Dated: May 12, 2010.

Ronald K. Lorentzen,

Deputy Assistant Secretary for Import Administration.

[FR Doc. 2010–11866 Filed 5–17–10; 8:45 am]

BILLING CODE 3510–DS–P

DEPARTMENT OF COMMERCE

National Institute of Standards and Technology

National Institute of Standards and Technology Performance Review Board Membership

The National Institute of Standards and Technology Performance Review Board (NIST PRB) reviews performance appraisals, agreements, and recommended actions pertaining to employees in the Senior Executive Service and ST–3104 employees. The Board makes recommendations to the appropriate appointing authority concerning such matters so as to ensure the fair and equitable treatment of these individuals.

This notice lists the membership of the NIST PRB and supersedes the list published in **Federal Register** Vol. 73, No. 164, pages 49646–49647, on August 22, 2008:

Michael Culpepper (C), Chief Human Capital Officer, National Institute of Standards & Technology, Gaithersburg, MD 20899. *Appointment Expires:* 12/31/12.

Robert Dimeo (C), Deputy Director, NIST Center for Neutron Research, National Institute of Standards & Technology, Gaithersburg, MD 20899. *Appointment Expires:* 12/31/12.

Stella Fiotes (C), (Alternate) Chief Facilities Management Officer, National Institute of Standards & Technology, Gaithersburg, MD 20899. *Appointment Expires:* 12/31/12.

Ellen Herbst (C), Senior Advisor for Policy and Program Integration, Office of the Deputy Secretary, Department of Commerce, Washington, DC 20230. *Appointment Expires:* 12/31/2012.

Sivaraj Shyam-Sunder (C), (Alternate) Director, Building and Fire Research Laboratory, National Institute of Standards & Technology, Gaithersburg, MD 20899. *Appointment Expires:* 12/31/10.

Dated: May 11, 2010.

Katharine Gebbie,

Director, Physics Laboratory.

[FR Doc. 2010–11843 Filed 5–17–10; 8:45 am]

BILLING CODE 3510–13–P

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

RIN 0648–XV36

Stanford University Habitat Conservation Plan

AGENCIES: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce; Fish and Wildlife Service, Interior (DOI).

ACTION: Notice; correction.

SUMMARY: NMFS and FWS published a notice in the Federal Register on April 12, 2010, announcing the availability of the Stanford University Habitat Conservation Plan (Plan), the Draft Environmental Impact Statement (DEIS) for Authorization of Incidental Take and Implementation of the Plan, and the Implementing Agreement (IA) for public review and comment. The document contained incorrect dates and contact information.

DATES: This correction is effective May 18, 2010.

FOR FURTHER INFORMATION CONTACT: Gary Stern, 707–575–6060; or Sheila Larsen, 916–414–6600.

SUPPLEMENTARY INFORMATION:

Need for Correction

In the **Federal Register** of April 12, 2010, in FR Doc. 2010-8300, on page 18483, in the first column, correct the "**DATES**" paragraph to read:

DATES: Written comments on the DEIS, Plan, and IA, must be received by 5 p.m. Pacific Time on July 15, 2010.

In the same **Federal Register** notice, on page 18483, in the first column, correct the "**FOR FURTHER INFORMATION CONTACT**" paragraph to read:

FOR FURTHER INFORMATION CONTACT: (1) Ms. Sheila Larsen, Senior Staff Biologist, U.S. Fish and Wildlife Service at 2800 Cottage Way, Room W-2605, Sacramento, California 95825; telephone 916–414–6600; or (2) Gary Stern, San Francisco Bay Region Supervisor, National Marine Fisheries Service, 777 Sonoma Avenue, Room 325, Santa Rosa, CA 95404 ; telephone 707–575–6060.

Dated: May 11, 2010.

Angela Somma,

Chief, Endangered Species Division, Office of Protected Resources, National Marine Fisheries Service.

Dated: May 11, 2010.

Alexandra Pitts,

Acting Deputy Region Director, Pacific Southwest Region, U.S. Fish and Wildlife Service.

[FR Doc. 2010–11852 Filed 5–17–10; 8:45 am]

BILLING CODES 3510–22–S, 4310–55–S

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

RIN 0648–XV09

Takes of Marine Mammals Incidental to Specified Activities; Taking Marine Mammals Incidental to Open Water Marine Survey Program in the Beaufort and Chukchi Seas, Alaska

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

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

SUMMARY: NMFS received an application from Shell Offshore Inc. (Shell) for an Incidental Harassment Authorization (IHA) to take marine mammals, by harassment, incidental to a proposed open water marine survey program in the Beaufort and Chukchi Seas, Alaska, between July and October 2010. Pursuant to the Marine Mammal Protection Act (MMPA), NMFS is requesting comments on its proposal to issue an IHA to Shell to take, by Level B harassment only, eight species of marine mammals during the specified activity.

DATES: Comments and information must be received no later than June 17, 2010.

ADDRESSES: Comments on the application should be addressed to Michael Payne, Chief, Permits, Conservation and Education Division, Office of Protected Resources, National Marine Fisheries Service, 1315 East-West Highway, Silver Spring, MD 20910. The mailbox address for providing e-mail comments is *PR1.0648-XV09@noaa.gov*. NMFS is not responsible for e-mail comments sent to addresses other than the one provided here. Comments sent via e-mail, including all attachments, must not exceed a 10-megabyte file size.

Instructions: All comments received are a part of the public record and will

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

A copy of the application used in this document may be obtained by writing to the address specified above, telephoning the contact listed below (*see* **FOR FURTHER INFORMATION CONTACT**), or visiting the Internet at: *http://www.nmfs.noaa.gov/pr/permits/incidental.htm*. Documents cited in this notice may also be viewed, by appointment, during regular business hours, at the aforementioned address.

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

SUPPLEMENTARY INFORMATION:

Background

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

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

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

Except with respect to certain activities not pertinent here, the MMPA defines "harassment" as:

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

Summary of Request

NMFS received an application on December 24, 2009, from Shell for the taking, by harassment, of marine mammals incidental to several marine surveys designed to gather data relative to site clearance and shallow hazards, ice gouge, and strudel scour in selected areas of the Beaufort Sea and ice gouge in the Chukchi Sea, Alaska. These surveys are continuations of those performed by Shell in the Beaufort Sea beginning in 2006, and in the Chukchi Sea in 2008. After addressing comments from NMFS, Shell modified its application and submitted a revised application on April 19, 2010. The April 19, 2009, application is the one available for public comment (*see* **ADDRESSES**) and considered by NMFS for this proposed IHA.

Site clearance and shallow hazards surveys will evaluate the seafloor, and shallow sub seafloor at prospective exploration drilling locations, focusing on the depth to seafloor, topography, the potential for shallow faults or gas zones, and the presence of archaeological features. The types of equipment used to conduct these surveys use low level energy sources focused on limited areas in order to characterize the footprint of the seafloor and shallow sub seafloor at prospective drilling locations. Ice gouge surveys will determine the depth and distribution of ice gouges into the seabed. Ice gouge surveys use low-level energy sources similar to the site clearance and shallow hazards.

Shell intends to conduct these marine surveys during the 2010 Arctic open-water season (July through October). Impacts to marine mammals may occur from noise produced by various active acoustic sources used in the surveys.

Description of the Specified Activity

Shell plans to complete the following surveys during the 2010 open-water season:

- Beaufort Sea Site Clearance and Shallow Hazards Surveys
- Beaufort Sea Marine Surveys
  - Ice Gouge Survey
  - Strudel Scour Survey
- Chukchi Sea Marine Surveys
  - Ice Gouge Survey

Each of these individual surveys will require marine vessels to accomplish the work. Shell states that these marine surveys will be conducted between July and October 2010, however, ice and weather conditions will influence the exact dates and locations marine vessel survey operations can be conducted.

1. Beaufort Sea Site Clearance and Shallow Hazards Surveys

Shell's proposed site clearance and shallow hazards surveys are to gather data on: (1) Bathymetry, (2) seabed topography and other seabed characteristics (*e.g.,* boulder patches), (3) potential geohazards (*e.g.,* shallow faults and shallow gas zones), and (4) the presence of any archeological features (*e.g.,* shipwrecks). Site clearance and shallow hazards surveys can be accomplished by one vessel with acoustic sources. No other vessels are necessary to accomplish the proposed work.

The focus of this activity will be on Shell's existing leases in Harrison Bay in the central Beaufort Sea. Actual locations of site clearance and shallow hazards surveys within Harrison Bay have not been definitively set as of this date, although these will occur on the Outer Continental Shelf (OCS) lease blocks in Harrison Bay located in the Beaufort Sea shown on Figure 1 of Shell's IHA application. The site clearance and shallow hazards surveys will be conducted within an area of approximately 216 mi^2 (558 km^2) north of Thetis Island more than 3 mi (4.8 km) to approximately 20 mi (33 km) offshore. Approximately 63 mi (162.7 km) of the data acquisition is planned within this general area. The survey track line is approximately 351.5 mi^2 (565 km^2). The average depth of the survey area ranges from 35 to 85 ft (10.7 to 26 m).

Ice and weather permitting, Shell is proposing to conduct site clearance and shallow hazards surveys within the timeframe of July 2010 through October 2010. The actual survey time is expected to take 30 days.

The vessel that will be conducting this activity has not been determined at this point, but will be similar to the R/V *Mt. Mitchell* which is the vessel that was used for surveys in the Chukchi Sea in 2009. The R/V *Mt. Mitchell* is a diesel powered-vessel, 70 m (231 ft) long, 12.7 m (42 ft) wide, with a 4.5 m (15 ft) draft.

It is proposed that the following acoustic instrumentation, or something similar, be used.

• *Deep Penetration Profiler, (40 cu-in airgun source with 48-channel streamer) and Medium Penetration Profiler, (40 cu-in airgun source with 24-channel streamer):*

The deep and medium penetration profiler and the medium penetration profiler are the major active acoustic sources used in the site clearance and shallow hazards surveys. The modeled source level is estimated at 217 dB re 1 µPa rms. The 120, 160, 180, and 190 dB re 1 µPa rms received level isopleths are estimated at 14,900 m, 1,220 m, 125 m, and 35 m from the source, respectively.

• *Dual-frequency side scan sonar, (100–400 kHz or 300–600 kHz):*

Based on the 2006 Shell's 90-day report, the source level of this active acoustic source when operated at 190 and 240 kHz is approximately 225 dB re 1 µPa rms. Due to its high frequency range, NMFS does not consider its acoustic energy would be strong enough to cause impacts to marine mammals beyond a couple of hundred meters from the source.

• *Single beam Echo Sounder, (high: 100–340 kHz, low: 24–50 kHz):*

This echo sounder is a typical "fathometer" or "fish-finder" that is widely used in most recreational or fishing vessels. Source levels for these types of units are typically in the range of 180–200 dB re 1 µPa rms. Using a spherical spreading model, the 160 dB isopleth is estimated at 100 m from the source for the lower range of the acoustic signals. For the higher range of the signal, due to the higher absorption coefficients, the 160 dB isopleth is expected to be under 100 m from the source.

• *Multi-beam Echo Sounder, (240 kHz):*

Since the output frequency from this echo sounder is above the upper limit of marine mammal hearing range, NMFS does not believe this equipment would affect marine mammals.

• *Shallow Sub-Bottom Profiler, (2–12 kHz):*

Information regarding this active acoustic source on two vessels (*Alpha Helix* and *Henry C.*) was provided in Shell's 2008 90-day open water marine survey monitoring report. For the *Alpha Helix* measurement, at 3.5 kHz, the source level for the shallow sub-bottom profiler was 193.8 dB re 1 µPa rms, and its 120, 160, 180, and 190 dB re 1 µPa rms isopleths were determined to be 310 m, 14 m, 3 m, and 1 m from the source, respectively. For the *Henry C.* measurement, at 3.5 kHz, the source level of the similar profiler was measured at 167.2 dB re 1 µPa rms, and its 120 and 160 dB re 1 µPa rms isopleths were determined to be 980 m and 3 m, respectively.

2. Beaufort Sea Marine Surveys

Two marine survey activities are proposed for the Beaufort Sea: (1) Ice gouge survey, and (2) strudel scour survey. Shell continues to conduct these types of marine surveys annually over a few years to enhance baseline and statistical understanding of the formation, longevity, and temporal distribution of sea floor features and baseline environmental and biologic conditions. Marine surveys for ice gouge and strudel scour surveys can be accomplished by one vessel for each. No other vessels are necessary to accomplish the proposed work.

The proposed ice gouge surveys will be conducted in both State of Alaska waters including Camden Bay, and the Federal waters of the OCS in the Beaufort Sea near Pt. Thomson ranging from near shore to approximately 37 mi (59.5 km) offshore. The water depth in the ice gouging survey area ranges between 15 to 120 ft (4.5 to 36.6 m), and the surveys will be conducted within an area of 1,950 mi^2 (5,036 km^2) with a survey track line of approximately 1,276 mi (2,050 km, See Figure 2 of Shell's IHA application).

The proposed strudel scour survey will occur in State of Alaska waters in Pt. Thomson ranging from near shore to 3 mi (4.8 km) offshore. The water depth ranges from 3 to 20 ft (0.9 to 6.1 m). The strudel scour survey will be conducted in an area of approximately 140 mi^2 (361.5 km^2). The survey track line is approximately 124 mi (200 km).

Ice and weather permitting, Shell is proposing to conduct this work within the timeframe of July 2010 through October 2010. The actual survey time is expected to take 45 days.

