additional supply vessel. The chase boat and supply vessel (if present) will have two MMOs onboard to collect marine mammal observations and to monitor the 160 dB (rms) disturbance zone from the seismic airgun array. MMOs on the chase boats will be able to contact the seismic ship if marine mammals are sighted. To maximize the amount of time during the day that an observer is on duty, the two observers aboard the chase boat or supply vessel will rarely work at the same time. As on the source vessels, shifts will be limited to 4 hrs in length and 12 hrs total in a 24 hr period.

SOI plans to monitor the 160 dB (rms) disturbance radius in 2007 using MMOs onboard the chase vessel as was done in 2006. The 160 dB (rms) radius in the Chukchi Sea in 2006 was determined by Blackwell (2006) to extend approximately 8.4 km (5.2 mi) from the airgun source on the *Gilavar* and was monitored by MMOs onboard the *Kilabuk*. During monitoring of the 160 dB zone, the *Kilabuk* followed a zig-zag pattern about 6–8 km (3.7–5 mi) ahead of the *Gilavar*. MMOs onboard the *Kilabuk* searched the area ahead of the *Gilavar* within the 160 dB zone for marine mammals. Mitigation (i.e., power down or shut down of the airgun array) was to be implemented if a group of 12 or more bowhead or gray whales entered the 160 dB zone. SOI proposes to use this same protocol in the Beaufort Sea after the 160 dB radius has been determined by direct measurement.

##### Underwater Seismic Acoustic Measurement Program

As part of the IHA application process for similar seismic acquisition in 2006, SOI contracted to model the distances from WesternGeco's airgun array on the SOI source vessel, the *MV Gilavar*, to various broadband received levels of 190, 180, 170, 160, and 120 dB rms re 1 microPa. The model estimated the broadband received sound level in

water in relation to properties of the airgun array along with various environmental and physical characteristics. These modeled radii were used to define temporary safety radii that were used prior to and during measurements of the actual sounds produced by the airgun array at the beginning of the field season. These measured radii were used to establish actual safety radii that were used for mitigation during the 2006 seismic exploration activities in the Chukchi Sea. In 2007, SOI plans to again use the *Gilavar* as its seismic source vessel. Assuming that an airgun array identical to the one used in 2006 (WesternGeco's 3147 in<sup>3</sup> Bolt-Gun Array) is used during 2007, and that SOI's seismic acquisition during 2007 occurs in the same general location in the Chukchi Sea as the 2006 surveys, SOI does not plan to make empirical measurements of the airgun array in 2007 in the Chukchi Sea. For this scenario, SOI would use the same safety radii that were developed during 2006 for marine mammal mitigation during the 2007 field season. However, SOI proposes to measure the sound propagation of the airgun array if (1) an airgun array different from the array used during 2006 is used during the 2007 surveys, (2) the 2007 surveys in the Chukchi Sea are conducted in a different location than the surveys in 2006, or (3) if there is some other compelling reason to re-measure the sound propagation from the airgun array used during 2006.

SOI proposes to conduct measurements of the sound produced from the airgun array in the Beaufort Sea. This was not accomplished in 2006 due to the presence of ice and other logistical considerations which precluded the *Gilavar* from entering the Beaufort Sea. Sound source measurements will be conducted by a qualified acoustics contractor in the general area where seismic activities are planned. Results of the measurements will be used to determine the actual safety radii to be used for mitigation during the seismic activities. Technical details on this program can be found in SOI's IHA application.

#### Aerial Survey Program

SOI proposes to conduct an aerial survey program in support of the seismic exploration program in the Beaufort Sea during summer and fall of 2007. The objectives of the aerial survey will be: (1) to advise operating vessels as to the presence of marine mammals in the general area of operation; (2) to collect and report data on the distribution, numbers, movement and behavior of marine mammals near the

seismic operations with special emphasis on migrating bowhead whales; (3) to support regulatory reporting and Inupiat communications related to the estimation of impacts of seismic operations on marine mammals; (4) to monitor the accessibility of bowhead whales to Inupiat hunters and (5) to document how far west of seismic activities bowhead whales travel before they return to their normal migration paths, and if possible, to document how far east of seismic operations the deflection begins.

