MARINE MAMMAL COMMISSION

8 July 2010

Mr. P. Michael Payne, Chief
Permits, Conservation, and Education Division
Office of Protected Resources
National Marine Fisheries Service
1315 East-West Highway
Silver Spring, MD 20910-3225

Dear Mr. Payne:

The Marine Mammal Commission, in consultation with its Committee of Scientific Advisors on Marine Mammals, has reviewed the application submitted by the Statoil USA E&P, Inc., seeking authorization under section 101(a)(5)(D) of the Marine Mammal Protection Act to take small numbers of marine mammals by harassment. The taking would be incidental to a marine seismic survey in the Chukchi Sea, Alaska, during approximately 60 days between 15 July and 30 November 2010. The Commission also has reviewed the National Marine Fisheries Service's 8 June 2010 *Federal Register* notice announcing receipt of the application and proposing to issue the authorization, subject to certain conditions (75 Fed. Reg. 32379).

Statoil is funding Fugro-Geoteam, Inc., to collect seismic reflection data for assessing petroleum reserves in the Minerals Management Service's Outer Continental Shelf Lease Sale 193 area, which is located at 71°30' to 72°00' N latitude, 165°00' to 162°30' W longitude in the northern Chukchi Sea. Fugro-Geoteam, Inc., will conduct a three-dimensional (3-D) survey of 2,370 km^2 (915 mi^2) to better evaluate the evolution of the petroleum system at the basin level and a two-dimensional (2-D) survey of 675 km (420 mi) to integrate surrounding regional geology to the new high-resolution 3-D image. The surveys would occur in waters 30 to 50 m (100 to 165 ft) in depth. The applicant would use the M/V *Geo Celtic* (or similar vessel) towing two 26-airgun arrays (3,000 in^3 with a nominal source level of 245 dB re 1 μPa at 1 m). The vessel also would tow a receiving system of 12 hydrophone streamers 4 km (2.2 mi) in length. In addition, the applicant would operate a 55–95 kHz pinger to position the streamer array relative to the vessel.

RECOMMENDATIONS

The Marine Mammal Commission recommends that, before issuing the requested authorization, the National Marine Fisheries Service—

- clarify whether the 3-D and 2-D surveys will occur simultaneously or independent of one another and, if they will occur independently, recalculate the total exposed area and subsequent exposures for the 2-D surveys;
- require Statoil to revise its study design to include expanded pre- and post-seismic survey assessments sufficient to obtain reliable sighting data for comparing marine mammal abundance, distribution, and behavior under various conditions;
- require the applicant to collect data on the behavior and movements of any marine mammals present during all ramp-up and power-down procedures to help evaluate the effectiveness of these procedures as mitigation measures;

- undertake or prompt others to undertake studies needed to resolve questions regarding the effectiveness of ramp-up and power-down as mitigation measures;
- review the proposed monitoring measures and require the applicant (or its contractors) to collect and analyze information regarding all of the potentially important sources of sound and the complex sound field created by all of the activities associated with conducting the seismic survey;
- require the applicant to collect information to evaluate the assumption that 160 dB is the appropriate threshold at which harassment occurs for all marine mammals that occur in the survey area;
- determine, in consultation with Statoil, whether aerial surveys are safe to conduct and should be required and, if not, identify alternative monitoring strategies capable of providing reliable information on the presence of marine mammals and the impact of survey activities to the affected species and stocks;
- require Statoil to supplement its vessel-based monitoring with towed passive acoustics to provide a more reliable estimate of the species and number of marine mammals taken during the proposed seismic surveys; and
- require Statoil to halt its seismic survey and related activities and consult with the Service regarding any seriously injured or dead marine mammal when the injury or death may have resulted from Statoil's activities and allow resumption only after steps to avoid additional serious injuries or deaths have been implemented or such takings have been authorized under section 101(a)(5)(A) of the Marine Mammal Protection Act.

RATIONALE

The Service preliminarily has determined that the proposed activities would result, at most, in a temporary modification in the behavior of small numbers of up to 12 species of marine mammals and that any impact to the affected species would be negligible. The Service also anticipates no take of marine mammals by death or serious injury and believes that the potential for temporary or permanent hearing impairment will be avoided through the incorporation of the proposed mitigation measures.

2-D Survey Methodology

It is unclear in Statoil's application and the Service's *Federal Register* notice whether all of the planned 2-D survey line transects would occur independently of the 3-D survey. Both the Service and the applicant seem to be subtracting the 2-D area of exposure at 160 dB re 1 μPa (root mean square [rms]) that overlaps the 3-D area of exposure in determining the area of exposure for the 2-D survey. However, the only instance in which it would be appropriate to subtract the 2-D area of exposure from the 3-D area of exposure is if the 3-D and 2-D surveys occur simultaneously. The Marine Mammal Commission therefore recommends that the National Marine Fisheries Service clarify whether the 3-D and 2-D surveys will occur simultaneously or independent of one another and, if they will occur independently, recalculate the total exposed area and subsequent exposures for the 2-D surveys.

Monitoring and Mitigation

Whether informative comparisons can be made between marine mammal observations conducted when airguns are and are not firing depends, in part, on the length of time that the airguns have been silent before they begin or after they stop firing. If firing of airguns causes marine mammals to abandon an area or alter their behavior, a comparison after the airguns are silenced would be meaningful only if sufficient time had elapsed for the marine mammals in the area to return to their normal distribution and behavior. If the length of time is not sufficient to allow the animals to return to their normal distribution and behavior, then any comparison would be largely meaningless for assessing the effects of seismic surveys. A more meaningful approach would be to compare sighting rates in the survey area before, during, and periodically after the seismic survey (e.g., until the animals resume their pre-survey distribution and behavior) to determine how those rates differ. With that in mind, the Marine Mammal Commission recommends that the National Marine Fisheries Service require Statoil to revise its study design to include expanded pre- and post-seismic survey assessments sufficient to obtain reliable sighting data for comparing marine mammal abundance, distribution, and behavior under various conditions. To provide meaningful information, such assessments will need to be timed to avoid periods when marine mammals are migrating through the survey area or otherwise account for the confounding effects of such movements on the presence and abundance of migratory species.