Ice Gouge Survey

As part of the feasibility study for Shell's Alaskan prospects a survey is required to identify and evaluate seabed conditions. Ice gouging is created by ice keels, which project from the bottom of moving ice and gouge into seafloor sediment. Ice gouge features are mapped, and by surveying each year, new gouges can be identified. The ice gouge information is used to aid in predicting the prospect of, orientation, depth, and frequency of future ice gouges. Ice gouge information is required for the design of potential pipelines and for the design of pipeline trenching and installation equipment.

The 2010 ice gouge surveys will be conducted using the conventional survey method where the acoustic instrumentation will be towed behind the survey vessel, or possibly with the use of an Autonomous Underwater Vehicle (AUV). The same acoustic instrumentation will be used during both AUV and the conventional survey methods. The AUV is a self-propelled autonomous vehicle that will be equipped with acoustic instrumentation and programmed for remote operation over the seafloor where the ice gouge survey is to be conducted, and the vehicle is launched and retrieved from a marine vessel.

For the survey operations, the AUV will be launched from the stern of a vessel and will survey the seafloor close to the vessel. The vessel will transit an area, with the AUV surveying the area behind the vessel. The AUV also has a Collision Avoidance System and operates without a towline that reduces potential impact to marine mammals (such as entanglement). Using bathymetric sonar or multibeam echo sounder the AUV can record the gouges on the seafloor surface caused by ice keels. The sub-bottom profiler can record layers beneath the surface to about 20 feet (6 m). The AUV is more maneuverable and able to complete surveys quicker than a conventional survey. This reduces the duration that vessels producing sound must operate. The proposed ice gouge survey in the Beaufort Sea is expected to last for 45 days.

The vessel that will be used for ice gouging surveys has not been selected, but it is anticipated that the vessel would be similar to the R/V *Mt. Mitchell,* which is 70 m (231 ft) long, 12.7 m (42 ft) wide, and 4.5 m (15 ft) draft.

It is proposed that the following acoustic instrumentation, or something similar, be used.

• Dual Frequency subbottom profiler; (2 to 7 kHz or 8 to 23 kHz):

Information regarding this active acoustic source on *Henry C.* was provided in Shell's 2006 and 2007 90-day open water marine survey monitoring reports. In the 2006 report, at 2–7 and 8–23 kHz, the source level was estimated at 184.6 dB re 1 µPa rms, and its 120, 160, and 180 dB re 1 µPa rms isopleths were determined to be 456 m, 7 m, and 2 m from the source, respectively. In the 2007 report, at 2–7 kHz, the source level was estimated at 161.1 dB re 1 µPa rms, and its 120 and 160 dB re 1 µPa rms isopleths were determined to be 260 m and 1 m, respectively.

• Multibeam Echo Sounder (240 kHz) and Side-scan sonar system (190 to 210 kHz):

Since the output frequencies from these acoustic instruments are above the upper-limits of marine mammal hearing range, NMFS does not believe they would affect marine mammals.

Because of the low source levels of the sub-bottom profiler and the high-frequency nature of the multi-beam echo sounder used in the proposed ice gouge survey, NMFS believes it unlikely that a marine mammal would be taken by this activity.

Strudel Scour Survey

During the early melt on the North Slope, the rivers begin to flow and discharge water over the coastal sea ice near the river deltas. That water flows down holes in the ice ("strudels") and scours the seafloor. These areas are called "strudel scours." Information on these features is required for prospective pipeline planning. Two proposed activities are required to gather this information: Aerial survey via helicopter overflights during the melt to locate the strudels; and strudel scour marine surveys to gather bathymetric data. The overflights investigate possible sources of overflood water and will survey local streams that discharge in the vicinity of Point Thomson including the Staines River, which discharges to the east into Flaxman Lagoon, and the Canning River, which discharges to the east directly into the Beaufort Sea. These helicopter overflights will occur during late May/early June 2010 and, weather permitting, should take no more than two days. There are no planned landings during these overflights other than at the Deadhorse or Kaktovik airports.

Areas that have strudel scour identified during the aerial survey will be verified and surveyed with a marine vessel after the breakup of nearshore ice. The vessel has not been determined, however, it is anticipated that it will be the diesel-powered R/V *Annika Marie* which has been utilized 2006 through 2008 and measures 13.1 m (43 ft) long, or similar vessel.

This proposed activity is not anticipated to take more than 5 days to conduct. The operation is conducted in the shallow water areas near the coast in the vicinity of Point Thomson. This vessel will use the following equipment:

- *Multibeam Echo Sounder (240 kHz) and Side-scan sonar system (190 to 210 kHz):*

Since the output frequencies from these acoustic instruments are above the upper-limits of marine mammal hearing range, NMFS does not believe they would affect marine mammals.

- *Single Beam Bathymetric Sonar:*

Source levels for these types of units are typically in the 180–230 dB range, somewhat lower than multibeam or side scan sonars. A unit used during a previous survey had a source level (at high power) of 215 dB re 1 μPa (0-peak) and a standard operating frequency of 200 kHz. Since the output frequencies from these acoustic instruments are above the upper-limits of marine mammal hearing range, NMFS does not believe they would affect marine mammals.

3. Chukchi Sea Marine Survey—Ice Gouge Survey

Shell proposes one marine survey activity for the Chukchi Sea in 2010. Shell intends to conduct ice gouge surveys annually over a few years to enhance baseline and statistical understanding of the formation, longevity, and temporal distribution of sea floor features and baseline environmental and biologic conditions. The ice gouge survey can be accomplished by one vessel. No other vessels are necessary to accomplish the proposed work.

The proposed ice gouge surveys will be conducted in both State of Alaska waters and the Federal waters of the OCS in the Chukchi Sea. Actual locations of the ice gouge surveys have not been definitively set as of this date, although these will occur within the area outlined in Figure 4 of the IHA application. The water depth of the ice gouging survey ranges between 20 to 120 ft (6.1 to 36.6 m), and the surveys will take in an area of 21,954 mi^2 (56,965 km^2), with a survey track line of approximately 1,539 mi (2,473 km). This activity is proposed to be conducted within the timeframe of July through October 2010. The total program will last a maximum of 60 days, excluding downtime due to ice, weather and other unforeseen delays, and should be complete by the end of October 2010.

The equipment and method used to conduct the ice gouge survey in the Chukchi Sea will be the same as that used in the Beaufort Sea. Because of the low source levels of the sub-bottom profiler and the high-frequency nature of the multi-beam echo sounder used in the proposed ice gouge survey, NMFS believes it unlikely that a marine mammal would be taken by this activity.

Description of Marine Mammals in the Area of the Specified Activity

Nine cetacean and four pinniped species under NMFS jurisdiction could occur in the general area of Shell's open water marine survey areas in the Beaufort and Chukchi Seas. The species most likely to occur in the general area near Harrison Bay in the Alaskan Beaufort Sea include two cetacean species: beluga (*Delphinapterus leucas*) and bowhead whales (*Balaena mysticetus*) and three seal species: ringed (*Phoca hispida*), spotted (*P. largha*), and bearded seals (*Erignathus barbatus*). Most encounters are likely to occur in nearshore shelf habitats or along the ice edge. The marine mammal species that is likely to be encountered most widely (in space and time) through-out the period of the planned shallow hazards surveys is the ringed seal. Encounters with bowhead and beluga whales are expected to be limited to particular regions and seasons, as discussed below.

Other marine mammal species that have been observed in the Beaufort and Chukchi Seas but are less frequent or uncommon in the project area include harbor porpoise (*Phocoena phocoena*), narwhal (*Monodon monoceros*), killer whale (*Orcinus orca*), fin whale (*Balaenoptera physalus*), minke whale (*B. acutorostrata*), humpback whale (*Megaptera novaeangliae*), gray whale (*Eschrichtius robustus*), and ribbon seal (*Histriophoca fasciata*). These species could occur in the project area, but each of these species is uncommon or rare in the area and relatively few encounters with these species are expected during the proposed marine surveys. The narwhal occurs in Canadian waters and occasionally in the Beaufort Sea, but it is rare there and is not expected to be encountered. There are scattered records of narwhal in Alaskan waters, including reports by subsistence hunters, where the species is considered extralimital (Reeves *et al.* 2002). Point Barrow, Alaska, is the approximate northeastern extent of the harbor porpoise's regular range (Suydam and George 1992), though there are extralimital records east to the mouth of the Mackenzie River in the Northwest Territories, Canada, and recent sightings in the Beaufort Sea in the vicinity of Prudhoe Bay during surveys in 2007 and 2008 (Christie *et al.* 2009). Monnett and Treacy (2005) did not report any harbor porpoise sightings during aerial surveys in the Beaufort Sea from 2002 through 2004. Humpback, fin, and minke whales have recently been sighted in the Chukchi Sea but very rarely in the Beaufort Sea. Greene *et al.* (2007) reported and photographed a humpback whale cow/calf pair east of Barrow near Smith Bay in 2007, which is the first known occurrence of humpbacks in the Beaufort Sea. Savarese *et al.* (2009) reported one minke whale sighting in

the Beaufort Sea in 2007 and 2008. Ribbon seals do not normally occur in the Beaufort Sea; however, two ribbon seal sightings were reported during vessel-based activities near Prudhoe Bay in 2008 (Savarese *et al.* 2009).

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

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

Potential Effects of the Specified Activity on Marine Mammals

Operating a variety of active acoustic sources such as airguns, side-scan sonars, echo-sounders, and sub-bottom profilers for site clearance and shallow hazard surveys, ice gouge, and strudel surveys can impact marine mammals in a variety of ways.

Potential Effects of Airgun Sounds on Marine Mammals

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

(1) Tolerance

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

(2) Behavioral Disturbance

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

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

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

For example, at the Guerreo Negro Lagoon in Baja California, Mexico, which is one of the important breeding grounds for Pacific gray whales, shipping and dredging associated with a salt works may have induced gray whales to abandon the area through most of the 1960s (Bryant *et al.* 1984). After these activities stopped, the lagoon was reoccupied, first by single whales and later by cow-calf pairs.

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

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

(3) Masking

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

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

Marine mammals are thought to be able to compensate for masking by adjusting their acoustic behavior such as shifting call frequencies, increasing call volume and vocalization rates. For example, blue whales are found to increase call rates when exposed to seismic survey noise in the St. Lawrence

Estuary (Di Iorio and Clark 2010). The North Atlantic right whales (*Eubalaena glacialis*) exposed to high shipping noise increase call frequency (Parks *et al.* 2007), while some humpback whales respond to low-frequency active sonar playbacks by increasing song length (Miller *el al.* 2000).

(4) Hearing Impairment

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

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

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

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

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

No cases of TTS are expected as a result of Shell's proposed activities given the small size of the source, the strong likelihood that baleen whales (especially migrating bowheads) would avoid the approaching airguns (or vessel) before being exposed to levels high enough for there to be any possibility of TTS, and the mitigation measures proposed to be implemented during the survey described later in this document.

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

(5) Non-auditory Physical Effects

Non-auditory physical effects might occur in marine mammals exposed to strong underwater pulsed sound. Possible types of non-auditory physiological effects or injuries that theoretically might occur in mammals close to a strong sound source include stress, neurological effects, bubble formation, and other types of organ or tissue damage. Some marine mammal species (*i.e.,* beaked whales) may be especially susceptible to injury and/or stranding when exposed to strong pulsed sounds. However, there is no definitive evidence that any of these effects occur even for marine mammals in close proximity to large arrays of airguns, and beaked whales do not occur in the proposed project area. In addition, marine mammals that show behavioral avoidance of seismic vessels, including most baleen whales, some odontocetes (including belugas), and some pinnipeds, are especially unlikely to incur non-auditory impairment or other physical effects. The small airgun array proposed to be used by Shell would only have 190 and 180 dB distances of 35 and 125 m (115 and 410 ft), respectively.

Therefore, it is unlikely that such effects would occur during Shell's proposed surveys given the brief duration of exposure and the planned monitoring and mitigation measures described later in this document.

(6) Stranding and Mortality

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

Ketten 1995). Airgun pulses are less energetic and their peak amplitudes have slower rise times. To date, there is no evidence that serious injury, death, or stranding by marine mammals can occur from exposure to airgun pulses, even in the case of large airgun arrays.

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

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

Potential Effects From Active Sonar Equipment on Marine Mammals

Several active acoustic sources other than the 40 cu-in airgun have been proposed for Shell's 2010 open water marine surveys in the Beaufort and Chukchi Seas. The specifications of these sonar equipments (source levels and frequency ranges) are provided above. In general, the potential effects of these equipments on marine mammals are similar to those from the airgun, except the magnitude of the impacts is expected to be much less due to the lower intensity and higher frequencies. Estimated source levels and zones of influence from sonar equipment are discussed above. In some cases, due to the fact that the operating frequencies of some of this equipment (*e.g.,* Multi-beam echo sounder: frequency at 240 kHz) are above the hearing ranges of marine mammals, they are not expected to have any impacts to marine mammals.

Vessel Sounds

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

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

Anticipated Effects on Habitat

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

Potential Impacts on Prey Species

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

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

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

Some mysticetes, including bowhead whales, feed on concentrations of zooplankton. Some feeding bowhead whales may occur in the Alaskan Beaufort Sea in July and August, and others feed intermittently during their westward migration in September and October (Richardson and Thomson [eds.] 2002; Lowry *et al.* 2004). Reactions of zooplanktoners to sound are, for the most part, not known. Their abilities to move significant distances

are limited or nil, depending on the type of animal. A reaction by zooplankton to sounds produced by the marine survey program would only be relevant to whales if it caused concentrations of zooplankton to scatter. Pressure changes of sufficient magnitude to cause that type of reaction would probably occur only near the airgun source, which is expected to be a very small area. Impacts on zooplankton behavior are predicted to be negligible, and that would translate into negligible impacts on feeding mysticetes.