SOI proposes to implement different aerial survey designs during the summer (August) and fall (late August-October) periods because the numbers and distributions of marine mammal species of primary interest are different during those periods. During the early summer, few cetaceans are expected to be encountered in the Beaufort Sea, and those that are encountered are expected to be either along the coast (gray whales) or among the pack ice (bowheads and belugas) north of the area where seismic surveys and drilling activities are to be conducted.

During the late summer and fall, the bowhead whale is the primary species of concern, but belugas and gray whales are also present. Bowheads and belugas migrate through the Alaskan Beaufort Sea from summering areas in the central and eastern Beaufort Sea and Amundsen Gulf to their wintering areas in the Bering Sea. Small numbers of bowheads are sighted in the eastern Alaskan Beaufort Sea starting mid-August and near Barrow starting late August but the main migration does not start until early September.

The aerial survey procedures will be generally consistent with those during earlier industry studies (Miller *et al.*, 1997, 1998, 1999; Patterson *et al.*, 2007). This will facilitate comparison and pooling of data where appropriate. However, the specific survey grids will be tailored to SOI's operations and the time of year. Information on survey procedures can be found in SOI's IHA application.

#### Survey Design in the Beaufort Sea in Summer

The main species of concern in the Beaufort Sea is the bowhead whale but small numbers of belugas, and in some years, gray whales, are present in the Beaufort Sea during summer (see above). Few bowhead whales are expected to be found in the Beaufort Sea during early August; however, a reduced aerial survey program is proposed during the summer prior to seismic operations to confirm the distribution and numbers of bowheads,

gray whales and belugas, because no recent surveys have been conducted at this time of year. The few bowheads that were present in the Beaufort Sea during summer in the late 1980s were generally found among the pack ice in deep offshore waters of the central Beaufort Sea (Moore and DeMaster 1998; Moore *et al.* 2000). Although gray whales were rarely sighted in the Beaufort Sea prior to the 1980's (Rugh and Fraker, 1981), sightings appear to have become more common along the coast of the Beaufort Sea in summer and early fall (Miller *et al.*, 1999; Treacy 1998, 2000, 2002; Patterson *et al.*, 2007) possibly because of increases in the gray whale population and/or reductions in ice cover in recent years. Because no summer surveys have been conducted in the Beaufort Sea since the 1980s, the information on summer distribution of cetaceans will be valuable for planning future seismic or drilling operations. The grid that will be flown in the summer will have more-widely-spaced lines than the grid that will be flown during the fall period and will extend farther offshore to document the offshore distribution of bowhead whales and belugas.

#### Survey Design in the Beaufort Sea in Fall

Aerial surveys during the late August-October period will be designed to ensure that large aggregations of mother-calf bowheads do not approach to within the 120 dB re 1 microPa radius from the active seismic operation. At the same time, these surveys will obtain detailed data (weather permitting) on the occurrence, distribution, and movements of marine mammals, particularly bowhead whales, within an area that extends about 100 km to the east of the primary seismic vessel to a few km west of it, and north to about 65 km offshore. This site-specific survey coverage will complement the simultaneous MMS' Bowhead Whales Aerial Survey Program (BWASP) survey coverage. The proposed survey grid will provide data both within and beyond the anticipated immediate zone of influence of the seismic program, as identified by Miller *et al.* (1999). Miller *et al.* (1999) were not able to determine how far upstream and downstream (i.e., east and west) of the seismic operations bowheads began deflecting and then returned to their "normal" migration corridor. That is an important concern for the Inupiat whalers. SOI notes that the proposed survey grid is not able to address that concern because of the mitigation need to extend flights well to the east to detect mother-calf pairs before they are exposed to seismic

sounds greater than 120 dB re 1 microPa.