Ramp-up and power-down procedures. As the Commission has noted in previous correspondence, the effectiveness of ramp-up and power-down procedures as mitigation measures has yet to be empirically verified. The Service should not continue to assume that ramp-up and power-down procedures constitute effective mitigation without such verification. Verification likely will require not only collecting opportunistic data as surveys are being conducted but also designing and carrying out dedicated field studies to test specific hypotheses regarding responses of marine mammals to various ramp-up and power-down scenarios. As an interim measure capable of furnishing some useful information, the Marine Mammal Commission recommends that the National Marine Fisheries Service require the applicant to collect data on the behavior and movements of any marine mammals present during all ramp-up and power-down procedures to evaluate the effectiveness of these procedures as mitigation measures. In addition, the Marine Mammal Commission recommends that the Service undertake or prompt others to undertake the types of studies needed to resolve questions regarding the effectiveness of ramp-up and power-down as mitigation measures. As noted in past correspondence, the Commission would be pleased to discuss with the Service the types of data that should be collected, the analyses that are needed, and the design of experiments that would promote a better understanding of the utility and shortcomings of these mitigation measures and that may identify ways to improve the current measures.

The peer-review panel convened by the Service after its March 2010 open-water meeting also made several recommendations for improving the planned mitigation and monitoring measures. One of those was that Statoil monitor not only the effects of its primary sound sources (e.g., airgun arrays) on marine mammals but also the effects of sounds introduced into the marine environment

by sources related to various support activities, such as the ship used to pull the array, active sonar used in ship navigation, and support vessels and helicopters. The panel noted that the marine mammals in the area will not just hear and react to the sound from the seismic airguns but to the entire suite of sounds from various sources associated with the activities and the complex sound field they create in combination (referred to as "soundscape" by the panel). To understand the animals' responses to that sound field requires that all major sources of sound are monitored and considered. The Marine Mammal Commission concurs with the panel's assessment and recommends that the National Marine Fisheries Service review the proposed monitoring measures and require the applicant (or its contractors) to collect and analyze information regarding all of the potentially important sources of sound and the complex sound field created by all of the activities associated with conducting the seismic survey.

The peer-review panel also questioned whether the use of a single sound threshold, such as 160 dB re 1 μPa (rms), constitutes an adequate basis for determining when certain effects (e.g., sufficient to constitute a taking by Level B harassment) will or will not occur (i.e., whether disturbance of marine mammal behavioral patterns occurs). The Service's *Federal Register* notice cites a summary of information regarding disturbance from Southall et al. (2007) as the basis for using 160 dB re 1 μPa (rms) to delineate the threshold below which it does not believe behavioral harassment would occur. However, that summary acknowledges that disturbance (presumably including disturbance that would constitute Level B harassment) may occur at a wide range of sound levels. Furthermore, the directive of section 101(a)(5)(D) of the Marine Mammal Protection Act is not just to determine whether the disturbance resulting from a stimulus at a certain threshold might result in the taking of marine mammals and whether the impact of such takings is negligible. Rather, the Act requires the Service to prescribe means of "effecting the least practicable impact" on the affected marine mammal species and stocks by, for example, minimizing any such disturbance to the extent practicable, irrespective of any presumed threshold. Although it may be reasonable to start with an assumption that, for some species, harassment is not likely to occur at sound levels less than 160 dB re 1 μPa (rms), for certain species (e.g., bowhead and beluga whales) the available information indicates behavioral responses at much lower sound levels. This being the case, the Marine Mammal Commission recommends that the applicant be required to collect information to evaluate the assumption that 160 dB is the appropriate threshold at which harassment occurs for all marine mammals that occur in the survey area. This assumption can and should be tested using in-situ measurements of sound propagation (which Statoil is planning to do at the beginning of the season) concurrent with observations of the responses of marine mammals exposed to such sounds. Such tests should be conducted using species-specific data, and test results should be used to inform decision makers regarding the applicability of the 160-dB re 1 μPa (rms) threshold for specific species and to improve future mitigation measures. The Service's *Federal Register* notice indicates that Statoil will conduct such tests, and the Marine Mammal Commission encourages it to do so.

Statoil intends to monitor for marine mammals using vessel-based observers and a prototype infrared radar during periods of poor visibility. Statoil contends that aerial surveys in the Chukchi Sea are not safe because they would be conducted too far from land. The Service's peer-review panel recognized that safety is always the primary consideration but also indicated that surveys have been and are being flown safely in this region by others. The Commission concurs that safety should be

the primary consideration but believes that a determination of what constitutes an unacceptable risk should not be left to the applicant alone. The Marine Mammal Commission recommends that such a determination be made in consultation with the Service, taking into account the safety record of others conducting surveys and providing aerial support for oil and gas activities in the area. If Statoil does not conduct aerial surveys, whether because of safety concerns or for other reasons, there is still a need for an adequate monitoring program. Therefore, if aerial surveys are not conducted, it is incumbent on the applicant and the Service to identify alternative monitoring strategies capable of providing reliable information on the presence of marine mammals and the impact of survey activities to the affected species and stocks.

For example, even if Statoil does not fly aerial surveys over potential production sites in the Chukchi Sea, it can still supplement its vessel-based observations using towed acoustic sensors. As has been demonstrated, passive acoustics can be used effectively to detect animals that otherwise spend little time or are inconspicuous at the surface. Passive acoustic monitoring would not improve the implementation of mitigation measures if data are not available on a real-time basis. Nevertheless, a retrospective analysis of such data would likely yield a more accurate estimate of the total number of marine mammals taken in the course of the seismic survey. For these reasons, the Marine Mammal Commission recommends that the National Marine Fisheries Service require Statoil to supplement its vessel-based monitoring with towed passive acoustics to provide a more reliable estimate of the species and number of marine mammals taken during the proposed seismic surveys.

Serious Injury and Mortality

Statoil has decided to apply for an incidental harassment authorization under section 101(a)(5)(D) of the Marine Mammal Protection Act. Such an authorization is valid for no more than one year at a time, does not require the promulgation of regulations, and cannot authorize taking by serious injury or death of a marine mammal. An alternative authorization under section 101(a)(5)(A) of the Act is available for up to five years and could allow for a certain number of takings by serious injury or death but would require the issuance of regulations. Statoil has indicated its intention to investigate the cause of death of any marine mammal found dead near its operations, including any unauthorized deaths that may have resulted from its operations. It is unclear, however, who would conduct such investigations and what qualifications they would have. This should be clarified. Investigations of all deaths are essential for evaluating the effects of the proposed activities and determining whether an authorization under section 101(a)(5)(A) is needed. It needs to be recognized, however, that conducting such investigations and determining the cause of death may be difficult under some circumstances. For example, collecting a dead bowhead whale can be time-consuming and logistically challenging. In some cases, even if a necropsy is done by a qualified veterinarian, the results might be equivocal. The Commission appreciates Statoil's willingness to investigate the causes of death of any dead marine mammal found near its operations. However, as no authorization for serious injury or mortality is being sought, the Marine Mammal Commission recommends that the National Marine Fisheries Service require Statoil to halt its seismic survey and related activities and consult with the Service regarding any seriously injured or dead marine mammal found near its operations, when the death or injury may have resulted from Statoil's activities. Once the Service determines whether the injury or death likely resulted from Statoil's

activities, it can determine whether modifications to Statoil's activities can be taken to avoid additional injuries or deaths or whether Statoil needs to obtain a letter of authorization under section 101(a)(5)(A).