Proposed Mitigation

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

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

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

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

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

Mitigation Measures Proposed in Shell's IHA Application

For the proposed mitigation measures, Shell listed the following protocols to be implemented during its marine surveys in the Beaufort Sea.

(1) Sound Source Measurements

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

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

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

Airgun pressure waveform data from the OBH systems will be analyzed using JASCO's suite of custom signal processing software that implements the following data processing steps:

- Energy source pulses in the OBH recordings are identified using an automated detection algorithm. The algorithm also chooses the 90% energy time window for rms sound level computations.
- Waveform data is converted to units of μPa using the calibrated acoustic response of the OBH system. Gains for frequency-dependent hydrophone sensitivity, amplifier and digitizer are applied in this step.
- For each pulse, the distance to the airgun array is computed from GPS deployment positions of the OBH systems and the time referenced DGPS navigation logs of the survey vessel.
- The waveform data are processed to determine flat-weighted peak sound pressure level (PSPL), rms SPL and SEL.
- Each energy pulse is Fast Fourier Transformed (FFT) to obtain 1-Hz spectral power levels in 1-second steps.
- The spectral power levels are integrated in standard 1/3-octave bands to obtain band sound pressure levels (BSPL) for bands from 10 Hz to 20 kHz. Both un-weighted and M-weighted (frequency weighting based on hearing sensitivities of four marine mammal functional hearing groups, see Southall et al. (2007) for a review) SPL's for each airgun pulse may be computed in this step for species of interest.

The output of the above data processing steps includes listings and graphs of airgun array narrow band and broadband sound levels versus range, and spectrograms of shot waveforms at specified ranges. Of particular importance are the graphs of level versus range that are used to compute representative radii to specific sound level thresholds.

(2) Safety and Disturbance Zones

Under current NMFS guidelines, "safety radii" for marine mammals exposure to impulse sources are customarily defined as the distances within which received sound levels are ≥180 dB re 1 μPa (rms) for cetaceans and ≥190 dB re 1 μPa (rms) for pinnipeds. These safety criteria are based on an assumption that SPL received at levels lower than these will not injure these animals or impair their hearing abilities, but that SPL received at higher levels might have some such effects. Disturbance or behavioral effects to marine mammals from underwater sound may occur after exposure to sound at distances greater than the safety radii (Richardson *et al.* 1995).

Initial safety and disturbance radii for the sound levels produced by the survey activities have been modeled. These

radii will be used for mitigation purposes until results of direct measurements are available early during the exploration activities. The planned survey will use an airgun source composed of either 40 in ^{3} airguns or 1 x 20-in ^{3} plus 2 x 10-in ^{3} airguns. The total source volume will be 4 x 10 in ^{3}. Measurements of a 2 x 10-in ^{3} airgun array used in 2007 were reported by Funk *et al.* (2008). These measurements were used as the basis for modeling both of the potential airgun arrays that may be used in 2010. The modeling results showed that the 40 in ^{3} array is likely to produce sounds that propagate further than the alternative array, so those results were used to estimate "takes by harassment" in Shell's IHA application and will also be used during initial survey activities prior to in-field sound source measurements. The modeled 190 and 180 dB distances from a 40 cubic inch array were 35 and 125 m, respectively. Because this is a modeled estimate, but based on similar measurements at the same location, the estimated distances for initial safety radii were only increased by a factor of 1.25 instead of a typical 1.5 factor. This results in a 190-dB distance of 44 m and a 180-dB distance of 156 m.

A single 10-in ^{3} airgun will be used as a mitigation gun during turns or if a power down of the full array is necessary due to the presence of a marine mammal close to the vessel. Underwater sound propagation of a 10-in ^{3} airgun was measured near Harrison Bay in 2007 and results were reported in Funk *et al.* (2008). The 190 dB and 180 dB distances from those measurements, 5 m and 20 m respectively, will be used as the pre-sound source measurement safety zones during use of the single mitigation gun.

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

(3) Power Downs and Shut Downs

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

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

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

(4) Ramp Ups

A ramp up of an airgun array provides a gradual increase in sound levels, and involves a stepwise increase in the number and total volume of airguns firing until the full volume is achieved.

The purpose of a ramp up (or "soft start") is to "warn" cetaceans and pinnipeds in the vicinity of the airguns and to provide the time for them to leave the area and thus avoid any potential injury or impairment of their hearing abilities.

During the proposed shallow hazards survey 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 single airgun in the array. The minimum duration of a shut-down period, *i.e.,* without air guns firing, which must be followed by a ramp up typically is the amount of time it would take the source vessel to cover the 180-dB safety radius. The actual time period depends on ship speed and the size of the 180-dB safety radius. That period is estimated to be about 1–2 minutes based on the modeling results described above and a survey speed of 4 knots.

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

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

Additional Mitigation Measures Proposed by NMFS

Besides Shell's proposed mitigation measures discussed above, NMFS proposes the following additional protective measures to address some uncertainties regarding the impacts to bowhead cow-calf pairs and aggregations of whales from seismic surveys. Specifically, NMFS proposes that:

- For seismic activities (including shallow hazards and site clearance and other marine surveys where active acoustic sources will be employed) in the Beaufort Sea after August 25, a 120-dB monitoring (safety) zone for bowhead whales will be established and monitored for the next 24 hours if four or more bowhead whale cow/calf pairs are observed at the surface during an aerial monitoring program within the area where an ensonified 120-dB zone around the vessel's track is projected. To the extent practicable, such

monitoring should focus on areas upstream (eastward) of the bowhead migration. No seismic surveying shall occur within the 120-dB safety zone around the area where these whale cow-calf pairs were observed, until two consecutive surveys (aerial or vessel) indicate they are no longer present within the 120-dB safety zone of seismic-surveying operations.

- A 160-dB vessel monitoring zone for bowhead and gray whales will be established and monitored in the Chukchi Sea and after August 25 in the Beaufort Sea during all seismic surveys. Whenever an aggregation of bowhead whales or gray whales (12 or more whales of any age/sex class that appear to be engaged in a nonmigratory, significant biological behavior (*e.g.,* feeding, socializing)) are observed during an aerial or vessel monitoring program within the 160-dB safety zone around the seismic activity, the seismic operation will not commence or will shut down, until two consecutive surveys (aerial or vessel) indicate they are no longer present within the 160-dB safety zone of seismic-surveying operations.
- Survey information, especially information about bowhead whale cow-calf pairs or feeding bowhead or gray whales, shall be provided to NMFS as required in MMPA authorizations, and will form the basis for NMFS determining whether additional mitigation measures, if any, will be required over a given time period.

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

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

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

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

Mitigation Conclusions

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

- The manner in which, and the degree to which, the successful implementation of the measure is expected to minimize adverse impacts to marine mammals;
- The proven or likely efficacy of the specific measure to minimize adverse impacts as planned; and
- The practicability of the measure for applicant implementation.

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

Proposed Monitoring and Reporting

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

Monitoring Measures Proposed in Shell's IHA Application

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

(1) Vessel-Based MMOs

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

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

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

Shell anticipates that there will be provision for crew rotation at least every six to eight weeks to avoid observer fatigue. During crew rotations detailed hand-over notes will be provided to the incoming crew leader by the outgoing leader. Other communications such as e-mail, fax, and/or phone communication between the current and oncoming crew leaders during each rotation will also occur when possible. In the event of an unexpected crew change Shell will facilitate such communications to insure monitoring consistency among shifts.

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

Biologist-observers will have previous marine mammal observation experience, and field crew leaders will be highly experienced with previous vessel-based marine mammal monitoring and mitigation projects. Resumes for those individuals will be provided to NMFS for review and acceptance of their qualifications. Inupiat observers will be experienced in the region, familiar with the marine mammals of the area, and complete a NMFS approved observer training course designed to familiarize individuals with monitoring and data collection procedures. A marine mammal observers' handbook, adapted for the specifics of the planned survey program, will be prepared and distributed beforehand to all MMOs.

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

equivalent experience or training. The training session(s) will be conducted by qualified marine mammalogists with extensive crew-leader experience during previous vessel-based seismic monitoring programs.

Primary objectives of the training include:

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

MMOs will watch for marine mammals from the best available vantage point on the survey vessel, typically the bridge. MMOs will scan systematically with the unaided eye and 7×50 reticle binoculars, supplemented with 20×60 image-stabilized Zeiss Binoculars or Fujinon 25×150 "Big-eye" binoculars and night-vision equipment when needed. Personnel on the bridge will assist the MMOs in watching for marine mammals.

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

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

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

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

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

Distances to nearby marine mammals will be estimated with binoculars (Fujinon 7 x 50 binoculars) containing a reticle to measure the vertical angle of the line of sight to the animal relative to the horizon. MMOs may use a laser rangefinder to test and improve their abilities for visually estimating distances to objects in the water. However, previous experience showed that a Class 1 eye-safe device was not able to measure distances to seals more than about 230 ft (70 m) away. The device was very useful in improving the distance estimation abilities of the observers at distances up to about 1968 ft (600 m)—the maximum range at which the device could measure distances to highly reflective objects such as other vessels. Humans observing objects of more-or-less known size via a standard observation protocol, in this case from a standard height above water, quickly become able to estimate distances within about ±20% when given immediate feedback about actual distances during training.

For monitoring related to deployment of the AUV, MMOs will advise the vehicle operators prior to deployment if aggregations of marine mammals have been observed in the survey area which might increase the likelihood of the vehicle encountering an animal or otherwise disturbing a group of animals.

Shell plans to conduct the site clearance and shallow hazards survey 24 hr/day. Regarding nighttime operations, note that there will be no periods of total darkness until mid-August. When operating under conditions of reduced visibility attributable to darkness or to adverse weather conditions, night-vision equipment ("Generation 3" binocular image intensifiers, or equivalent units) will be available for use.

(2) Aerial Survey Program

Shell proposes to conduct an aerial survey program in support of the shallow hazards program in the Beaufort Sea during the fall of 2010. The shallow hazards survey program may start in the Beaufort Sea as early as July 2010, however, aerial surveys would not begin until the start of the bowhead whale migration, around August 20, 2010. The objectives of the aerial survey will be:

- To advise operating vessels as to the presence of marine mammals (primarily cetaceans) in the general area of operation;
- To collect and report data on the distribution, numbers, movement and behavior of marine mammals near the survey operations with special emphasis on migrating bowhead whales;
- To support regulatory reporting related to the estimation of impacts of survey operations on marine mammals;
- To investigate potential deflection of bowhead whales during migration by documenting how far east of survey operations a deflection may occur and where whales return to normal migration patterns west of the operations; and
- To monitor the accessibility of bowhead whales to Inupiat hunters.

Specially-outfitted Twin Otter aircraft have an excellent safety record and are expected to be the survey aircraft. These aircraft will be specially modified for survey work and have been used extensively by NMFS, Alaska Department of Fish and Game, North Slope Borough, and LGL Limited during many marine mammal projects in Alaska, including industry funded projects as recent as the 2006–2008 seasons. The aircraft will be provided with a comprehensive set of survival equipment appropriate to offshore surveys in the Arctic. For safety reasons, the aircraft will be operated with two pilots.

Aerial survey flights will begin around August 20, 2010. Surveys will then be flown daily during the shallow hazards survey operations, weather and flight conditions permitting, and continued for 5 to 7 days after all activities at the site have ended.

The aerial survey procedures will be generally consistent with those used during earlier industry studies (Davis *et al.* 1985; Johnson *et al.* 1986; Evans *et al.* 1987; Miller *et al.* 1997, 1998, 1999, 2002; Patterson 2007). This will facilitate comparison and pooling of data where appropriate. However, the specific survey grids will be tailored to Shell's operations. During the 2010 open-water season Shell will coordinate and cooperate with the aerial surveys conducted by MMS/NMFS and any other groups conducting surveys in the same region.

It is understood that shallow hazard survey timing and the specific location offshore of Harrison Bay are subject to change as a result of unpredictable weather and ice conditions. The aerial survey design is therefore intended to be flexible and able to adapt at short notice to changes in the operations.

For marine mammal monitoring flights, aircraft will be flown at approximately 120 knots (138 mph) ground speed and usually at an altitude of 1,000 ft (305 m). Flying at a survey

speed of 120 knots (138 mph) greatly increases the amount of area that can be surveyed, given aircraft limitations, with minimal effect on the ability to detect bowhead whales. Surveys in the Beaufort Sea are directed at bowhead whales, and an altitude of 900–1,000 ft (274–305 m) is the lowest survey altitude that can normally be flown without concern about potential aircraft disturbance. Aerial surveys at an altitude of 1,000 ft (305 m) do not provide much information about seals but are suitable for both bowhead and beluga whales. The need for a 900–1000+ (274–305 m) ft cloud ceiling will limit the dates and times when surveys can be flown.

Two primary observers will be seated at bubble windows on either side of the aircraft and a third observer will observe part time and record data the rest of the time. All observers need bubble windows to facilitate downward viewing. For each marine mammal sighting, the observer will dictate the species, number, size/age/sex class when determinable, activity, heading, swimming speed category (if traveling), sighting cue, ice conditions (type and percentage), and inclinometer reading to the marine mammal into a digital recorder. The inclinometer reading will be taken when the animal's location is 90° to the side of the aircraft track, allowing calculation of lateral distance from the aircraft trackline.