It is possible that the east-west extent of seismic surveys will change during the season due to ice or other operational restrictions. If so, SOI may need to modify the aerial survey grid to maintain observations to 100 km (62 mi) east of the seismic survey area, but the total km of survey that can be conducted each day are limited by the fuel capacity of the aircraft. The only alternative to ensure adequate aerial survey coverage over the entire area where seismic activities might influence bowhead whale distribution is to space the individual transects farther apart. For each 15–20 km (9.3–12.4 mi) increase in the east-west size of the seismic survey area, the spacing between lines will need to be increased by 1 km to maintain survey coverage from 100 km (62 mi) east to 20 km (12.4 mi) west of the seismic activities. Data from the easternmost transects of the proposed survey grid will document the main bowhead whale migration corridor east of the seismic exploration area and will provide the baseline data on the location of the migration corridor relative to the coast. SOI does not propose to fly a smaller “intensive” survey grid in 2007. In most previous years, a separate grid of 4–6 shorter transects was flown, whenever possible, to provide additional survey coverage within about 20 km (12.4 mi) of the seismic operations. This coverage was designed to provide additional data on marine mammal utilization of the actual area of seismic exploration and immediately adjacent waters. The 1996–98 studies showed that bowhead whales were almost entirely absent from the area within 20 km (12.4 mi) of the active seismic operation (Miller *et al.* 1997, 1998, 1999). Thus, the flying-time that (in the past) would have been expended on flying the intensive grid will be used to extend the coverage farther to the east and west of the seismic activity.

If seismic surveys of the Beaufort Sea end while substantial numbers of bowhead whales are still migrating west, aerial survey coverage of the area of most recent seismic operations will continue for several days after seismic surveys have ended. This will provide “post-seismic” data on whale distribution for comparison with whale distribution during seismic periods. These data will be used in analyses to estimate the extent of deflection during seismic activities and the duration of deflection after surveys end. Postseismic coverage will not be conducted if the bowhead migration has ended by that time, but it is expected that due to freeze-up, seismic operations will move

out of the Beaufort Sea before the end of the bowhead whale migration.

**Survey Grids:** Two different aerial survey grids are proposed depending on whether surveys are being conducted during summer (July to late August) or fall (late August–October). During summer, four north-south lines spaced 48 km (30 mi) apart and centered on the planned seismic exploration area would be flown 2 times each week. They would extend from the barrier islands (or 10–m (32.8 ft) depth contour in areas with no barrier islands) north to about 72° N which may be well within the pack ice at that time of year. The proposed survey grid for late August–October consists of up to 18 north-south lines spaced 8 km (4.9 mi) apart and will extend to 100 km (62 mi) east of the then-current seismic exploration area. Lines will extend from the barrier islands (or 10–m (32.8 ft) contour) north to approximately the 100 m (328 ft) depth contour. As previously described, when the seismic program moves east or west, the aerial survey grids will also be relocated a corresponding distance along the coast. This grid will be flown 2 times each week until one week prior to the start of seismic surveys. They will then be flown daily until one week after the end of seismic surveys in the Beaufort Sea. The eastern boundary of the survey area will extend eastward beyond the 120 dB radius of seismic sounds in order to detect aggregations of mother-calf pairs approaching the seismic operation.

Depending on the distance offshore where seismic is being conducted, the survey grid that is shown may not extend far enough offshore to document whales deflecting north of the operation. In this case, the north ends of the transects will be extended farther north so that they extend 30–35 km (18.6–21.7 mi) north of the seismic operation and the two most westerly lines will not be surveyed. This will mean that the survey lines will only extend as far west as the seismic operation. It is not possible to move the survey grid north without surveying areas south of the seismic operation because some whales may deflect south of the seismic operation and that deflection must be monitored. During previous studies of offshore drilling operations, bowhead whales were documented migrating near the coast less than 20 km (12.4 mi) south of a drilling operation (Koski and Johnson, 1987). It would be desirable to monitor whale movements west of the seismic operation to document how far west bowheads move before returning to their normal migratory corridor. It is not possible, however, to monitor the 120 dB radius east of the seismic operation

and obtain information on the distribution of whales west of the operation because of the large area that must be surveyed to the east.