Please contact me if you have questions about the Commission's recommendations and comments.

Sincerely,

Timothy J. Ragen, Ph.D.
Executive Director

Literature Cited

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ALASKA WILDERNESS LEAGUE – AUDUBON ALASKA – CENTER FOR BIOLOGICAL DIVERSITY – DEFENDERS OF WILDLIFE – EARTHJUSTICE GREENPEACE – NATURAL RESOURCES DEFENSE COUNCIL – NORTHERN ALASKA ENVIRONMENTAL CENTER – OCEAN CONSERVANCY – OCEANA – PACIFIC ENVIRONMENT – SIERRA CLUB – THE WILDERNESS SOCIETY – WORLD WILDLIFE FUND

July 8, 2010

VIA E-MAIL

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Re: Takes of Marine Mammals Incidental to Specified Activities; Taking Marine Mammals Incidental to Open Water Marine Seismic Survey in the Chukchi Sea, Alaska 75 Fed. Reg. 32,379 (June 8, 2010)

Dear Mr. Payne:

The undersigned groups submit the following comments on the National Marine Fisheries Service's (NMFS) June 8, 2010, proposed incidental harassment authorization (IHA) issued pursuant to the Marine Mammal Protection Act (MMPA). NMFS has proposed allowing the incidental take of twelve marine mammal species resulting from Statoil USA E&P Inc.'s (Statoil) open water marine seismic surveying in the Chukchi Sea that is scheduled to begin in July 2010. 75 Fed. Reg. 32,379 (June 8, 2010). NMFS should deny Statoil's application.

The ongoing tragedy in the Gulf of Mexico has brought to light the many problems related to the planning, regulation, and oversight of offshore oil and gas activities. Congress and the Obama administration are now evaluating the failures that led to the blowout and contributed to the inability to effectively respond to the spill. As the government attempts to put into place the necessary safeguards to avoid a similar catastrophe in the future, we should take the opportunity to address all decisions about offshore activities – not just drilling, but seismic activities and other sources of noise and disturbance as well. The government has the opportunity to step back and take a holistic view of industrial activities in the Arctic, and there is no reason to rush ahead to approve proposals like the ones under consideration here.

As an initial matter, in light of the recognition that a programmatic Environmental Impact Statement (EIS) is needed to consider the cumulative impacts of increased oil and gas activities in the Arctic and its current steps to develop a draft, NMFS should not authorize the marine

mammal harassment incident to Statoil's surveying. The National Environmental Policy Act (NEPA) prohibits piecemeal approvals while a programmatic EIS process is ongoing, except under strictly prescribed circumstances not found here. If it were to allow these activities, NMFS risks undermining the overarching review contained in the EIS that will establish appropriate standards for future oil and gas activities. Moreover, incorporating all seismic activities into that process will reinforce NMFS's commitment to create a five-year Arctic Action Plan that will include efforts to improve the management of ocean and coastal resources.

In addition, the impacts of the proposed surveying on whales (bowhead, beluga, and gray) and harbor porpoises, along with the concomitant effects on Alaska Native communities, exceed the protective standards imposed by the MMPA. Statoil's proposal includes both 3D and 2D surveys using an array of 26 active airguns with a maximum discharge volume of 3,000 cubic inches and a received level near the source of 245 dB. The surveying will take place over a 2,300 square kilometer area, ensonifing close to 7,500 square kilometers up to 160 dB. In evaluating the effects, the proposed IHA does not apply best available science in a number of respects, including disregarding the uncertainties associated with introducing industrial noise into the Chukchi, failing to adequately consider the risk of serious injury, setting an arbitrary 160-dB harassment threshold for all species, and ignoring the potential effects from other surveys planned in the Arctic this year. The proposed IHA also does not reduce impacts to the "least practicable level," as required by the statute.

Finally, should it choose to allow Statoil to proceed, NMFS must first address the full scope of Statoil's activities pursuant to the Endangered Species Act (ESA) while using an appropriate baseline for future activities. As part of its ESA obligations, NMFS previously issued successive regional, programmatic biological opinions examining the effects of exploration activities on endangered whales in the Arctic. The broad scope of those opinions – considering activities through actual production – is equally applicable to the exploratory seismic activity at issue this year. The opportunity for future exploration and production is the reason that Statoil is conducting its surveys. If Statoil's surveys are to take place this summer, the ESA requires that NMFS update its existing analysis, evaluating exploration and production, in light of the best information currently available.

I. NATIONAL ENVIRONMENTAL POLICY ACT

NMFS and the Minerals Management Service (MMS)[1] have acknowledged the potential for significant, longer-term impacts to marine mammals resulting from expanded oil and gas activity. The agencies first proposed to address this problem in the context of a projected increase in seismic activity and now must address the potential increase in exploratory drilling. As a result, the cumulative, long-term effects of increased noise and other impacts from oil and gas activity must be properly addressed before further activity is authorized. A number of the undersigned groups raised this issue to NMFS previously, including in a letter dated February 12, 2010. We repeat the main points here.

[1] MMS is now known as the Bureau of Ocean Energy Management, Regulation, and Enforcement. Because the documents referenced here were created when the agency was known as MMS, these comments will continue to use its former name.

Although NMFS and MMS have begun a comprehensive analysis of oil and gas activities in the Arctic, they have not yet finished the job. In 2006, the agencies published a notice of intent to prepare a programmatic EIS in order to assess the entire program of seismic survey permitting throughout the Beaufort and Chukchi seas. 71 Fed. Reg. 66,912 (Nov. 17, 2006). According to the notice, the agencies determined that a programmatic EIS was necessary because of an anticipated increase in permitting and the determination that impacts needed to be analyzed over "a longer time frame" than had been addressed in previous single season assessments. *Id.* at 66,913. In spring 2007, the agencies issued a draft programmatic EIS (DPEIS) that reinforced their earlier conclusions. NMFS and MMS continued to recognize that the "reasonably foreseeable proposed offshore oil and gas seismic surveys off Alaska" have "potential significant impacts on marine mammals, other Arctic marine life, and native subsistence lifestyles" 72 Fed. Reg. 17,117, 17,117 (Apr. 6, 2007).