Transect information, sighting data and environmental data will be entered into a GPS-linked computer by the third observer and simultaneously recorded on digital voice recorders for backup and validation. At the start of each transect, the observer recording data will record the transect start time and position, ceiling height (ft), cloud cover (in 10ths), wind speed (knots), wind direction (°T) and outside air temperature (°C). In addition, each observer will record the time, visibility (subjectively classified as excellent, good, moderately impaired, seriously impaired or impossible), sea state (Beaufort wind force), ice cover (in 10ths) and sun glare (none, moderate, severe) at the start and end of each transect, and at 2-min intervals along the transect. This will provide data in units suitable for statistical summaries and analyses of effects of these variables (and position relative to the survey vessel) on the probability of detecting animals (*see* Davis *et al.* 1982; Miller *et al.* 1999; Thomas *et al.* 2002). The data logger will automatically record time and aircraft position (latitude and longitude) for sightings and transect waypoints, and at pre-selected intervals along transects.

Ice observations during aerial surveys will be recorded and satellite imagery may be used, where available, during post-season analysis to determine ice conditions adjacent to the survey area. These are standard practices for surveys of this type and are necessary in order to interpret factors responsible for variations in sighting rates.

Shell will assemble the information needed to relate marine mammal observations to the locations of the survey vessel, and to the estimated received levels of industrial sounds at mammal locations. During the aerial surveys, Shell will record relevant information on other industry vessels, whaling vessels, low-flying aircraft, or any other human activities that are observed in the survey area.

Shell will also consult with MMS/National Marine Mammal Laboratory regarding coordination during the survey activities and real-time sharing of data. The aims will be:

- To ensure aircraft separation when both crews conduct surveys in the same general region;
- to coordinate the 2010 aerial survey projects in order to maximize consistency and minimize duplication;
- To use data from MMS's broad-scale surveys to supplement the results of the more site specific Shell surveys for purposes of assessing the effects of shallow hazard survey activities on whales and estimating "take by harassment";
- To maximize consistency with previous years' efforts insofar as feasible.

It is expected that raw bowhead sighting and flight-line data will be exchanged between MMS and Shell on a daily basis during the survey period, and that each team will also submit its sighting information to NMFS in Anchorage each day. After the Shell and MMS data files have been reviewed and finalized, they will be exchanged in digital form.

Shell is not aware of any other related aerial survey programs presently scheduled to occur in the Alaskan Beaufort Sea in areas where Shell is anticipated to be conducting survey operations during July–October 2010. However, one or more other programs are possible in support of other industry and research operations. If another aerial survey project were planned, Shell would seek to coordinate with that project to ensure aircraft separation, maximize consistency, minimize duplication, and share data.

During the late summer and fall, bowhead whale is the primary species of concern, but belugas and gray whales are also present. To address concerns regarding deflection of bowheads at greater distances, the survey pattern around shallow hazards survey operations has been designed to document whale distribution from about 25 mi (40 km) east of Shell's vessel operations to about 37 mi (60 km) west of operations (see Figure 1 of Shell's 4MP).

Bowhead whale movements during the late summer/autumn are generally from east to west, and transects should be designed to intercept rather than parallel whale movements. The transect lines in the grid will be oriented north-south, equally spaced at 5 mi (8 km) and randomly shifted in the east-west direction for each survey by no more than the transect spacing. The survey grid will total about 808 mi (1,300 km) in length, requiring approximately 6 hours to survey at a speed of 120 knots (138 mph), plus ferry time. Exact lengths and durations will vary somewhat depending on the position of the survey operation and thus of the grid, the sequence in which lines are flown (often affected by weather), and the number of refueling/rest stops.

Weather permitting, transects making up the grid in the Beaufort Sea will be flown in sequence from west to east. This decreases difficulties associated with double counting of whales that are (predominantly) migrating westward.

(3) Acoustic Monitoring

As discussed earlier in this document, Shell will conduct SSV tests to establish the isopleths for the applicable safety radii. In addition, Shell proposes to use acoustic recorders to study bowhead deflections.

Shell plans to deploy arrays of acoustic recorders in the Beaufort Sea in 2010, similar to that which was done in 2007 and 2008 using Directional Autonomous Seafloor Acoustic Recorders (DASARs) supplied by Greeneridge. These directional acoustic systems permit localization of bowhead whale and other marine mammal vocalizations. The purpose of the array will be to further understand, define, and document sound characteristics and propagation resulting from shallow hazards surveys that may have the potential to cause deflections of bowhead whales from their migratory pathway. Of particular interest will be the east-west extent of deflection, if any (*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 (or towards shore) deflection that might occur.

In previous work around seismic operations in the Alaskan Beaufort Sea, the primary method for studying this question has been aerial surveys. Acoustic localization methods will provide supplementary information for addressing the whale deflection question. Compared to 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 call frequently in fall, but there is some evidence that their calling rate may be reduced upon exposure to industrial sounds, complicating interpretation. The combined use of acoustic and aerial survey methods will provide a suite of information that should be useful in assessing the potential effects of survey operations on migrating bowhead whales.

Using passive acoustics with directional autonomous recorders, the locations of calling whales will be observed for a 6- to 10-week continuous monitoring period at five coastal sites (subject to favorable ice and weather conditions).

Shell plans to conduct the whale migration monitoring using the passive acoustics techniques developed and used successfully since 2001 for monitoring the migration past Northstar production island northwest of Prudhoe Bay and from Kaktovik to Harrison Bay during the 2007–2009 migrations. Those techniques involve using DASARs to measure the arrival angles of bowhead calls at known locations, then triangulating to locate the calling whale.

In attempting to assess the responses of bowhead whales to the planned industrial operations, it will be essential to monitor whale locations at sites both near and far from industry activities. Shell plans to monitor at five sites along the Alaskan Beaufort coast as shown in Figure 3 of Shell's 4MP. The eastern-most site (#5 in Figure 3 of the 4MP) will be just east of Kaktovik and the western-most site (#1 in Figure 3 of the 4MP) will be in the vicinity of Harrison Bay. Site 2 will be located west of Prudhoe Bay. Sites 4 and 3 will be west of Camden Bay. These five sites will provide information on possible migration deflection well in advance of whales encountering an industry operation and on "recovery" after passing such operations should a deflection occur.

The proposed geometry of DASARs at each site is comprised of seven DASARs oriented in a north-south pattern resulting in five equilateral triangles with 4.3-mi (7-km) element spacing. DASARs will be installed at planned locations using a GPS. However, each DASAR's orientation once it settles on the bottom is unknown and must be determined to know how to reference the call angles measured to the whales. Also, the internal clocks used to sample the acoustic data typically drift slightly, but linearly, by an amount up to a few seconds after 6 weeks of autonomous operation. Knowing the time differences within a second or two between DASARs is essential for identifying identical whale calls received on two or more DASARs.

Bowhead migration begins in late August with the whales moving westward from their feeding sites in the Canadian Beaufort Sea. It continues through September and well into October. Shell will attempt to install the 21 DASARs at three sites (3, 4 and 5) in early August. The remaining 14 DASARs will be installed at sites 1 and 2 in late August. Thus, Shell proposes monitoring for whale calls from before August 15 until sometime before October 15, 2010.

At the end of the season, the fourth DASAR in each array will be refurbished, recalibrated, and redeployed to collect data through the winter. The other DASARs in the arrays will be recovered. The redeployed DASARs will be programmed to record 35 min every 3 hours with a disk capacity of 10 months at that recording rate. This should be ample space to allow over-wintering from approximately mid-October 2010, through mid-July 2011.

Additional details on methodology and data analysis for the three types of monitoring described here (*i.e.,* vessel-based, aerial, and acoustic) can be found in the 4MP in Shell's application (*see* **ADDRESSES**).

Additional Monitoring Measures Proposed by NMFS

In addition to the vessel and aerial surveys and acoustic monitoring described above, NMFS proposes that Shell conduct vessel-based monitoring in the Chukchi Seas during the fall bowhead whale migration period to detect bowhead whale cow/calf pairs within the 120-dB isopleths (modeled at approximately 456 m or 1,496 ft) for mitigation purposes (See Proposed Mitigation section above).

Monitoring Plan Peer Review

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

NMFS convened an independent peer review panel to review Shell's 4MP for Proposed Open Water Marine Survey Program in the Beaufort and Chukchi Seas, Alaska, during 2010. The panel met and reviewed the 4MP in late March 2010, and provided comments to NMFS in late April 2010. NMFS will consider all recommendations made by the panel, incorporate appropriate changes into the monitoring requirements of the IHA (if issued) and publish the panel's findings and recommendations in the final IHA notice of issuance or denial document.

Reporting Measures

(1) SSV Report

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

(2) Technical Reports

The results of Shell's 2010 open water marine survey monitoring program (*i.e.,* vessel-based, aerial, and acoustic), including estimates of "take" by harassment, will be presented in the "90-day" and Final Technical reports. Shell proposes that the Technical Reports will include: (a) Summaries of monitoring effort (*e.g.,* total hours, total distances, and marine mammal distribution through the study period, accounting for sea state and other factors affecting visibility and detectability of marine mammals); (b) analyses of the effects of various factors influencing detectability of marine mammals (*e.g.,* sea state, number of observers, and fog/glare); (c) species composition, occurrence, and distribution of marine mammal

sightings, including date, water depth, numbers, age/size/gender categories (if determinable), group sizes, and ice cover; (d) analyses of the effects of survey operations; (e) sighting rates of marine mammals during periods with and without airgun activities (and other variables that could affect detectability); (f) initial sighting distances versus airgun activity state; (g) closest point of approach versus airgun activity state; (h) observed behaviors and types of movements versus airgun activity state; (i) numbers of sightings/individuals seen versus airgun activity state; (j) distribution around the survey vessel versus airgun activity state; and (k) estimates of take by harassment. This information will be reported for both the vessel-based and aerial monitoring.

Analysis of all acoustic data will be prioritized to address the primary questions. The primary data analysis questions are to (a) Determine when, where, and what species of animals are acoustically detected on each DASAR, (b) analyze data as a whole to determine offshore bowhead distributions as a function of time, (c) quantify spatial and temporal variability in the ambient noise, and (d) measure received levels of airgun activities. The bowhead detection data will be used to develop spatial and temporal animal distributions. Statistical analyses will be used to test for changes in animal detections and distributions as a function of different variables (*e.g.,* time of day, time of season, environmental conditions, ambient noise, vessel type, operation conditions).

The initial technical report is due to NMFS within 90 days of the completion of Shell's Beaufort and Chukchi Seas open water marine survey programs. The "90-day" report will be subject to review and comment by NMFS. Any recommendations made by NMFS must be addressed in the final report prior to acceptance by NMFS.

(3) Comprehensive Report

In November, 2007, Shell (in coordination and cooperation with other Arctic seismic IHA holders) released a final, peer-reviewed edition of the 2006 Joint Monitoring Program in the Chukchi and Beaufort Seas, July–November 2006 (LGL 2007). This report is available on the NMFS Protected Resources Web site (*see* **ADDRESSES**). In March, 2009, Shell released a final, peer-reviewed edition of the Joint Monitoring Program in the Chukchi and Beaufort Seas, Open Water Seasons, 2006–2007 (Ireland *et al.* 2009). This report is also available on the NMFS Protected Resources Web site (*see* **ADDRESSES**). A draft comprehensive report for 2008 (Funk *et al.* 2009) was provided to NMFS and those attending the Arctic Stakeholder Open-water Workshop in Anchorage, Alaska, on April 6–8, 2009. The 2008 report provides data and analyses from a number of industry monitoring and research studies carried out in the Chukchi and Beaufort Seas during the 2008 open-water season with comparison to data collected in 2006 and 2007. Reviewers plan to provide comments on the 2008 report to Shell shortly. Once Shell is able to incorporate reviewer comments, the final 2008 report will be made available to the public. The 2009 draft comprehensive report is due to NMFS by mid-April 2010. NMFS will make this report available to the public upon receipt.

Following the 2010 shallow hazards surveys a comprehensive report describing the vessel-based, aerial, and acoustic monitoring programs will be prepared. The comprehensive report will describe the methods, results, conclusions and limitations of each of the individual data sets in detail. The report will also integrate (to the extent possible) the studies into a broad based assessment of industry activities, and other activities that occur in the Beaufort and/or Chukchi seas, and their impacts on marine mammals during 2010. The report will help to establish long-term data sets that can assist with the evaluation of changes in the Chukchi and Beaufort Seas ecosystems. The report will attempt to provide a regional synthesis of available data on industry activity in offshore areas of northern Alaska that may influence marine mammal density, distribution and behavior. The comprehensive report will be due to NMFS within 240 days of the date of issuance of the IHA (if issued).

(4) Notification of Injured or Dead Marine Mammals

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

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

Estimated Take by Incidental Harassment

Except with respect to certain activities not pertinent here, the MMPA defines "harassment" as: any act of pursuit, torment, or annoyance which (i) has the potential to injure a marine mammal or marine mammal stock in the wild [Level A harassment]; or (ii) has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering [Level B harassment]. Only take by Level B behavioral harassment is anticipated as a result of the proposed open water marine survey program. Anticipated take of marine mammals is associated with noise propagation from the seismic airgun(s) used in the site clearance and shallow hazards surveys.