The “summer” grid will total about 1000 km (621.4 mi) in length, requiring 4.6 hours to survey at a speed of 220 km/hr (120 nmi/hr), plus ferry time which will vary according to the location of the survey grid relative to the logistics base. The late August–October grid will total about 1300 km (807.8 mi) in length, requiring 6 h to survey at a speed of 220 km/h (120 nmi/hr), plus ferry time. Exact lengths and durations will vary somewhat depending on the east-west position of the seismic operations area and thus of the grid, the sequence in which lines are flown (often affected by weather), and the number of refueling/rest stops. As during previous studies, we propose that, while whaling is underway we will not survey the southern portions of survey lines over or near hunting areas unless the whalers agree that this can be done without interfering with their activities. This will reduce (but not eliminate) the potential for overflying whalers and whales that are being approached by whalers. Some of the autumn bowhead sightings in the region do occur in this “nearshore” area, and these whales will not be documented if the survey aircraft remains 15 or more km offshore in this area at all times. If SOI does not survey this area while whaling is occurring, it will reduce the potential for aircraft-whaler interactions at the expense of reducing our ability to assess seismic effects on bowheads, other marine mammals, and subsistence activities in that nearshore area.

#### **Joint Industry Studies Program**

This section describes studies that were undertaken in 2006 in the Chukchi Sea that will be continued during seismic operations in 2007. SOI plans to conduct aerial surveys consistent with the 2006 program along the Chukchi Sea coast. Additionally, an acoustic “net” array will be used to monitor industry sounds and marine mammals along the Chukchi Sea coast. This program may be modified to include recorders at different or additional locations depending upon the results obtained from the 2006 program. Once these results are available final determination of the numbers and placements of the recorders will occur in consultation with industry partners, agencies, and other stakeholders. In addition to the aerial and acoustical components of the study program in the Chukchi Sea, SOI plans to also establish an acoustic net array in the Beaufort Sea in 2007.

### *Chukchi Sea Coastal Aerial Survey*

The only recent aerial surveys of marine mammals in the Chukchi Sea were conducted along coastal areas of the Chukchi Sea to approximately 20 nmi (37 km) offshore in 2006 in support of SOI seismic exploration. These surveys, funded jointly by several industry groups, provided relatively sparse data on the distribution and abundance of marine mammals in nearshore waters of the Chukchi Sea, and the current distribution and densities of marine mammals there are unknown. Population sizes of several species found there may have changed considerably since earlier surveys were conducted and their distributions may have changed because of changes in ice conditions. SOI in cooperation with other industry groups, plans to conduct an aerial survey program in the Chukchi Sea in 2007 that will be similar to the 2006 program.

Alaskan Natives from several villages along the east coast of the Chukchi Sea hunt marine mammals during the summer and Native communities are concerned that offshore oil and gas development activities such as seismic exploration may negatively impact their ability to harvest marine mammals. Of particular concern are potential impacts on the beluga harvest at Point Lay and on future bowhead harvests at Point Hope, Wainwright and Barrow. Other species of concern in the Chukchi Sea include the gray whale, bearded, ringed, and spotted seals, and walrus. The gray whale is expected to be the most numerous cetacean species encountered during the proposed summer seismic activities, although beluga whales also occur in the area. The ringed seal is likely to be the most abundant pinniped species. The current aerial survey program will be designed to collect distribution data on cetaceans and will be limited in its ability to collect similar data on pinnipeds.

The aerial survey program will be conducted in support of the SOI seismic program in the Chukchi Sea during summer and fall of 2007. The objectives of the aerial survey will be (1) to address data deficiencies in the distribution and abundance of marine mammals in coastal areas of the eastern Chukchi Sea; and (2) to collect and report data on the distribution, numbers, orientation and behavior of marine mammals, particularly beluga whales, near traditional hunting areas in the eastern Chukchi Sea.