The agencies did not complete the programmatic EIS. In October 2009, NMFS published a notice along with MMS, announcing that new information had become available since the DPEIS was published – in particular, "renewed interest in exploratory drilling in both the Chukchi and Beaufort Seas " – and that therefore the agencies were "withdrawing the 2007 DPEIS" and initiating a new process that will consider and incorporate this new information. 74 Fed. Reg. 55,539, 55,539 (Oct. 28, 2009). On February 8, 2010, NMFS published a second notice announcing its intent to prepare an EIS "to analyze the environmental impacts of issuing Incidental Take Authorizations (ITAs) . . . to the oil and gas industry for the taking of marine mammals incidental to offshore exploration activities (e.g., seismic surveys and exploratory drilling) in Federal and state waters of the U.S. Chukchi and Beaufort Seas off Alaska" and opening the official scoping period for this EIS. 75 Fed. Reg. at 6,175. According to the notice:

> For the purposes of complying with NEPA and to achieve greater administrative efficiency in its ITA program, NMFS has determined the need to prepare an EIS that will analyze a range of oil and gas exploratory actions and that will satisfy the requirements of the [CEQ]'s NEPA regulations and the NOAA NEPA administrative order 216-6. The proposed EIS would cover known and reasonably foreseeable projects requiring ITAs in the U.S. Arctic regions for future years, until such time that a revision of the document is necessary.

Id. at 6,176. The factors that contributed to NMFS's decision that a programmatic EIS is needed include the receipt of applications for exploratory drilling, as well as anticipated future applications, that were not analyzed in the withdrawn DPEIS, and the need to analyze a longer timeframe "in order to most effectively and fully evaluate the potential for cumulative impacts." *Id.*

In short, the agencies have reaffirmed their previous determination that a programmatic EIS process is necessary to address the overall, cumulative impacts of increased oil and gas activity in the Arctic Ocean and intend to incorporate into that analysis new scientific information as well as new information about projected seismic and exploratory drilling activity in both seas.

This approach is consistent with the mandate of NEPA. NEPA "emphasizes the importance of coherent and comprehensive up-front environmental analysis to ensure informed decision making" so that "'the agency will not act on incomplete information, only to regret its decision after it is too late to correct.'" *Blue Mountains Biodiversity Project v. Blackwood*, 161 F.3d 1208, 1216 (9th Cir. 1998) (quoting *Marsh v. Oregon Natural Res. Council*, 490 U.S. 360, 371 (1989)). Conducting an upfront, "coherent and comprehensive" analysis of the environmental impacts of expanded seismic *and* drilling activities – now that proposals for drilling are increasing as well – in the Alaskan Arctic Ocean will enable the agencies to make informed decisions and provide adequate protection for the affected resources.

NEPA regulations make clear that NMFS should not proceed with authorizations for individual projects like Statoil's surveying until its programmatic EIS is complete. Specifically, agencies are explicitly prohibited from undertaking any major action covered by a programmatic EIS that is underway:

> While work on a required program environmental impact statement is in progress and the action is not covered by an existing program statement, agencies shall not undertake in the interim any major Federal action covered by the program which may significantly affect the quality of the human environment . . . .

40 C.F.R. § 1506.1(c).[2] NMFS and MMS have made it clear that the programmatic EIS is necessary for an adequate evaluation of the environmental impacts of approving currently proposed and reasonably foreseeable oil and gas exploration activity in the Beaufort and Chukchi seas. Work on that EIS, moreover, has been in progress since 2006. The primary effect of the recent notices withdrawing the 2007 draft and initiating a new EIS process is to expand the scope of that process to reflect the "renewed interest in exploratory drilling" along with other relevant new information. 74 Fed. Reg. at 55,539. In light of this ongoing programmatic EIS process, it would be unlawful for NMFS to authorize marine mammal harassment associated with new seismic activity. Only by evaluating the cumulative, long-term impacts of noise associated with expanding levels of seismic exploration and exploratory drilling can the full and potentially synergistic effects of the various individual projects be understood and adequately protective mitigation measures put in place.

The programmatic EIS should complement NMFS's commitment to create a five-year Arctic Action Plan that will include efforts to improve management of ocean and coastal resources. 75 Fed. Reg. 25,843 (May 10, 2010). We encourage NMFS to take the opportunity to thoroughly review both the industrial activities and the marine resources of the Arctic. Ultimately, the Action Plan and the EIS should ensure that widely acknowledged information

[2] The regulation requires any activity covered by the program to meet a stringent three-part test in order to qualify for an exception to the general rule. It must be: justified independently of the program; accompanied by an adequate environmental impact statement; and not prejudicial to the ultimate decision on the program. 40 C.F.R. § 1506.1(c). The proposed seismic surveying does not meet all of the requirements. Statoil's plans are inseparable from the issues to be addressed in the programmatic EIS and must be considered in the larger context to avoid compromising future options for protecting vulnerable resources in the Arctic.

gaps relating to the Arctic are filled and that all decisions are made in the context of a comprehensive plan for the region. Given these important plans, it is premature to issue IHAs that commit to a path of increasing exploitation of the Arctic.

II. MARINE MAMMAL PROTECTION ACT

NMFS's proposed authorization to Statoil does not comply with the requirements of the MMPA. Congress enacted the MMPA in 1972 in response to widespread concern that "certain species and population stocks of marine mammals are, or may be, in danger of extinction or depletion as a result of man's activities[.]" 16 U.S.C. § 1361(1). The legislative history states that the purpose of the MMPA is to manage marine mammals "for their benefit and not for the benefit of commercial exploitation." H. Rep. No. 92-707 (1972), *reprinted in* 1972 U.S.C.C.A.N., pp. 4144, 4154. The primary mechanism by which the MMPA protects marine mammals is through the implementation of a "moratorium on the taking" of marine mammals. 16 U.S.C. § 1371(a). Under the MMPA, the term "take" is broadly defined to mean "to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal." *Id*. § 1362(13). "Harassment" is further defined to include acts of "torment" or "annoyance" that have the "potential" to injure a marine mammal or marine mammal stock in the wild or have the potential to "disturb" them "by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering." *Id*. § 1362(18); *see also* 50 C.F.R. § 216.3 (defining "Level A" and "Level B" harassment).