The full suite of potential impacts to marine mammals was described in detail in the "Potential Effects of the Specified Activity on Marine Mammals" section found earlier in this document. The potential effects of sound from the proposed open water marine survey programs might include one or more of the following: Tolerance; masking of natural sounds; behavioral disturbance; non-auditory physical effects; and, at least in theory, temporary or permanent hearing impairment (Richardson *et al.* 1995). As discussed earlier in this document, the most common impact will likely be from behavioral disturbance, including avoidance of the ensonified area or changes in speed, direction, and/or diving profile of the animal. For reasons discussed previously in this document, hearing impairment (TTS and PTS) is highly unlikely to occur based on the fact that most of the equipment to be used during Shell's proposed open water marine survey programs does not have received levels high enough to elicit even mild TTS beyond a short distance. For instance, for the airgun sources, the 180– and 190–dB re 1 μPa (rms) isopleths extend to 125 m and 35 m from the source, respectively. None of the other active acoustic sources is expected to have received levels above 180 dB re 1 μPa (rms) within the frequency bands of marine mammal hearing sensitivity (below 180 kHz) beyond a few meters from the source. Finally, based on the proposed mitigation and monitoring measures described earlier in this document, no injury or mortality of marine mammals is anticipated as a result of Shell's

proposed open water marine survey programs.

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

Shell has requested an authorization to take individuals of 11 marine mammal species by Level B harassment. These 11 marine mammal species are: Beluga whale (*Delphinapterus leucas*), narwhal (*Monodon monoceros*), harbor porpoise (*Phocoena phocoena*), bowhead whale (*Balaena mysticetus*), gray whale (*Eschrichtius robustus*), humpback whale (*Megaptera novaeangliae*), minke whale (*Balaenoptera acutorostrata*), bearded seal (*Erignathus barbatus*), ringed seal (*Phoca hispida*), spotted seal (*P. largha*), and ribbon seal (*Histriophoca fasciata*). However, NMFS believes that narwhals, minke whales, and ribbon seals are not likely to occur in the proposed survey area during the time of the proposed site clearance and shallow hazards surveys. Therefore, NMFS believes that only the other eight of the 11 marine mammal species would likely be taken by Level B behavioral harassment as a result of the proposed marine surveys.

Basis for Estimating "Take by Harassment"

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

The proposed open water marine surveys would use low energy active acoustic sources, including a total volume of 40 cu-in airgun or airgun array. Other active acoustic sources used for ice gouging and strudel score all have relatively low source levels and/or high frequencies beyond marine mammal hearing range. Table 1 depicts the modeled and/or measured source levels, and radii for the 120, 160, 180, and 190 dB re 1μPa (rms) from various sources (or equivalent) that are proposed to be used in the marine mammal surveys by Shell.

TABLE 1—A LIST OF ACTIVE ACOUSTIC SOURCES PROPOSED TO BE USED FOR THE SHELL'S 2010 OPEN WATER MARINE SURVEYS IN THE CHUKCHI AND BEAUFORT SEAS

Survey types	Active acoustic sources	Frequency	Modeled source level	Radii (m) at modeled received levels (dB re 1 μPa)			
				190	180	160	120
Site Clearance & Shallow Hazards.	40 cu-in airgun		217	35	125	1,220	14,900
	Dual frequency side scan	190 & 240 kHz	225	Not modeled/measured because frequency outputs beyond marine mammal hearing range.			
	Single beam echo sound	high: 100–340 kHz, low: 24–50 kHz.	180–200	Not modeled/measured because frequency outputs beyond marine mammal hearing range.			
	Shallow sub-bottom profiler.	3.5 kHz (Alpha Helix)	193.8	1	3	14	310
		3.5 kHz (*Henry C.*)	167.2	NA	NA	3	980
		400 Hz	176.8	NA	NA	9	1,340
Ice Gouging Surveys	Dual freq sub-bottom profiler.	(2–7 kHz & 8–23 kHz	184.6	NA	2	7	456
	Multibeam Echo Sounder	240 kHz	Not modeled/measured because frequency outputs beyond marine mammal hearing range.				
Strudel Scour Survey	Multibeam Echo Sounder	240 kHz	Not modeled/measured because frequency outputs beyond marine mammal hearing range.				
	Single Beam Bathymetric Sonar.	>200 kHz	215	Not modeled/measured because frequency outputs beyond marine mammal hearing range.			

"Take by Harassment" is calculated in this section and Shell's application by multiplying the expected densities of marine mammals that may occur in the site clearance and shallow hazards survey area of water likely to be exposed to airgun impulses with received levels of ≥160 dB re 1 μPa (rms). The single exception to this method is for the

estimation of exposures of bowhead whales during the fall migration where more detailed data were available allowing an alternate approach, described below, to be used. This section describes the estimated densities of marine mammals that may occur in the project area. The area of water that may be ensonified to the above sound levels is described further in the "Potential Number of Takes by Harassment" subsection.

Marine mammal densities near the operation are likely to vary by season and habitat. However, sufficient published data allowing the estimation of separate densities during summer (July and August) and fall (September and October) are only available for beluga and bowhead whales. As noted above, exposures of bowhead whales during the fall are not calculated using densities (see below). Therefore, summer and fall densities have been estimated for beluga whales, and a summer density has been estimated for bowhead whales. Densities of all other species have been estimated to represent the duration of both seasons. The estimated 30 days of site clearance and shallow hazards survey activity will take place in eastern Harrison Bay at approximately five potential prospective future drill sites. The survey lines form a grid or survey "patch." It is expected that three of these patches will be surveyed during the summer and two during the fall. The areas of water exposed to sounds during surveys at the patches are separated by season in this manner and as described further below.

Marine mammal densities are also likely to vary by habitat type. In the Alaskan Beaufort Sea, where the continental shelf break is relatively close to shore, marine mammal habitat is often defined by water depth. Bowhead and beluga occurrence within nearshore (0–131 ft, 0–40 m), outer continental shelf (131–656 ft, 40–200 m), slope (656–6,562 ft, 200–2,000 m), basin (>6,562 ft, 2,000 m), or similarly defined habitats have been described previously (Moore *et al.* 2000; Richardson and Thomson 2002). The presence of most other species has generally only been described relative to the entire continental shelf zone (0–656 ft, 0–200 m) or beyond. Sounds produced by the site clearance and shallow hazards surveys are expected to drop below 160 dB within the nearshore zone (0–131 ft, 0–40 m, water depth). Sounds ≥160 dB are not expected to occur in waters >656 ft (200 m). Because airgun sounds at the indicated levels would not be introduced to the outer continental shelf, separate beluga and bowhead densities for the outer continental shelf have not been used in the calculations.

In addition to water depth, densities of marine mammals are likely to vary with the presence or absence of sea ice (see later for descriptions by species). At times during either summer or fall, pack-ice may be present in some of the area near Harrison Bay. However, because some of the survey equipment towed behind the vessel may be damaged by ice, site clearance and shallow hazards survey activities will generally avoid sea-ice. Therefore, Shell has assumed that only 10% of the area exposed to sounds ≥160 dB by the survey will be near ice margin habitat. Ice-margin densities of marine mammals in both seasons have therefore been multiplied by 10% of the area exposed to sounds by the airguns, while open-water (nearshore) densities have been multiplied by the remaining 90% of the area (see area calculations below).

To provide some allowance for the uncertainties, Shell calculated both "maximum estimates" as well as "average estimates" of the numbers of marine mammals that could potentially be affected. For a few marine mammal species, several density estimates were available, and in those cases the mean and maximum estimates were determined from the survey data. In other cases, no applicable estimate (or perhaps a single estimate) was available, so correction factors were used to arrive at "average" and "maximum" estimates. These are described in detail in the following subsections. NMFS has determined that the average density data of marine mammal populations will be used to calculate estimated take numbers because these numbers are based on surveys and monitoring of marine mammals in the vicinity of the proposed project area. For several species whose average densities are too low to yield a take number due to extra-limital distribution in the vicinity of the proposed survey area, but whose chance occurrence has been documented in the past, such as gray and humpback whales and harbor porpoises, NMFS allotted a few numbers of these species to allow unexpected takes of these species.

Detectability bias, quantified in part by f(0), is associated with diminishing sightability with increasing lateral distance from the trackline. Availability bias [g(0)] refers to the fact that there is <100% probability of sighting an animal that is present along the survey trackline. Some sources of densities used below included these correction factors in their reported densities. In other cases the best available correction factors were applied to reported results when they had not been included in the reported data (*e.g.* Moore *et al.* 2000b).

(1) Cetaceans

As noted above, the densities of beluga and bowhead whales present in the Beaufort Sea are expected to vary by season and location. During the early and mid-summer, most belugas and bowheads are found in the Canadian Beaufort Sea and Amundsen Gulf or adjacent areas. Low numbers are found in the eastern Alaskan Beaufort Sea. Belugas begin to move across the Alaskan Beaufort Sea in August, and bowheads do so toward the end of August.

Beluga Whales—Beluga density estimates were derived from data in Moore *et al.* (2000). During the summer, beluga whales are most likely to be encountered in offshore waters of the eastern Alaskan Beaufort Sea or areas with pack ice. The summer beluga whale nearshore density was based on 11,985 km (7,749 mi) of on-transect effort and 9 associated sightings that occurred in water ≤50 m (164 ft) in Moore *et al.* (2000; Table 2). A mean group size of 1.63, a f(0) value of 2.841, and a g(0) value of 0.58 from Harwood *et al.* (1996) were also used in the calculation. Moore *et al.* (2000) found that belugas were equally likely to occur in heavy ice conditions as open water or very light ice conditions in summer in the Beaufort Sea, so the same density was used for both nearshore and ice-margin estimates (Table 2). The fall beluga whale nearshore density was based on 72,711 km (45,190 mi) of on-transect effort and 28 associated sightings that occurred in water ≤50 m (164 ft) reported in Moore *et al.* (2000). A mean group size of 2.9 (CV=1.9), calculated from all Beaufort Sea fall beluga sightings in ≤50 m (164 ft) of water present in the MMS Bowhead Whale Aerial Survey Program (BWASP) database, along with the same f(0) and g(0) values from Harwood *et al.* (1996) were also used in the calculation. Moore *et al.* (2000) found that during the fall in the Beaufort Sea belugas occurred in moderate to heavy ice at higher rates than in light ice, so ice-margin densities were estimated to be twice the nearshore densities. Based on the CV of group size maximum estimates in both season and habitats were estimated as four times the average estimates. "Takes by harassment" of beluga whales during the fall in the Beaufort Sea were not calculated in the same manner as described for bowhead whales (below) because of the relatively lower expected densities of beluga whales in nearshore habitat near the site clearance and shallow hazards surveys and the lack of

detailed data on the likely timing and rate of migration through the area (Table 3).

TABLE 2—EXPECTED SUMMER (JUL–AUG) DENSITIES OF BELUGA AND BOWHEAD WHALES IN THE ALASKAN BEAUFORT SEA. DENSITIES ARE CORRECTED FOR F(0) AND G(0) BIASES

Species	Nearshore Average Density (#/km^2)	Ice Margin Average Density (#/km^2)
Beluga whale	0.0030	0.0030
Bowhead whale	0.0186	0.0186

TABLE 3—EXPECTED FALL (SEP–NOV) DENSITIES OF BELUGA AND BOWHEAD WHALES IN THE ALASKAN BEAUFORT SEA. DENSITIES ARE CORRECTED FOR F(0) AND G(0) BIASES

Species	Nearshore Average Density (#/km^2)	Ice Margin Average Density (#/km^2)
Beluga whale	0.0027	0.0054
Bowhead whale*	N/A	N/A

**See* text for description of how bowhead whales estimates were made.

Bowhead Whales—Industry aerial surveys of the continental shelf near Camden Bay in 2008 recorded eastward migrating bowhead whales until July 12 (Lyons and Christie 2009). No bowhead sightings were recorded again, despite continued flights, until August 19. Aerial surveys by industry operators did not begin until late August of 2006 and 2007, but in both years bowheads were also recorded in the region before the end of August (Christie *et al.* 2009). The late August sightings were likely of bowheads beginning their fall migration so the densities calculated from those surveys were not used to estimate summer densities in this region. The three surveys in July 2008, resulted in density estimates of 0.0099, 0.0717, and 0.0186 whales/km^2, respectively. The estimate of 0.0186 whales/km^2 was used as the average nearshore density, and the estimate of 0.0717 whales/km^2 was used as the maximum (Table 2). Sea ice was not present during these surveys. Moore *et al.* (2000) reported that bowhead whales in the Alaskan Beaufort Sea were distributed uniformly relative to sea ice, so the same nearshore densities were used for ice-margin habitat.

During the fall most bowhead whales will be migrating west past the site clearance and shallow hazards surveys, so it is less accurate to assume that the number of individuals present in the area from one day to the next will be static. However, feeding, resting, and milling behaviors are not entirely uncommon at this time and location either. In order to incorporate the movement of whales past the planned operations, and because the necessary data are available, Shell has developed an alternate method of calculating the number of individuals exposed to sounds produced by the site clearance and shallow hazards surveys. The method is founded on estimates of the proportion of the population that would pass within the ≥160 dB rms zones on a given day in the fall during survey activities.