With agreement from hunters in the coastal villages, aerial surveys of coastal areas to approximately 20 nmi (37 km) offshore between Point Hope and Point

Barrow will begin in early July and will continue until seismic operations in the Chukchi Sea are completed. Weather and equipment permitting, surveys will be conducted twice per week during this time period. In addition, during the 2007 field season, SOI will coordinate and cooperate with the aerial surveys conducted by MMS and any other groups conducting surveys in the same region. For a description of the aerial survey procedures, please see SOI's IHA application.

Three MMOs will be aboard the aircraft during surveys during key hunting periods. Two observers will be looking for marine mammals within 1 km (0.62 km) of the survey track line; one each at windows on either side of the aircraft. The third person will record data. When sightings are made, observers will notify the data recorder of the species or species class of the animal(s) sighted, the number of animals present, and the lateral distance (inclinometer angle) of the animals from the flight path of the aircraft. This information, along with time and location data from an onboard GPS, will be entered into a database. Environmental data that affect sighting conditions including wind speed, sea state, cloud cover or fog, and severity of glare will be recorded for each transect line or whenever conditions change substantially.

### *Acoustic "Net" Array: Chukchi Sea*

The acoustic "net" array used during the 2006 field season in the Chukchi Sea was designed to accomplish two main objectives. The first was to collect information on the occurrence and distribution of beluga whales that may be available to subsistence hunters near villages located on the Chukchi Sea coast. The second objective was to measure the ambient noise levels near these villages and record received levels of sounds from seismic survey activities should they be detectable. If allowed by local villages, and equipment, ice and weather conditions permitting, an acoustic program in the Chukchi Sea from July-October will again be conducted.

A suite of autonomous seafloor recorders will be deployed in the Chukchi Sea to collect acoustic data from strategically situated sites. Figure 5 in SOI's application shows the locations of the acoustic arrays in 2006. The 2007 program may be similar but may also modify the locations and types of recorders used to attempt to answer specific questions about the movement of bowhead whales through the Chukchi Sea during fall. The acoustic contractor will provide technical personnel

support and equipment for the field deployment, refurbishment and recovery of recorders. The basic plan will be to deploy Acoustic recorders at strategic locations within the Chukchi Sea in locations where they can deliver broad area information on the acoustic environment of this basin. The specific geometries and placements of the arrays are primarily driven by the objectives of (a) detecting the occurrence and approximate offshore distributions of beluga and possibly bowhead whales during the July to mid-August period and primarily bowhead whales during the mid-August to late October period, (b) measuring ambient noise, and c) measuring received levels of seismic survey activities.

### *Acoustic "Net" Array: Beaufort Sea*

In addition to the continuation of the acoustic net array program in the Chukchi Sea in 2007, SOI plans to develop a similar acoustic component in the Beaufort Sea. The purpose of the array will be to further understand, define, and document sound characteristics and propagation resulting from offshore seismic and vessel-based drilling operations that may have the potential to cause deflections of bowhead whales from anticipated migratory pathways. Of particular interest will be the east-west extent of deflection (i.e. how far east of a sound source do bowheads begin to deflect and how far to the west beyond the sound source does deflection persist). Of additional interest will be the extent of offshore deflection that occurs.

In previous work around seismic and drill-ship operations in the Alaskan Beaufort Sea, the primary method for studying this question has been aerial surveys. Acoustic localization methods provide a possible alternative to aerial surveys for addressing these questions. As compared with aerial surveys, acoustic methods have the advantage of providing a vastly larger number of whale detections, and can operate day or night, independent of visibility, and to some degree independent of ice conditions and sea state-all of which prevent or impair aerial surveys. However, acoustic methods depend on the animals to call, and to some extent assume that calling rate is unaffected by exposure to industrial noise. Bowheads do call frequently in the fall, but there is some evidence that their calling rate may be reduced upon exposure to industrial sounds, complicating interpretation. Also, acoustic methods require development and deployment of instruments that are stationary (preferably mounted on the bottom) to

record and localize the whale calls. However, acoustic methods would likely be more effective for studying impacts related to a stationary sound source, such as a drilling rig that is operating within a relatively localized area, than for a moving sound source such as that produced by a seismic source vessel.