The MMPA provides several narrow exceptions to the moratorium on take. Relevant here, NMFS may, upon request, authorize take in the form of harassment by an IHA for a period of not more than one year, provided certain conditions are met. An activity: (i) must be "specified" and limited to a "specific geographical region," (ii) must result in the incidental take of only "small numbers of marine mammals of a species or population stock," (iii) can have no more than a "negligible impact" on species and stocks, and (iv) cannot have "an unmitigatable adverse impact on the availability of such species or stock for taking for subsistence uses" by Alaska Natives. 16 U.S.C. § 1371(a)(5)(D). In issuing an authorization, NMFS must provide for the monitoring and reporting of such takings and must prescribe methods and means of effecting the "least practicable impact" on the species or stock and its habitat. *Id*. Finally, an activity in the Arctic cannot have the "potential to result in serious injury or mortality[.]" 50 C.F.R. § 216.107. As discussed below, NMFS has not demonstrated that the proposed IHA will meet the standards imposed by the MMPA and its governing regulations.

A. <u>The findings of the proposed IHA are unjustified given the great number of acknowledged uncertainties</u>

As NMFS has observed in a number of contexts, one of the "greatest concerns" associated with the impacts of oil and gas activities on marine mammals is the potential effect of increased noise in the ocean environment. *See* NMFS, ESA Section 7 Consultation Biological Opinion, Oil and Gas Leasing and Exploration Activities in the U.S. Beaufort and Chukchi Seas, Alaska and Authorization of Small Takes Under the MMPA, at 45 (July 17, 2008) (2008 BiOp). Available information, discussed *infra*, indicates that proceeding with Statoil's proposed 3D and 2D surveying carries significant risks. The proposed IHA does not provide the necessary data to refute this point, and indeed, the dearth of information about the Chukchi ecosystem should

preclude NMFS from being able to ensure that activities have only a negligible impact affecting only small numbers of marine mammals.

NMFS has recognized that existing information gaps in the Arctic inhibit its ability to issue MMPA authorizations. In its comments on the proposed 193 lease sale in the Chukchi Sea, NMFS stated that without "current and thorough data which describe the habitat use and function of these waters," and without information on the seasonal presence and distribution patterns of marine mammals, the agency would find it challenging to meet its obligations under the MMPA. NMFS, Comments on MMS Draft EIS for Chukchi Lease Sale 193 and Seismic Surveying Activities in the Chukchi Sea, at 2 (Jan. 30, 2007). NMFS explained that, lacking such information, "it will be very difficult to permit and conduct seismic surveys in a manner than has no more than a negligible impact to the stock and minimizes disturbance and harassment to the extent practicable." *Id*.

In more recent Arctic lease sale comments, NMFS reiterated its position that more information is needed to avoid difficulties making the findings required by the MMPA. NMFS, Comments on MMS Draft EIS for the Beaufort Sea and Chukchi Sea Lease Sales 209, 212, 217, and 221 (March 27, 2009). The agency also specifically observed that activities "occurring near productive forage areas such as the Hanna Shoal" or "along migratory corridors" are "most likely to encounter and impact marine mammals." *Id*. at 4. Statoil's proposed surveying will likely take place proximate to the Hanna Shoal – a feeding ground for gray whales – and within the pathway for migrating bowheads.

This lack of critical information runs up against the precautionary nature of the MMPA. As the D.C Circuit has repeatedly stated, "it is clear that '[t]he Act was to be administered for the benefit of the protected species rather than for the benefit of commercial exploitation.'" *Kokechik Fishermen's Ass'n v. Sec'y of Commerce*, 839 F.2d 795, 800 (D.C. Cir. 1988) (quoting *Comm. for Humane Legislation, Inc. v. Richardson*, 540 F.2d 1141, 1148 (D.C. Cir. 1976)).

The court in *Committee for Humane Legislation* quoted the MMPA's legislative history in support of the idea that the Act was "deliberately designed to permit takings of marine mammals only when it was known that that taking would not be to the disadvantage" of the species:

> "In the teeth of this lack of knowledge of specific causes, and of the certain knowledge that these animals are almost all threatened in some way, it seems elementary common sense to the Committee that legislation should be adopted to require that we act conservatively – that no steps should be taken regarding these animals that might prove to be adverse or even irreversible in their effects until more is known. As far as could be done, we have endeavored to build such a conservative bias into the legislation here presented."

540 F.2d at 1150 (quoting H.R. Rep. No. 92-707, 92nd Cong. (1972)). Nor can NMFS claim the lack of available information justifies its decisions. NMFS has an affirmative obligation to find

that impacts are no more than "negligible" and limited to the harassment of only "small numbers" of marine mammals.

B. The proposed IHA does not negate the possibility of serious injury

In the Arctic, an IHA pursuant to 16 U.S.C. § 1371(a)(5)(D) is only available if the activity has no potential to result in serious injury or mortality to a marine mammal. 50 C.F.R. § 216.107(a) ("Except for activities that have the potential to result in serious injury or mortality, which must be authorized under § 216.105, incidental harassment authorizations may be issued[.]"). If such injury or mortality is possible, take can only be authorized pursuant to a Letter of Authorization (LOA) consistent with regulations promulgated pursuant to 16 U.S.C. § 1371(a)(5)(A) and 50 C.F.R. § 216.105. Because NMFS has not promulgated any such regulations related to seismic surveys, and because such surveys and associated activities carry the potential for serious injury or death to marine mammals, neither an IHA nor an LOA can be issued for Statoil's proposed activities.

In promulgating the regulations that govern IHAs in the Arctic, NMFS acknowledged that permanent hearing loss – or permanent threshold shift (PTS) – constitutes serious injury:

> Serious injury for marine mammals, such as permanent hearing or eyesight loss, or severe trauma, could lead fairly quickly to the animal's death. NMFS does not believe that Congress intended to allow "incidental harassment" takings to include injuries that are likely to result in mortality, even where such incidental harassment involves only small numbers of marine mammals.

60 Fed. Reg. 28,379, 28,380 (May 31, 1995). Therefore, "if the acoustic source at its maximum level had the potential to cause a permanent threshold shift in a marine mammal's hearing ability," that activity would be considered "capable of causing serious injury to a marine mammal and would therefore not be appropriate for an incidental harassment authorization." *Id*. at 28,381.