Approximately 10 days of site clearance and shallow hazards survey activity are likely to occur during the fall period when bowheads are migrating through the Beaufort Sea. If the bowhead population has continued to grow at an annual rate of 3.4%, the current population size would be approximately 14,247 individuals based on a 2001 population of 10,545 (Zeh and Punt 2005). Based on data in Richardson and Thomson (2002, Appendix 9.1), the number of whales expected to pass each day was estimated as a proportion of the population. Minimum and maximum estimates of the number of whales passing each day were not available, so a single estimate based on the 10-day moving average presented by Richardson and Thomson (2002) was used. Richardson and Thomson (2002) also calculated the proportion of animals within water depth bins (<20 m, 20–40 m, 40–200 m, >200 m; or <65 ft, 65–131 ft, 131–656 ft, >656 ft). Using this information the total number of whales expected to pass the site clearance and shallow hazards surveys each day was multiplied by the proportion of whales that would be in each depth category to estimate how many individuals would be within each depth bin on a given day. The proportion of each depth bin falling within the ≥160 dB rms zone was then multiplied by the number of whales within the respective bins to estimate the total number of individuals that would be exposed on each day. This was repeated for a total of 10 days (September 15–19 and October 1–4) and the results were summed to estimate the total number of bowhead whales that might be exposed to ≥160 dB rms during the migration period in the Beaufort Sea.

Other Cetaceans—For other cetacean species that may be encountered in the Beaufort Sea, densities are likely to vary somewhat by season, but differences are not expected to be great enough to require estimation of separate densities for the two seasons. Harbor porpoises and gray whales are not expected to be present in large numbers in the Beaufort Sea during the fall but small numbers may be encountered during the summer. They are most likely to be present in nearshore waters (Table 4). Narwhals are not expected to be encountered during the site clearance and shallow hazards surveys. However, there is a chance that a few individuals may be present if ice is nearby. The first record of humpback whales in the Beaufort Sea was documented in 2007 so their presence cannot be ruled out. Since these species occur so infrequently in the Beaufort Sea, little to no data are available for the calculation of densities. Minimal densities have therefore been assigned for calculation purposes and to allow for chance encounters (Table 4).

TABLE 4—EXPECTED DENSITIES OF CETACEANS (EXCLUDING BELUGA AND BOWHEAD WHALE) AND SEALS IN THE ALASKAN BEAUFORT SEA

Species	Nearshore Average Density (#/km^2)	Ice Margin Average Density (#/km^2)
Narwhal	0.0000	0.0000
Harbor porpoise	0.0001	0.0000
Gray whale	0.0001	0.0000
Bearded seal	0.0181	0.0128
Ribbon seal	0.0001	0.0001
Ringed seal	0.3547	0.2510
Spotted seal	0.0037	0.0001

(2) Pinnipeds

Extensive surveys of ringed and bearded seals have been conducted in the Beaufort Sea, but most surveys have been conducted over the landfast ice, and few seal surveys have occurred in open-water or in the pack ice. Kingsley (1986) conducted ringed seal surveys of the offshore pack ice in the central and eastern Beaufort Sea during late spring (late June). These surveys provide the most relevant information on densities of ringed seals in the ice margin zone of the Beaufort Sea. The density estimate in Kingsley (1986) was used as the average density of ringed seals that may be encountered in the ice margin (Table 6–3 in Shell's application and Table 4 here). The average ringed seal density in the nearshore zone of the Alaskan Beaufort Sea was estimated from results of ship-based surveys at times without seismic operations reported by Moulton and Lawson (2002; Table 6–3 in Shell's application and Table 4 here).

Densities of bearded seals were estimated by multiplying the ringed seal densities by 0.051 based on the proportion of bearded seals to ringed seals reported in Stirling *et al.* (1982; Table 6–3 in Shell's application and Table 4 here). Spotted seal densities in the nearshore zone were estimated by summing the ringed seal and bearded seal densities and multiplying the result by 0.015 based on the proportion of spotted seals to ringed plus bearded seals reported in Moulton and Lawson (2002; Table 6–3 in Shell's application and Table 4 here). Minimal values were assigned as densities in the ice–margin zones (Table 6–3 in Shell's application and Table 4 here).

Potential Number of Takes by Harassment

Numbers of marine mammals that might be present and potentially disturbed are estimated below based on available data about mammal distribution and densities at different locations and times of the year as described previously. The planned site clearance and shallow hazards survey would take place in the Beaufort Sea over two different seasons. The estimates of marine mammal densities have therefore been separated both spatially and temporarily in an attempt to represent the distribution of animals expected to be encountered over the duration of the site clearance and shallow hazards survey.

The number of individuals of each species potentially exposed to received levels ≥160 dB re 1μPa (rms) within each season and habitat zone was estimated by multiplying

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

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

The area of water potentially exposed to received levels ≥160 dB re 1μPa (rms) by airgun operations was calculated by buffering a typical site clearance and shallow hazards survey grid of lines by the estimated >160 dB distance from the airgun source, including turns between lines during which a single mitigation airgun will be active. Measurements of a 2×10 in^3 airgun array used in 2007 were reported by Funk *et al.* (2008). These measurements were used to model both of the potential airgun arrays that may be used in 2010, a 4×10 in^3 array or a 2×10 in^3 + 1×20 in^3 array. The modeling results showed that the 40 cubic inch source is likely to produce sound that propagates further than the alternative array, so those results were used. The modeled 160 dB re 1μPa (rms) distance from a 40 cubic inch source was 1,220 m (4,003 ft) from the source. Because this is a modeled estimate, but based on similar measurements at the same location, the estimated distance was only increased by a factor of 1.25 instead of a typical 1.5 factor. This results in a 160 dB distance of 1,525 m (5,003 ft) which was added to both sides of survey lines in a typical site clearance and shallow hazards survey grid. The resulting area that may be exposed to airgun sounds ≥160 dB re 1μPa (rms) is 81.6 km^2. In most cases the use of a single mitigation gun during turns will not appreciably increase the total area exposed to sounds ≥160 dB re 1μPa (rms), but analysis of a similar survey pattern from the Chukchi Sea (but using the Beaufort sound radii) suggested use of the mitigation gun may increase this area to 82.3 km^2. As described above, three patches (246.9 km^2) are likely to be surveyed during the summer leaving two (164.6 km^2) for the fall. During both seasons, 90% of the area has been multiplied by nearshore (open-water) densities, and the remaining 10% by the ice-margin densities.

For analysis of potential effects on migrating bowhead whales we calculated the maximum distance perpendicular to the migration path ensonified to ≥160 dB re 1μPa (rms) by a typical survey patch as 11.6 km (7.2 mi). This distance represents approximately 21% of the 56 km (34.8 mi) between the barrier islands and the 40-m (131-ft) bathymetry line so it was assumed that 21% of the bowheads migrating within the nearshore zone (water depth 0–40 m, or 0–131 ft) may be exposed to sounds ≥160 dB re 1μPa (rms) if they showed no avoidance of the site clearance and shallow hazards survey activities.

Cetaceans—Cetacean species potentially exposed to airgun sounds with received levels ≥160 dB re 1μPa (rms) would involve bowhead, gray, humpback, and beluga whales and harbor porpoises. Shell also included some maximum exposure estimates for narwhal and minke whale. However, as stated previously in this document, NMFS has determined that authorizing take of these two cetacean species is not warranted given the highly unlikely potential of these species to occur in the open water marine survey area. The average estimates of the number of individual bowhead whales exposed to received sound levels ≥160 dB re 1μPa (rms) is 381 and belugas is 1 individual. However, since beluga whales often form small groups, therefore, it's likely that the exposure to the animals would be based on groups instead of individual animals. Therefore, NMFS proposes to make an adjustment to increase the number of beluga whale takes to 5 individuals to reflect the aggregate nature of these animals.

The estimates show that one endangered cetacean species (the bowhead whale) is expected to be exposed to sounds ≥160 dB re 1μPa (rms) unless bowheads avoid the area around the site clearance and shallow hazards survey areas (Tables 4). Migrating bowheads are likely to do so to some extent, though many of the bowheads engaged in other activities, particularly feeding and socializing, probably will not.

As discussed before, although no take estimates of gray and humpback whales and harbor porpoises can be calculated due to their low density and extralimital distribution in the vicinity of the site clearance and shallow hazards survey area, their occurrence has been documented in the past. Therefore, to allow for chance encounters of these species, NMFS proposes to include two individuals of each of these three species as having the potential to be exposed to an area with received levels ≥160 dB re 1μPa (rms).

Pinnipeds—The ringed seal is the most widespread and abundant pinniped in ice-covered arctic waters, and there appears to be a great deal of year-to-year variation in abundance and distribution of these marine mammals. Ringed seals account for a large number of marine mammals expected to be encountered during the site clearance and shallow hazard survey activities, and hence exposed to sounds with received levels ≥160 dB re 1μPa (rms). The average estimate is that 567 ringed seals might be exposed to sounds with received levels ≥160 dB re 1μPa (rms) from airgun impulses.

Two additional seal species are expected to be encountered. Average estimates for bearded seal exposures to sound levels ≥160 dB re 1μPa (rms) is 7 individuals. For spotted seal the exposure estimates is 1 individual.

Table 5 summarizes the number of potential takes by harassment of all species.

TABLE 5—SUMMARY OF THE NUMBER OF POTENTIAL EXPOSURES OF MARINE MAMMALS TO RECEIVED SOUND LEVELS IN THE WATER OF ≥160 dB DURING SHELL'S PLANNED SITE CLEARANCE AND SHALLOW HAZARDS SURVEYS NEAR HARRISON BAY IN THE BEAUFORT SEA, ALASKA, JULY–OCTOBER, 2010

Species	Total number of exposures to sound levels ≥160 dB re 1 μPa (rms)
Beluga whale	5
Harbor porpoise	2
Bowhead whale	381
Gray whale	2
Humpback whale ..	2
Bearded seal	7
Ringed seal	142
Spotted seal	1

Estimated Take Conclusions

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

Using the 160 dB criterion, the average estimates of the numbers of individual cetaceans exposed to sounds ≥160 dB re 1 μPa (rms) represent varying proportions of the populations of each species in the Beaufort Sea and adjacent waters. For species listed as "Endangered" under the ESA, the estimates include approximately 381 bowheads. This number is approximately 2.7% of the Bering-Chukchi-Beaufort population of >14,247 assuming 3.4% annual population growth from the 2001 estimate of >10,545 animals (Zeh and Punt 2005). The small numbers of other mysticete whales that may occur in the Beaufort Sea are unlikely to occur near the planned site clearance and shallow hazards surveys. The few that might occur would represent a very small proportion of their respective populations. The average estimate of the number of belugas that might be exposed to ≥160 dB re 1 μPa (rms) (1, with adjustment to 5 considering group occurrence) represents <1% of its population.

Seals—A few seal species are likely to be encountered in the study area, but ringed seal is by far the most abundant in this area. The average estimates of the numbers of individuals exposed to sounds at received levels ≥160 dB re 1 μPa (rms) during the site clearance and shallow hazards surveys are as follows: ringed seals (142), bearded seals (7), and spotted seals (1), (representing <1% of their respective Beaufort Sea populations).

Negligible Impact and Small Numbers Analysis and Preliminary Determination

NMFS has defined "negligible impact" in 50 CFR 216.103 as ". . . an impact resulting from the specified activity that cannot be reasonably expected to, and is not reasonably likely to, adversely affect the species or stock through effects on annual rates of recruitment or survival." In making a negligible impact determination, NMFS considers a variety of factors, including but not limited to: (1) The number of anticipated mortalities; (2) the number and nature of anticipated injuries; (3) the number, nature, intensity, and duration of Level B harassment; and (4) the context in which the takes occur.

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

Some studies have shown that bowhead whales will continue to feed in areas of seismic operations (*e.g.,* Richardson, 2004). Therefore, it is reasonable to conclude that the marine surveys using active acoustic sources will not displace bowhead whales from their important feeding areas. Also, it is important to note that the sounds produced by the proposed Shell marine surveys are of much lower intensity than those produced by airgun arrays during a 3D or 2D seismic survey. Should bowheads choose to feed in the ensonified area instead of avoiding the sound, individuals may be exposed to sounds at or above 160 dB re 1 μPa (rms) when the survey vessel passes by. Depending on the direction and speed of the survey vessel, the duration of exposure is not expected to be more than 15 minutes (assuming the survey vessel is traveling at 4 knots (7.5 km/hr) and heading directly towards the whale but without engaging the whale inside the safety zone). While feeding in an area of increased anthropogenic sound even below NMFS current threshold for behavioral harassment for impulse sound, *i.e.* 160 dB re 1 μPa (rms), may potentially result in increased stress, it is not anticipated that the low received levels from marine surveys and the amount of time that an individual whale may remain in the area to feed would result in extreme physiological stress to the animal (*see* review by Southall *et al.* 2007). Additionally, if an animal is excluded from the area (such as Harrison Bay) for feeding because it decides to avoid the ensonified area, this may result in some extra energy expenditure for the animal to find an alternate feeding area. However, there are multiple feeding areas nearby in the Beaufort Sea for bowhead whales to choose from. The disruption to feeding is not anticipated to have more than a negligible impact on the affected species or stock.

Beluga whales are less likely to occur in the proposed marine survey area than bowhead whales in Beaufort Sea. Should any belugas occur in the area of marine surveys, it is not expected that they would be exposed for a prolonged period of time, for the same reason discussed above due to the movement of survey vessel and animals. Gray whales, humpback whales, and harbor porpoises rarely occur in the Beaufort Sea, therefore, the potential effects to these species from the proposed open water marine surveys is expected to be close to none. The exposure of cetaceans to sounds produced by the proposed marine surveys is not expected to result in more than Level B harassment and is anticipated to have no more than a negligible impact on the affected species or stock.