Bottom-founded acoustic recorders that have the ability to record calling whales will be deployed around SOI's seismic and drilling activities during the 2007 program. Figure 6 in SOI's application shows potential locations of the bottom-founded recorders and an array layout in relation to the proposed seismic and drilling locations. The actual locations of the bottom-founded recorders will depend on specifications of recording equipment chosen for the project, and on the acoustical characteristics of the environment. The results of these data will be used to determine the extent of deflection of migrating bowhead whales from the sound sources.

## Reporting

### *Interim Report*

The results of the 2007 SOI vessel-based monitoring, including estimates of take by harassment, will be presented in the "90 day" and final technical report as required by NMFS under IHAs. SOI proposes that these technical report(s) will include: (1) summaries of monitoring effort: total hours, total distances, and distribution through study period, sea state, and other factors affecting visibility and detectability of marine mammals; (2) analyses of the effects of various factors influencing detectability of marine mammals: sea state, number of observers, and fog/glare; (3) species composition, occurrence, and distribution of marine mammal sightings including date, water depth, numbers, age/size/gender categories, group sizes, and ice cover; (4) sighting rates of marine mammals versus operational state (and other variables that could affect detectability); (5) initial sighting distances versus operational state; (6) closest point of approach versus seismic state; (7) observed behaviors and types of movements versus operational state; (8) numbers of sightings/individuals seen versus operational state; (9) distribution around the drilling vessel and support vessels versus operational state; and (10) estimates of take based on (a) numbers of marine mammals directly seen within the relevant zones of influence (160 dB, 180 dB, 190 dB (if SPLs of that level are measured)), and (b) numbers of marine mammals estimated to be there based on

sighting density during daytime hours with acceptable sightability conditions.

### *Comprehensive Report*

Following the 2007 open water season a comprehensive report describing the proposed acoustic, vessel-based, and aerial 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 their impacts on marine mammals in the Beaufort Sea during 2007. The report will form the basis for future monitoring efforts and will establish long term data sets to help evaluate changes in the Beaufort Sea ecosystem. The report will also incorporate studies being conducted in the Chukchi Sea and 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.

This comprehensive report will consider data from many different sources including two relatively different types of aerial surveys; several types of acoustic systems for data collection (net array, passive acoustic monitoring, vertical array, and other acoustical monitoring systems that might be deployed), and vessel based observations. Collection of comparable data across the wide array of programs will help with the synthesis of information. However, interpretation of broad patterns in data from a single year is inherently limited. Much of the 2007 data will be used to assess the efficacy of the various data collection methods and to establish protocols that will provide a basis for integration of the data sets over a period of years.

### **Endangered Species Act (ESA)**

Under section 7 of the ESA, the MMS has begun consultation on the proposed seismic survey activities in the Beaufort and Chukchi seas during 2007. NMFS will also consult on the issuance of the IHA under section 101(a)(5)(D) of the MMPA to SOI for this activity. Consultation will be concluded prior to NMFS making a determination on the issuance of an IHA.

### **National Environmental Policy Act (NEPA)**

In 2006, the MMS prepared Draft and Final Programmatic Environmental Assessments (PEAs) for seismic surveys in the Beaufort and Chukchi Seas. Availability of the Draft and Final PEA was noted by NMFS in several **Federal**

**Register** notices regarding issuance of IHAs to SOI and others. NMFS was a cooperating agency in the preparation of the MMS PEA.