For its 3D surveys, Statoil's proposes using two towed arrays consisting of 26 active airguns with a maximum discharge volume of 3,000 cubic inches. 75 Fed. Reg. at 32,379. The estimated source level for the full array is 245 dB re 1 µPa (rms) at 1 meter. *Id*. at 32,380. In the proposed IHA, NMFS states that it is assumed that PTS can occur either at a received sound level higher than that necessary to inflict a temporary threshold shift (TTS) or by repeated exposure to levels that cause a TTS. *Id*. at 32,382. The notice does not, however, define at what sound levels TTS is expected to occur. NMFS instead relies on mitigation and monitoring to prevent TTS, making it "highly unlikely" that marine mammals will suffer a PTS. *Id*. The mitigation and monitoring is designed largely to prevent marine mammals from being exposed to sound levels in excess of 180-dB (for cetaceans) and 190-dB (for pinnipeds) through the use of safety zones and ramp up procedures. *Id*. at 32,384-85. Modeling based on similarly sized arrays indicate that the 180-dB and 190-dB received levels extend as far as 2,500 and 700 meters. *Id*. at 32,385.

The standard for determining whether an IHA is appropriate is exceptionally protective. If there is even the possibility of serious injury, NMFS must establish that the "potential for serious injury can be *negated* through mitigation requirements[.]" 60 Fed. Reg. at 28,380 (emphasis added). Reports from previous surveys, however, indicate that, despite monitored exclusion zones, marine mammals – especially seals – routinely stray too close to the airguns. *See, e.g.,* Marine Mammal Monitoring and Mitigation During Open Water Seismic Exploration by ConocoPhillips Alaska, Inc. in the Chukchi Sea, July-October 2006, at 5-11-5-12 (January 2007) (ConocoPhillips 2006 90-day Report) (identifying 50 marine mammals likely exposed to seismic noise within the exclusion zone); Marine Mammal Monitoring and Mitigation During Open Water Seismic Exploration by Shell Offshore Inc. in the Chukchi and Beaufort Seas, July-September 2006: 90-Day Report, at 6-13 (January 2007) (identifying 24 seals likely exposed seismic noise within the exclusion zone); Marine Mammal Monitoring and Mitigation During Open Water Seismic Exploration by Shell Offshore Inc. in the Chukchi and Beaufort Seas, July–October 2008: 90-Day Report, at 7-14 (January 2009) (Shell 2008 90-day Report) (identifying 44 powerdowns involving 45 marine mammals). Often, seals were exposed to noise well within the safety zone. For example, during ConocoPhillip's 2006 surveys, the 190-dB contour reached 517 meters; yet seals repeatedly came within 300-400 meters of the airguns before mitigation could be implemented. ConocoPhillips 2006 90-day Report at 5-12 (Table 5.8).

Perhaps more importantly, the documented exposures were recorded only because conditions were such that the marine mammals could be observed. But this only represents a fraction of the time that airguns are operating. Observers cannot see animals at the surface when it is dark, and even during the day, visually detecting marine mammals from the deck of a vessel may be inhibited due to glare, fog, rough seas, the small size of animals such as seals, and the large proportion of time that animals spend submerged. Reported sightings are only "minimum" estimates of the number of animals potentially affected by surveying: animals move away or remain underwater and compromised visibility and high seas "are often significant limiting factors." Shell 2008 90-Day Report at 5-17. As is often the case, the marine mammal observers for Statoil's operations are relieved of monitoring the exclusion zones at night, except during periods before and during ramp ups. 75 Fed. Reg. at 32,385. The shortcomings of monitoring were reiterated in a report issued by an interagency task force led by a representative from the National Oceanic and Atmospheric Administration:

> visual monitoring under the best of conditions may detect less than 50 percent of most marine mammals and only 1-10 percent of some deep-diving mammals . . . . In poor weather and at night those percentages are reduced to effectively zero.

Joint Subcommittee on Ocean Science & Technology, Addressing the Effects of Human-Generated Sound on Marine Life: An Integrated Research Plan for U.S. Federal Agencies, at 58 (Jan. 2009) (JSOST). The peer review panel created for the 2010 Open Water meeting observed that Statoil's "proposed methods would not be sufficient for adequate monitoring of the area within the safety radii when the radii are far from the vessel." Expert Panel Review of Monitoring and Mitigation Protocols in Applications for Incidental Take Authorizations Related to Oil and Gas Exploration, Including Seismic Surveys, in the Chukchi and Beaufort Seas, at 22 (March 2010).

NMFS appears to simply presume that marine mammals will naturally avoid airguns when they are operating (even when limited to the single mitigation gun), removing the need for monitoring when conditions prevent observers from effectively watching for intrusions into the exclusion zones. That premise, however, is belied by the survey data indicating that shutdowns and powerdowns have repeatedly proven necessary. In other words, if all marine mammals avoid airguns at distances great enough to eliminate the potential for harm, then the imposition of exclusion zones would not result in the number of shutdowns and powerdowns that are recorded each year. The requirement for ramp ups rests on the same foundation – that marine mammals will leave an affected area as a result of increasing noise. *See* 75 Fed. Reg. at 32,385. Yet, as the JSOST report noted, although ramp up is a widely imposed practice, "there has never been a demonstration that it works as intended." JSOST at 58.[3]

Dr. David Bain, a biologist who specializes in the behavioral ecology of marine mammals and has focused a substantial portion of his work on audition, sound production, and other aspects of acoustic ecology, has reviewed the proposed IHA and provided a statement, attached as Exhibit 1. Dr. Bain provides additional reasons why it is faulty to assume that marine mammals will always move away from seismic noise, including the fact that individuals are not always able to correctly determine the best path for avoiding the sound. Ex. 1 at 4-5; *see also id*. at 13-15 (noting the difficulties with sighting marine mammals).

Moreover, Statoil's closely spaced survey lines and large cross-track distances will result in the "repeated exposure of the same area of water." 75 Fed. Reg. at 32,389. To remove the overlap, NMFS used an alternative method for calculating the area ensonified to 160-dB, recognizing that it was necessary to avoid "an overestimation of the number of animals potentially exposed." *Id*. This is consistent with previous IHAs that have found that tight survey lines can lead to repeated exposures of the same animal. *See* 73 Fed. Reg. 36,044, 36,050 (June 25, 2008) (noting that close spacing can result in animals "exposed several times before the vessel moves to a new site"). Although the area of overlap for 160-dB does not directly apply to the smaller 180- and 190-dB safety zones, the logic employed does reveal the potential for non-migratory species to encounter Statoil's surveying a number of times over its duration. As noted, NMFS considers repeated exposure to sound levels that potentially cause a TTS to create a risk of PTS. 75 Fed. Reg. at 32,382.