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

Of the eight marine mammal species likely to occur in the proposed marine survey area, only the bowhead and humpback whales are listed as endangered under the ESA. The species are also designated as "depleted" under the MMPA. Despite these designations, the Bering-Chukchi-Beaufort stock of bowheads has been increasing at a rate

of 3.4 percent annually for nearly a decade (Allen and Angliss, 2010). Additionally, during the 2001 census, 121 calves were counted, which was the highest yet recorded. The calf count provides corroborating evidence for a healthy and increasing population (Allen and Angliss, 2010). The occurrence of humpback whales in the proposed marine survey areas is considered very rare. There is no critical habitat designated in the U.S. Arctic for the bowhead whale and humpback whale. The bearded and ringed seals are "candidate species" under the ESA, meaning they are currently being considered for listing but are not designated as depleted under the MMPA. None of the other three species that may occur in the project area are listed as threatened or endangered under the ESA or designated as depleted under the MMPA.

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

The estimated takes proposed to be authorized represent 0.01% of the Beaufort Sea population of approximately 39,258 beluga whales (Allen and Angliss 2010), 0.004% of Bering Sea stock of approximately 48,215 harbor porpoises, 0.01% of the Eastern North Pacific stock of approximately 17,752 gray whales, 2.67% of the Bering-Chukchi-Beaufort population of 14,247 individuals assuming 3.4 percent annual population growth from the 2001 estimate of 10,545 animals (Zeh and Punt, 2005), and 0.21% of the Western North Pacific stock of approximately 938 humpback whales. The take estimates presented for bearded, ringed, and spotted seals represent 0.003, 0.06, and 0.002 percent of U.S. Arctic stocks of each species, respectively. These estimates represent the percentage of each species or stock that could be taken by Level B behavioral harassment if each animal is taken only once. In addition, the mitigation and monitoring measures (described previously in this document) proposed for inclusion in the IHA (if issued) are expected to reduce even further any potential disturbance to marine mammals.

Based on the analysis contained herein of the likely effects of the specified activity on marine mammals and their habitat, and taking into consideration the implementation of the mitigation and monitoring measures, NMFS preliminarily finds that Shell's proposed 2010 open water marine surveys in the Beaufort and Chukchi Seas may result in the incidental take of small numbers of marine mammals, by Level B harassment only, and that the total taking from the marine surveys will have a negligible impact on the affected species or stocks.

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

Relevant Subsistence Uses

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

The subsistence communities in the Beaufort and Chukchi Seas that have the potential to be impacted by Shell's proposed open water marine surveys include Kaktovik, Nuiqsut, Barrow, Wainwright, and Point Lay. Kaktovik is a coastal community near the east boundary of the proposed ice gouging area. Nuiqsut is approximately 30 mi (50 km) inland from the proposed site clearance and shallow hazards survey area. Cross Island, from which Nuiqsut hunters base their bowhead whaling activities, is approximately 44 mi (70 km) east of the proposed site clearance and shallow hazards survey area. Barrow lies approximately 168 mi (270 km) west of Shell's Harrison Bay site clearance and shallow hazards survey areas. Wainwright is a coastal community approximately 12 mi (20 km) to the southeast boundary of the proposed ice gouging survey area in the Chukchi Sea. Point Lay is another coastal community boarding the southwest boundary of the proposed ice gouging survey area in the Chukchi Sea. Point Hope is the western tip of the North Slope and is approximately 124 mi (200 km) southwest of Shell's proposed ice gouge survey area in the Chukchi Sea.

(1) Bowhead Whales

Of the three communities along the Beaufort Sea coast, Barrow is the only one that currently participates in a spring bowhead whale hunt. However, this hunt is not anticipated to be affected by Shell's activities, as the spring hunt occurs in late April to early May, and Shell's marine surveys in Beaufort Sea will not begin until July at the earliest.

All three communities participate in a fall bowhead hunt. In autumn, westward-migrating bowhead whales typically reach the Kaktovik and Cross Island (Nuiqsut hunters) areas by early September, at which point the hunts begin (Kaleak 1996; Long 1996; Galginaitis and Koski 2002; Galginaitis and Funk 2004, 2005; Koski *et al.* 2005). Around late August, the hunters from Nuiqsut establish camps on Cross Island from where they undertake the fall bowhead whale hunt. The hunting period starts normally in early September and may last as late as mid-October, depending mainly on ice and weather conditions and the success of the hunt. Most of the hunt occurs offshore in waters east, north, and northwest of Cross Island where bowheads migrate and not inside the barrier islands (Galginaitis 2007). Hunters prefer to take bowheads close to shore to avoid a long tow, but Braund and Moorehead (1995) report that crews may (rarely) pursue whales as far as 50 mi (80 km) offshore. Whaling crews use Kaktovik as their home base, leaving the village and returning on a daily basis. The core whaling area is within 12 mi (19.3 km) of the village with a periphery ranging about 8 mi (13 km) farther, if necessary. The extreme limits of the Kaktovik whaling hunt would be the middle of Camden Bay to the west. The timing of the Kaktovik bowhead whale hunt roughly parallels the Cross Island whale hunt (Impact Assessment Inc 1990b; SRB&A 2009: Map 64). In recent years, the hunts at Kaktovik and Cross Island have usually ended by mid- to late September.

Westbound bowheads typically reach the Barrow area in mid-September, and are in that area until late October (Brower 1996). However, over the years, local residents report having seen a small number of bowhead whales feeding off Barrow or in the pack ice off Barrow during the summer. Recently, autumn bowhead whaling near Barrow has normally begun in mid-September to early October, but in earlier years it began as early as August if whales were observed and ice conditions were favorable (USDI/BLM 2005). The recent decision to delay harvesting whales until mid-to-late September has been made to prevent spoilage, which might occur if whales were harvested earlier in the season when the temperatures tend to be warmer. Whaling near Barrow can continue into October, depending on the quota and conditions.

Along the Chukchi Sea, the spring bowhead whale hunt for Wainwright occurs between April and June in leads offshore from the village. Whaling camps can be located up to 16–24 km (10–15 mi) from shore, depending on where the leads open up. Whalers prefer to be closer, however, and will sometimes go overland north of Wainwright to find closer leads (SRBA 1993). Residents of Point Lay have not hunted bowhead whales in the recent past, but were selected by the International Whaling Commission (IWC) to receive a bowhead whale quota in 2009, and began bowhead hunting again in 2009. In the more distant past, Point Lay hunters traveled to Barrow, Wainwright, or Point Hope to participate in the bowhead whale harvest activities. In Point Hope, the bowhead whale hunt occurs between March and June, when the pack-ice lead is usually 10–11 km (6–7 mi) offshore. Camps are set up along the landfast ice edge to the south and southeast of the village. Point Hope whalers took between one and seven bowhead whales per year between 1978 and 2008, with the exception of 1980, 1989, 2002, and 2006, when no whales were taken (Suydam and George 2004; Suydam *et al.* 2008, 2007, 2006, 2005). There is no fall bowhead hunt in Point Hope, as the whales migrate back down on the west side of the Bering Strait, out of range of the Point Hope whalers (Fuller and George 1997).

(2) Beluga Whales

Beluga whales are not a prevailing subsistence resource in the communities of Kaktovik and Nuiqsut. Kaktovik hunters may harvest one beluga whale in conjunction with the bowhead hunt; however, it appears that most households obtain beluga through exchanges with other communities. Although Nuiqsut hunters have not hunted belugas for many years while on Cross Island for the fall hunt, this does not mean that they may not return to this practice in the future. Data presented by Braund and Kruse (2009) indicate that only one percent of Barrow's total harvest between 1962 and 1982 was of beluga whales and that it did not account for any of the harvested animals between 1987 and 1989.

There has been minimal harvest of beluga whales in Beaufort Sea villages in recent years. Additionally, if belugas are harvested, it is usually in conjunction with the fall bowhead harvest. Shell will not be operating during the Kaktovik and Nuiqsut fall bowhead harvests.

In the Chukchi communities, the spring beluga hunt by Wainwright residents is concurrent with the bowhead hunt, but belugas are typically taken only during the spring hunt if bowheads are not present in the area. Belugas are also hunted later in the summer, between July and August, along the coastal lagoon systems. Belugas are usually taken less than 16 km (10 mi) from shore. Beluga whales are harvested in June and July by Point Lay residents. They are taken in the highest numbers in Naokak and Kukpowruk Passes south of Point Lay, but hunters will travel north to Utukok Pass and south to Cape Beaufort in search of belugas. The whales are usually herded by hunters with their boats into the shallow waters of Kasegaluk Lagoon (MMS 2007). In Point Hope, belugas are also hunted in the spring, coincident with the spring bowhead hunt. A second hunt takes place later in the summer, in July and August, and can extend into September, depending on conditions and the IWC quota. The summer hunt is conducted in open water along the coastline on either side of Point Hope, as far north as Cape Dyer (MMS 2007). Belugas are smaller than bowhead whales, but beluga whales often make up a significant portion of the total harvest for Point Hope (Fuller and George 1997; SRBA 1993). Ninety-eight belugas harvested in 1992 made up 40.3% of the total edible harvest for that year. Three bowhead whales represented 6.9% of the total edible harvest for the same year (Fuller and George 1997).

(3) Ice Seals

Ringed seals are available to subsistence users in the Beaufort Sea year-round, but they are primarily hunted in the winter or spring due to the rich availability of other mammals in the summer. Bearded seals are primarily hunted during July in the Beaufort Sea; however, in 2007, bearded seals were harvested in the months of August and September at the mouth of the Colville River Delta. An annual bearded seal harvest occurs in the vicinity of Thetis Island in July through August. Approximately 20 bearded seals are harvested annually through this hunt. Spotted seals are harvested by some of the villages in the summer months. Nuiqsut hunters typically hunt spotted seals in the nearshore waters off the Colville River delta, which drains into Harrison Bay, where Shell's proposed site clearance and shallow hazards surveys are planned.

Although there is the potential for some of the Beaufort villages to hunt ice seals during the summer and fall months while Shell is conducting marine surveys, the primary sealing months occur outside of Shell's operating time frame.

In the Chukchi Sea, seals are most often taken between May and September by Wainwright residents. Wainwright hunters will travel as far south as Kuchaurak Creek (south of Point Lay) and north to Peard Bay. Hunters typically stay within 72 km (45 mi) of the shore. Ringed and bearded seals are harvested all year by Point Lay hunters. Ringed seals are hunted 32 km (20 mi) north of Point Lay, as far as 40 km (25 mi) offshore. Hunters travel up to 48 m (30 mi) north of the community for bearded seals, which are concentrated in the Solivik Island area. Bearded seals are also taken south of the community in Kasegaluk Lagoon, and as far as 40 km (25 mi) from shore. Seals are harvested throughout most of the year by the Point Hope community, although they tend to be taken in the greatest numbers in the winter and spring months. The exception is the bearded seal hunt, which peaks later in the spring and into the summer (Fuller and George 1997; MMS 2007). Species of seals harvested by Point Hope hunters include ringed, spotted, and bearded. Seals are hunted on the ice (Fuller and George 1997). Hunters tend to stay close to the shore but will travel up to 24 km (15 mi) offshore south of the point, weather dependent. Seals are hunted to the north of the community as well, but less often, as the ice is less stable and can be dangerous. Seals are taken between Akoviknak Lagoon to the south and Ayugatak Lagoon to the north (MMS 2007).

Potential Impacts to Subsistence Uses

NMFS has defined "unmitigable adverse impact" in 50 CFR 216.103 as:

* * *an impact resulting from the specified activity: (1) That is likely to reduce

the availability of the species to a level insufficient for a harvest to meet subsistence needs by: (i) Causing the marine mammals to abandon or avoid hunting areas; (ii) Directly displacing subsistence users; or (iii) Placing physical barriers between the marine mammals and the subsistence hunters; and (2) That cannot be sufficiently mitigated by other measures to increase the availability of marine mammals to allow subsistence needs to be met.

Noise and general activity during Shell's proposed open water marine surveys have the potential to impact marine mammals hunted by Native Alaskans. In the case of cetaceans, the most common reaction to anthropogenic sounds (as noted previously in this document) is avoidance of the ensonified area. In the case of bowhead whales, this often means that the animals divert from their normal migratory path by several kilometers. Additionally, general vessel presence in the vicinity of traditional hunting areas could negatively impact a hunt.

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

Plan of Cooperation (POC or Plan)

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

Shell is preparing to implement a POC pursuant to MMS Lease Sale Stipulation No. 5, which requires that all exploration operations be conducted in a manner that prevents unreasonable conflicts between oil and gas activities and the subsistence activities and resources of residents of the North Slope.

The POC will identify the measures that Shell has developed in consultation with North Slope subsistence communities and will implement during its planned 2010 site clearance and shallow hazards surveys and ice gouge surveys to minimize any adverse effects on the availability of marine mammals for subsistence uses. In addition, the POC will detail Shell's communications and consultations with local subsistence communities concerning its planned 2010 program, potential conflicts with subsistence activities, and means of resolving any such conflicts. Shell continues to document its contacts with the North Slope subsistence communities, as well as the substance of its communications with subsistence stakeholder groups.

Shell states that the POC will be, and has been in the past, the result of numerous meetings and consultations between Shell, affected subsistence communities and stakeholders, and federal agencies. The POC identifies and documents potential conflicts and associated measures that will be taken to minimize any adverse effects on the availability of marine mammals for subsistence use. Outcomes of POC meetings are typically included in updates attached to the POC as addenda and distributed to federal, state, and local agencies as well as local stakeholder groups that either adjudicate or influence mitigation approaches for Shell's open water programs.