On November 17, 2006 (71 FR 66912), NMFS and MMS announced that they were preparing a Draft PEIS. This PEIS is being prepared to assess the impacts of MMS' annual authorizations under the Outer Continental Shelf Lands Act to the U.S. oil and gas industry to conduct offshore geophysical seismic surveys in the Chukchi and Beaufort seas off Alaska, and NMFS' authorizations under the MMPA to incidentally harass marine mammals while conducting those surveys.

On March 30, 2007 (72 FR 15135), the Environmental Protection Agency (EPA) noted the availability for comment of the NMFS/MMS Draft PEIS and on April 6, 2007 (72 FR 17117), NMFS and MMS announced its availability and times and locations for public hearings. On May 11, 2007 (72 FR 26788), based upon several verbal and written requests of additional time to review the Draft PEIS, NMFS announced an extension of the comment period until June 29, 2007. A copy of these NEPA documents are available upon request or online (see **ADDRESSES**).

### **Preliminary Conclusions**

Based on the information provided in SOI's application, this document, and the MMS Final PEA, NMFS has preliminarily determined that the impact of SOI conducting seismic surveys in the northern Chukchi Sea and eastern and central Beaufort Sea in 2007 will have no more than a negligible impact on marine mammals and that there will not be any unmitigable adverse impacts to subsistence communities, provided the mitigation measures described in this document are implemented (see Mitigation).

NMFS has preliminarily determined that the short-term impact of conducting seismic surveys in the U.S. Chukchi and Beaufort seas may result, at worst, in a temporary modification in behavior by certain species of marine mammals. While behavioral and avoidance reactions may be made by these species in response to the resultant noise, this behavioral change is expected to have a negligible impact on the animals. While the number of potential incidental harassment takes will depend on the distribution and abundance of marine mammals (which vary annually due to variable ice conditions and other factors) in the area of seismic operations, the number of potential harassment takings is estimated to be small. In addition, no take by death and/

or serious injury is anticipated, and the potential for temporary or permanent hearing impairment will be avoided through the incorporation of the mitigation measures mentioned in this document and required by the authorization. No rookeries, mating grounds, areas of concentrated feeding, or other areas of special significance for marine mammals occur within or near the planned area of operations during the season of operations.

NMFS has preliminarily determined that the proposed seismic activity by SOI in the northern Chukchi Sea and central and eastern Beaufort Sea in 2007 will not have an unmitigable adverse impact on the subsistence uses of bowhead whales and other marine mammals. This determination is supported by the information in this **Federal Register** Notice, including: (1) Seismic activities in the Chukchi Sea will not begin until after July 15 by which time the spring bowhead hunt is expected to have ended; (2) that the fall bowhead whale hunt in the Beaufort Sea will either be governed by a CAA between SOI and the AEWC and village whaling captains or by mitigation measures contained in the IHA; (3) the CAA or IHA conditions will significantly reduce impacts on subsistence hunters to ensure that there will not be an unmitigable adverse impact on subsistence uses of marine mammals; (4) while it is possible that accessibility to belugas during the spring subsistence beluga hunt could be impaired by the survey, it is unlikely because very little of the proposed survey is within 25 km (15.5 mi) of the Chukchi Sea coast, meaning the vessel will usually be well offshore and away from areas where seismic surveys would influence beluga hunting by communities; and (5) because seals (ringed, spotted, bearded) are hunted in nearshore waters and the seismic survey will remain offshore of the coastal and nearshore areas of these seals where natives would harvest these seals, it should not conflict with harvest activities.

As a result of these preliminary determinations, NMFS proposes to issue an IHA to SOI for conducting a seismic survey in the northern Chukchi Sea and central and eastern Beaufort Sea in 2007, provided the previously mentioned mitigation, monitoring, and reporting requirements are incorporated. NMFS has preliminarily determined that the proposed activity would result in the harassment of only small numbers of marine mammals; would have no more than a negligible impact on the affected marine mammal stocks; and would not have an unmitigable

adverse impact on the availability of species or stocks for subsistence uses.

Dated: May 30, 2007.