Because NMFS has not negated the possibility of serious injury from Statoil's seismic surveying, it may not issue an IHA.

C. The proposed IHA's small numbers finding is unjustified

The MMPA prohibits NMFS from authorizing the take of more than "small numbers" of marine mammals. 16 U.S.C. § 1371(a)(5)(D)(i). Critically, the MMPA definition of harassment

[3] In the lease sale 193 EIS, MMS – with NMFS as a cooperating agency – acknowledged that measures such as ramp ups are "not empirically proven," relying instead on "anecdotal evidence" and "professional reasoning." MMS, Final EIS Chukchi Sea Planning Area, Oil and Gas Lease Sale 193 and Seismic Surveying Activities in the Chukchi Sea, at II-25 (May 2007) (LS 193 EIS). The EIS did not expressly consider the industry survey results.

is focused on "potential harassment," which supports the conclusion that all of the animals in a population are harassed "if there is the *potential* for the act to disrupt the behavioral patterns of the most sensitive individual in the group." *Natural Res. Def. Council v. Evans*, 279 F. Supp. 2d 1129, 1157 (N.D. Cal. 2003) (emphasis added; in dicta); *see also* 16 U.S.C. § 1362(18)(A)(ii) (defining harassment to include any act of pursuit, torment, or annoyance that "has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns"). Recent amendments to the MMPA emphasize this point by requiring a more specific showing of disturbance for only two specified categories of activities. *See* 16 U.S.C. § 1362(18)(B)(ii) (defining harassment for a military readiness activity or scientific research activity as one that "disturbs or is likely to disturb" marine mammals to a point that natural behavioral patterns are "abandoned or significantly altered").[4] To estimate take, NMFS multiplied the area exposed to 160 dB by the expected density of each of the 12 marine species expected to be present. 75 Fed. Reg. at 32,389-90. Errors at each step, however, result in the proposed IHA underestimating potential effects.

1. The 160-dB harassment threshold is arbitrary

The proposed IHA calculates harassment from Statoil's proposed seismic surveying based on the exposure of marine mammals to sounds at or above 160 dB. *See* 75 Fed. Reg. at 32,389. This uniform approach to harassment, however, does not take into account known reactions of marine mammals in the Arctic to levels of noise well below 160 dB and avoids the MMPA injunction to consider even the "potential" for harassment. Much of the information NMFS relies on was gathered by industry during the course of oil and gas exploration. These data are skewed because they are often based upon the behavior of the more tolerant members of the population.

Harbor porpoises have been shown to be particularly responsive to sound, exhibiting behavioral changes, including exclusion from an area, at received levels of 90-110 dB or lower. Porpoises avoid pingers with source levels of about 130 dB at distances of 100 to 1,000 meters (with received levels around 70-90 dB), depending on experience with the noise source and environmental context. *See* Bain, D., *A Model Linking Energetic Effects of Whale Watching to in Killer Whale (Orcinus orca) Population Dynamics* (2002) (contract report, on file with Orca Relief Citizens' Alliance); Barlow, J. and G. A. Cameron, *Field Experiments Show That Acoustic Pingers Reduce Marine Mammal Bycatch in the California Drift Gillnet Fishery*, Paper IWC SC/S1/SM2 (1999); Cameron, G., *Report on the Effect of Acoustic Warning Devices (Pingers) on Cetacean and Pinniped Bycatch in the California Drift Gillnet Fishery*, NMFS Contract Report No. 40JGNF900207 (1999); Cox, T. M., A. J. Read, A. Solow and N. J. C. Tregenza, *Will Harbour Porpoises (Phocoena phocoena) Habituate to Pingers?* JOURNAL OF CETACEAN

[4] The current regulatory definition of "small numbers" incorporates NMFS's "negligible impact" finding, impermissibly conflating what should be two separate standards. 50 C.F.R. § 216.103 (defining small numbers as "a portion of a marine mammal species or stock whose taking would have a negligible impact" on that species or stock). Although the small numbers definition was found to be incompatible with the MMPA by one court, NMFS has not developed any guidance for how it determines whether the number of harassed marine mammals exceeds the statutory limitation. *See Natural Res. Def. Council v. Evans*, 279 F. Supp. 2d at 1153 (finding NMFS's definition "flatly inconsistent with the plain language of the statute").

RESEARCH AND MANAGEMENT 3(1): 81-86 (2001); Gearin, P. J., M. E. Gosho, L. Cooke, R. Delong, J. Laake and D. Greene, *Acoustic Alarm Experiment in the 1995 Northern Washington Marine Setnet Fishery,* NMML AND MAKAH TRIBAL FISHERIES MANAGEMENT DIVISION (1996); Kraus, S. D., A. J. Read, A Solow, K. Baldwin, T. Spradlin, E. Anderson & J. Williamson, *Acoustic Alarms Reduce Porpoise Mortality,* 388 Nature 525 (1997); Laake, J. L., P. J. Gearin, M. E. Gosho and R. L. DeLong, *Evaluation of Effectiveness of Pingers to Reduce Incidental Entanglement of Harbor Porpoise in a Set Gillnet Fishery, in* MMPA AND ESA IMPLEMENTATION PROGRAM, 1996 (P. S. Hill and D. P. DeMaster, eds.), AFSC Processed Report 97-10, 75-81 (1997); Laake, J., D. Rugh and L. Baraff, *Observations of Harbor Porpoise in the Vicinity of Acoustic Alarms on a Set Gill Net,* NOAA Tech. Memo. NMFS-AFSC-84 (1998); Laake, J. L., P. J. Gearin and R. L. DeLong, *Further Evaluation of Harbor Porpoise Habituation to Pingers in a Set Gillnet Fishery,* AFSC Processed Rep. 99-08 (1999).[5]

Similarly, as NMFS is aware, multiple studies confirm the sensitivity of beluga whales. Belugas are known to alter their migration paths in response to icebreaker noise at received levels as low as 80 dB. *See, e.g.*, 75 Fed. Reg. 25,730, 25,737 (May 7, 2010). Belugas have shown avoidance of icebreakers at distances of 35-50 kilometers, with some fleeing at distances of up to 80 kilometers. *Id*. Elsewhere, NMFS has taken notice of data suggesting that some belugas "might be avoiding the seismic operations" at distances of 10–20 kilometers. 74 Fed. Reg. 26,217, 26,226 (June 1, 2009). *See also* Sounding the Depths at 38 (noting that belugas in the Arctic have responded "dramatically" to ships and icebreakers).