Meetings for Shell's 2010 program in the Beaufort and Chukchi Seas are planned for Nuiqsut, Kaktovik, Barrow, Point Hope, Point Lay, Wainwright, and Kotzebue in the 1st quarter of 2010. Shell met with the marine mammal commissions and committees including the Alaska Eskimo Whaling Commission (AEWC), Eskimo Walrus Commission (EWC), Alaska Beluga Whale Committee (ABWC), Alaska Ice Seal Committee (AISC), and the Alaska Nanuuq Commission (ANC) on December 8, 2009 in co-management meeting. Throughout 2010 Shell anticipates continued engagement with the marine mammal commissions and committees active in the subsistence harvests and marine mammal research.

Following the 2010 season, Shell intends to have a post-season co-management meeting with the commissioners and committee heads to discuss results of mitigation measures and outcomes of the preceding season. The goal of the post-season meeting is to build upon the knowledge base, discuss successful or unsuccessful outcomes of mitigation measures, and possibly refine plans or mitigation measures if necessary.

Subsistence Mitigation Measures

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

Shell states that it will implement the following additional measures to ensure coordination of its activities with local subsistence users to minimize further the risk of impacting marine mammals and interfering with any subsistence hunts:

- To minimize impacts on marine mammals and subsistence hunting activities, the source vessel will transit through the Chukchi Sea along a route that lies offshore of the polynya zone. This entry into the Chukchi Sea will not occur before July 1, 2010. In the event the transit outside of the polynya zone results in Shell having to move away from ice, the source vessel may enter into the polynya zone. If it is necessary to move into the polynya zone, Shell will notify the local communities of the change in the transit route through the Com Centers.
- Shell has developed a Communication Plan and will implement the plan before initiating the 2010 program to coordinate activities with local subsistence users as well as Village Whaling Associations in order to minimize the risk of interfering with subsistence hunting activities, and keep current as to the timing and status of the bowhead whale migration, as well as the timing and status of other subsistence hunts. The Communication Plan includes procedures for coordination with Communication and Call Centers to be located in coastal villages along the Beaufort and Chukchi Seas during Shell's program in 2010.
- Shell will employ local Subsistence Advisors from the Beaufort and Chukchi Sea villages to provide consultation and guidance regarding the whale migration and subsistence hunt. There may be up nine subsistence advisor-liaison positions (one per village), to work approximately 8-hours per day and 40-hour weeks through Shell's 2010 program. The subsistence advisor will use local knowledge (Traditional Knowledge) to gather data on subsistence lifestyle within the community and advise as to ways to minimize and mitigate potential impacts to subsistence resources during program activities. Responsibilities include reporting any subsistence concerns or conflicts; coordinating with subsistence users; reporting subsistence-related comments, concerns, and information;

and advising how to avoid subsistence conflicts. A subsistence advisor handbook will be developed prior to the operational season to specify position work tasks in more detail.

• Shell will also implement flight restrictions prohibiting aircraft from flying within 1,000 ft (300 m) of marine mammals or below 1,500 ft (457 m) altitude (except during takeoffs and landings or in emergency situations) while over land or sea.

Unmitigable Adverse Impact Analysis and Preliminary Determination

NMFS has preliminarily determined that Shell's proposed 2010 open water marine surveys in the Beaufort and Chukchi Seas will not have an unmitigable adverse impact on the availability of species or stocks for taking for subsistence uses. This preliminary determination is supported by information contained in this document and Shell's POC. Shell has adopted a spatial and temporal strategy for its Arctic open water marine surveys that should minimize impacts to subsistence hunters, which is discussed in detail below, broken into different subsistence activities.

(1) Bowhead Whales

During the proposed period of activity (July through October) most marine mammals are expected to be dispersed throughout the area, except during the peak of the bowhead whale migration in the Beaufort Sea, which occurs from late August into October. Bowhead whales are expected to be in the Canadian Beaufort Sea during much of the time prior to subsistence whaling and, therefore, are not expected to be affected by the site clearance and shallow hazard surveys prior to then. Further, site clearance and shallow hazards surveys will be conducted over 50–100 mi (80–160 km) west of the furthest west boundary of the traditional bowhead hunting waters used by Kaktovik hunters, 10–50 mi (16–80 km) west of Cross Island from where Nuiqsut hunters base their harvest, and over 35 miles east of the furthest east boundary of the traditional bowhead hunting waters used by Barrow hunters. In light of the small sound source for these surveys and resulting ensonified area > 160 dB (1,525 m) described previously in this document, the sheer distances from where these site clearance and shallow hazard surveys will occur from the areas of Kaktovik and Barrow bowhead hunts serve to mitigate any prospect of impact to the hunts. Site clearance and shallow hazard surveys will be timed to occur beyond the traditional boundary of Nuiqsut hunts, besides occurring 10–50 mi (16–80 km) west of Cross Island and "downstream" of this bowhead whale hunt, thereby mitigating the prospect of impact to Nuiqsut whaling. In addition, Shell will execute a communication plan and use communication and call centers located in coastal villages of the Beaufort Sea (see above) to communicate activities and routine vessel traffic with subsistence users throughout the period in which all surveys will be conducted. As a result of the distance and spatial location of site clearance and shallow hazard surveys from traditional bowhead whale subsistence harvest, any effects on the bowhead whale, as a subsistence resource, will be negligible.

Activities associated with Shell's planned ice gouge surveys in Camden Bay would have no or negligible effect on the availability of bowhead whales for the Kaktovik, Nuiqsut, and Barrow subsistence whaling harvests. Mitigation of the impact from ice gouge surveys includes the possible use of either an AUV, or conventional survey method without airguns, and timing and location of surveys. The AUV will be launched from the stern of a vessel and will survey the seafloor close to the vessel. The vessel will transit an area, with the AUV surveying the area behind the vessel. Marine mammal observers onboard the vessel ensures the AUV has a minimal impact on the environment. The AUV also has a Collision Avoidance System and operates without a towline that reduces potential impact to marine mammals. Using bathymetric sonar or multi-beam echo sounder the AUV can record the gouges on the seafloor surface caused by ice keels. The Sub-bottom profiler can record layers beneath the surface to about 20 ft (6.1 m). The AUV is more maneuverable and able to complete surveys quicker than a conventional survey. This reduces the duration that vessels producing sound must operate. Also, the ice gouge surveys will be timed to avoid locations east of Mary Sachs Entrance in Camden Bay during the bowhead subsistence harvest of Kaktovik. The ice gouge survey locations through Mary Sachs Entrance and out into Camden Bay are more than 40 mi (64 km) east of Cross Island, and given this distance plus the low-level sound source of the ice gouge surveys, this will mitigate impact to the Nuiqsut bowhead whale subsistence harvest. Timing of activities will be coordinated via the nearest communication and call centers operating in the Beaufort Sea, presumably in Kaktovik and Deadhorse. As a result of the timing, location, and lack of an airgun source for the ice gouge surveys, any effects on the bowhead whale, as a subsistence resource, will be negligible.

Ice gouge survey activities in the Chukchi Sea will be scheduled to avoid impact to bowhead whale subsistence harvests that could be conducted in the Chukchi Sea communities of Wainwright or Point Hope. Scheduling will be coordinated via the nearest communication and call center operating in the Chukchi Sea communities.

(2) Beluga Whales

Beluga are not a prevailing subsistence resource in the communities of Kaktovik, Nuiqsut, or Barrow. Thus, given the location and timing of site clearance and shallow hazards and ice gouge surveys in the Beaufort Sea, any such behavioral response by beluga to these activities would have a no significant effect on them as a subsistence resource.

Belugas are a prevailing subsistence resource in the Chukchi Sea community of Pt. Lay. The Point Lay beluga hunt is concentrated in the first two weeks of July (but sometimes continues into August), when belugas are herded by hunters with boats into Kasegaluk Lagoon and harvested in shallow waters. Ice gouge survey activities in the Chukchi Sea will be scheduled to avoid the traditional subsistence beluga hunt in the community of Pt. Lay. Timing of any ice gouge survey activities will be coordinated via the nearest communication and call centers operating in the Chukchi Sea, presumably in Wainwright and Barrow.

(3) Seals

Seals are an important subsistence resource and ringed seals make up the bulk of the seal harvest of both Kaktovik and Nuiqsut. Seals can be hunted year-round, but are taken in highest numbers in the summer months in the Beaufort Sea (MMS 2008). Seal-hunting trips can take Nuiqsut hunters several miles offshore; however, the majority of seal hunting takes place closer to shore. The mouth of the Colville River is considered a productive seal hunting area (AES 2009), as well as the edge of the sea ice. Lease blocks where site clearance and shallow hazards surveys will occur are located over 15 mi (24 km) from the mouth of the Colville River, so there is less chance for impact on subsistence hunting for seals. Ice gouge surveys in Mary Sachs Entrance in Camden Bay will be conducted (AES 2009) over 30 miles from the westernmost extent of seal hunting by Kaktovik hunters (AES 2009). The remainder of ice gouge lines will be

much further offshore than where Kaktovik seal hunts typically occur which is inside the barrier islands (AES 2009). It is assumed that effects on subsistence seal harvests would be negligible given the distances between Shell's proposed site clearance and shallow hazards and ice gouge surveys and the subsistence seal hunting areas of Nuiqsut and Kaktovik.

Seals are an important subsistence resource in the Chukchi Sea community of Wainwright. Ringed seals make up the bulk of the seal harvest. Most ringed and bearded seals are harvested in the winter or in the spring (May–July) which is before Shell's ice gouge survey would commence, but some harvest continues into the open water period. Hunting that does occur during the open water season generally occurs within 10 miles of the coastline (AES 2009), while the majority of ice gouge survey activity will be much further offshore. Timing of activities will be coordinated via the nearest communication and call centers operating in the Chukchi Sea, presumably in Wainwright and Barrow. It is assumed that effects on subsistence seal harvests would be negligible given the timing and distances between Shell's proposed ice gouge survey and the subsistence seal hunting area of Wainwright.

All survey activities will be operated in accordance with the procedures of Shell's Marine Mammal Monitoring and Mitigation Plan (4MP) that accompanies this program. This potential impact is mitigated by application of the procedures established in the 4MP and to be detailed in the POC. Adaptive mitigation measures may be employed during times of active scouting, whaling, or other subsistence hunting activities that occur within the traditional subsistence hunting areas of the potentially affected communities.

Shell states that it will continue its adopted spatial and temporal operational strategy that, when combined with its community outreach and engagement program, will provide effective protection to the bowhead migration and subsistence hunt.

Based on the above analysis, measures described in Shell's Draft POC, the proposed mitigation and monitoring measures (described earlier in this document), and the project design itself, NMFS has determined preliminarily that there will not be an unmitigable adverse impact on subsistence uses from Shell's 2010 open water marine survey activities in the Beaufort and Chukchi Seas.

Endangered Species Act (ESA)

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

National Environmental Policy Act (NEPA)

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

Proposed Authorization

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

Dated: May 12, 2010.

James H. Lecky,

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

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CONSUMER PRODUCT SAFETY COMMISSION

Agency Information Collection Activities; Proposed Collection; Comment Request; Safety Standard for Multi-Purpose Lighters

AGENCY: Consumer Product Safety Commission.

ACTION: Notice.

SUMMARY: The Consumer Product Safety Commission ("CPSC" or "Commission") is announcing an opportunity for public comment on the proposed collection of certain information by the agency. Under the Paperwork Reduction Act of 1995 ("the PRA"), Federal agencies are required to publish notice in the **Federal Register** concerning each proposed collection of information, including each proposed extension of an existing collection of information, and to allow 60 days for public comment in response to the notice. This notice solicits comments on a proposed request for extension of approval of a collection of information from manufacturers and importers of multi-purpose lighters.

DATES: Submit written or electronic comments on the collection of information by July 19, 2010.

ADDRESSES: Submit written submissions in the following way:

Written comments should be captioned "Proposed Collection of Information—Multi-Purpose Lighters" and e-mailed to the Office of the Secretary at *cpsc-os@cpsc.gov.* Comments may also be sent by facsimile to (301) 504–0127, or by Mail/Hand delivery/Courier (for paper, disk, or CD–ROM submissions), preferably in five copies, to: Office of the Secretary, Consumer Product Safety Commission, Room 502, 4330 East West Highway, Bethesda, MD 20814; telephone (301) 504–7923.

FOR FURTHER INFORMATION CONTACT: Linda Glatz, Division of Policy and Planning, Office of Information Technology, Consumer Product Safety Commission, 4330 East West Highway, Bethesda, MD 20814, 301–504–7671, *lglatz@cpsc.gov*.

SUPPLEMENTARY INFORMATION: Under the PRA (44 U.S.C. 3501–3520), Federal agencies must obtain approval from the Office of Management and Budget ("OMB") for each collection of information they conduct or sponsor. "Collection of information" is defined in 44 U.S.C. 3502(3) and 5 CFR 1320.3(c) and includes agency requests or requirements that members of the public submit reports, keep records, or provide information to a third party. Section 3506(c)(2)(A) of the PRA (44 U.S.C. 3506(c)(2)(A)) requires Federal agencies to provide a 60-day notice in the **Federal Register** concerning each proposed collection of information, including each proposed extension of an existing collection of information, before submitting the collection to OMB for approval. To comply with this requirement, the CPSC is publishing notice of the proposed collection of information set forth in this document.

With respect to the following collection of information, the CPSC invites comments on these topics: (1) Whether the proposed collection of information is necessary for the proper performance of CPSC's functions, including whether the information will have practical utility; (2) the accuracy of CPSC's estimate of the burden of the proposed collection of information, including the validity of the methodology and assumptions used; (3)