**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-XA43**

#### Endangered and Threatened Species; Take of Anadromous Fish

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

**ACTION:** Issuance of a scientific research permit.

**SUMMARY:** Notice is hereby given that NMFS has issued Permit 1282 to Stillwater Sciences (Stillwater) in Arcata, CA. Permit 1282 affects threatened species of salmon and steelhead (see **SUPPLEMENTARY INFORMATION**). Permit 1282 will more effectively manage the resources of the named species and contribute to the support of the species through data assessment and consequent actions associated with data collection.

**ADDRESSES:** The application, permit, and related documents are available for review by appointment at: Protected Resources Division, NMFS, 777 Sonoma Avenue, Room 315, Santa Rosa, CA 95404 (ph: 707-575-6097, fax: 707-578-3435, e-mail at: [Jeffrey.Jahn@noaa.gov](mailto:Jeffrey.Jahn@noaa.gov)).

**FOR FURTHER INFORMATION CONTACT:** Jeffrey Jahn at 707-575-6097, or e-mail: [Jeffrey.Jahn@noaa.gov](mailto:Jeffrey.Jahn@noaa.gov).

#### **SUPPLEMENTARY INFORMATION:**

##### **Authority**

The issuance of permits and permit modifications, as required by the Endangered Species Act of 1973 (16 U.S.C. 1531-1543) (ESA), is based on a finding that such permits/modifications: (1) are applied for in good faith; (2) would not operate to the disadvantage of the listed species which are the subject of the permits; and (3) are consistent with the purposes and policies set forth in section 2 of the ESA. Authority to take listed species is subject to conditions set forth in the permits. Permits and modifications are issued in accordance with and are subject to the ESA and NMFS

regulations (50 CFR parts 222-226) governing listed fish and wildlife permits.

#### **Species Covered in This Notice**

This notice is relevant to federally threatened Southern Oregon/Northern California Coast coho salmon (*Oncorhynchus kisutch*), endangered Central California Coast coho salmon (*O. kisutch*), threatened California Coastal Chinook salmon (*O. tshawytscha*), endangered Sacramento River winter-run Chinook salmon (*O. tshawytscha*), threatened Central Valley spring-run Chinook salmon (*O. tshawytscha*), threatened Northern California steelhead (*O. mykiss*), threatened Central California Coast steelhead (*O. mykiss*), threatened California Central Valley steelhead (*O. mykiss*), threatened South-Central California Coast steelhead (*O. mykiss*), and endangered Southern California steelhead (*O. mykiss*).

#### **Permit Issued**

A notice of the receipt of an application for a scientific research permit (1282) was published in the **Federal Register** on January 22, 2007 (72 FR 2658). Permit 1282 was issued to Stillwater on May 1, 2007. Permit 1282 authorizes capture (by boat electrofishing, backpack electrofishing, beach seine, purse seine, rotary screw trap, pipe-trap, fyke-net trap, and trawl), handling, sampling (by collection of scales, fin-clips, or stomach contents), and marking (using fin-clips, passive integrated transponder (PIT) tags, visible implant elastomer (VIE) tags, or acoustic telemetry tags), and release of juvenile Southern Oregon/Northern California Coast coho salmon, Central California Coast coho salmon, California Coastal Chinook salmon, Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, Northern California steelhead, Central California Coast steelhead, California Central Valley steelhead, South-Central California Coast steelhead, and Southern California steelhead. Permit 1282 also authorizes capture (by boat electrofishing, backpack electrofishing, or beach seine), handling, and release of adult California Central Valley steelhead.

Permit 1282 is for research to be conducted in the following water bodies, listed by county, all within the State of California: Tillas Slough (Smith River Estuary) and Lake Earl/Lake Tolowa in Del Norte County; Stone Lagoon, Big Lagoon, Humboldt Bay, and Eel River estuary/lagoon in Humboldt County; Ten Mile River estuary/lagoon, Virgin Creek estuary/lagoon, Pudding