In the past, NMFS has found the potential for behavioral disturbance to endangered bowhead whales based on exposures to sound levels significantly lower than 160-dB, referencing studies that found migrating bowheads avoided seismic activities at distances of 20-30 kilometers. 74 Fed. Reg. at 26,226. In the Environmental Assessment prepared to evaluate the impacts of noise from Shell's previous plans for offshore drilling, NMFS took note that

> preliminary information from a Canadian seismic survey in 2006 indicates that a tagged bowhead whale migrating westward ceased its migration until the seismic survey ended. This reaction is of concern to NMFS principally because one animal's response to seismic sounds is a likely indicator that a larger population of

[5] Indeed, studies have found behavioral responses from harbor porpoise at even lower levels. Kastelein, R. A., D. de Hahn, A. D. Goodson, C. Staal and N. Vaughan, *The Effects of Various Sounds on a Harbour Porpoise (Phocoena phocoena), in* THE BIOLOGY OF THE HARBOUR PORPOISE (1997); Kastelein, R. A., D. de Hahn, N. Vaughan, C. Staal and N.M. Schooneman, *The Influence of Three Acoustic Alarms on the Behaviour of Harbour Porpoises (Phocoena phocoena) in a Floating Pen*., 52 MAR. ENVIRO. RES. 351-371 (2001). *See also* Natural Resources Defense Council, *Sounding the Depths II: The Rising Toll of Sonar, Shipping, and Industrial Ocean Noise on Marine Life*, at 5-6 & 30 (Nov. 2005) ("Sounding the Depths") (noting that harbor porpoises are "notoriously sensitive" to sound and will flee tens of miles to escape, endangering themselves in the process), available at http://www.nrdc.org/wildlife/marine/sound/contents.asp.

> bowheads could exhibit the same response to seismic sound and possibly even drilling noise.

NMFS, Environmental Assessment for the Shell Offshore, Inc. Incidental Harassment Authorization to Take Marine Mammals Incidental to Conducting an Offshore Drilling Project in the U.S. Beaufort Sea Under the Marine Mammal Protection Act, at 9 (October 2007). This protective approach is entirely consistent with the need to consider the potential for an activity to disrupt the behavioral patterns of the most sensitive individual in the group. *See Natural Res. Def. Council*, 279 F. Supp. 2d at 1157.

Moreover, recent research on cetaceans' reactions to noise in the marine environment indicates that most species are much more sensitive than previously understood. Based on the new data, Dr. Bain recommends a threshold for harassment of bowhead and beluga whales as well as harbor porpoise significantly lower than 120-dB. Ex. 1 at 10-12. A draft version of the recent study – currently submitted for publication – is attached as Exhibit 2. NMFS should consider this data before moving forward.

2. The density calculations fail to use the best available science

The proposed IHA's use of a "density" measure in determining take in the Chukchi Sea during the bowhead migration is inappropriate. In the Beaufort Sea, NMFS has repeatedly found that using density is unsuited for determining bowhead take from seismic activities during the fall migration. *See, e.g.*, 73 Fed. Reg. 66,106, 66,115 (Nov. 6, 2008). Measuring potential harassment using a density approach assumes that animals remain relatively stationary from one day to the next, but this assumption is inapplicable for surveying that will take place within a migratory corridor. The proposed IHA does not indicate the rationale for using an approach that ignores the fact that bowhead whales will pass through the Chukchi Sea in the fall. As Dr. Bain notes, properly taking the bowhead migration into account, along with an appropriate sound threshold for harassment, could dramatically increase the estimate of harassed whales. Ex. 1 at 16-17.[6] Even accepting a density approach for bowhead whales, the figures in the proposed IHA are problematic and do not conform to best scientific practices. *Id*. at 8-10. Although it is not always clear exactly what methods were used, it is apparent that the calculations ignore uncertainties and that data were used inappropriately. *Id*. A different method is needed to accurately estimate how many whales will be exposed to elevated noise levels. *Id*. at 10.

D. <u>The proposed IHA's finding of negligible impact is unjustified</u>

A "negligible impact" is defined 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." 50 C.F.R. § 216.103. NMFS must base its determination of negligible impact on the "best available scientific

[6] Nor is it clear that NMFS adequately considered the migration of beluga whales in the Chukchi and whether a density approach in that instance is equally inappropriate. Although the proposed IHA notes that beluga densities in the Chukchi Sea are higher in the fall, this may not fully take into account the numbers associated with the migration.

evidence." *Id*. § 216.104(c); *id*. § 216.102(a). In *Brower v. Evans*, 257 F.3d 1058, 1070 (9th Cir. 2001), the court found that ESA caselaw "provides insightful and analogous provisions and analysis" when considering a best available science requirement. The Ninth Circuit has invoked the ESA's best available science standard to require that agencies give the "'benefit of the doubt'" to the species. *Conner v. Burford*, 848 F.2d 1441, 1454 (9th Cir. 1988) (quoting H.R. Conf. Rep. No. 96-697, 96th Cong. (1979)).

1. Stress and migratory deflections can harm marine mammals

At high levels, anthropogenic noise can cause temporary or permanent hearing damage to marine mammals. This, however, is not the only source of potential harm. Marine mammals can also suffer long-term impacts attributable to exposure to lower levels of noise.

Noise exposure is likely to result in stress, and stress can impair an animal's immune system. Ex. 1 at 5-6, 8, 11; Wright, A.J. *et al*., *Do Marine Mammals Experience Stress Related to Anthropogenic Noise?*, INTL. J. COMP. PSYCH. 20:274-316; Rolland, R. M., P. K. Hamilton, S. D. Kraus, B. Davenport, R. M. Gillett, and S. K. Wasser, *Faecal Sampling Using Detection Dogs to Study Reproduction And Health in North Atlantic Right Whales (Eubalaena Glacialis)*, J. CETACEAN RES. MANAGE. 8:121–125 (2006); and Romano T.A., M.J. Keogh, C. Kelly., P. Feng, L. Berk, C.E. Schlundt, D.A. Carder, J., Finneran, *Anthropogenic Sound and Marine Mammal Health: Measures of the Nervous and Immune Systems Before and After Sound Loud Enough to Shift Hearing Threshold*, CANADIAN JOURNAL OF FISHERIES AND AQUATIC SCIENCES; 61:1124–1134 (2004). Stress can occur even in the absence of any behavioral change or exclusion from habitat. The consequences will depend on the duration of exposure, population condition, and other factors like exposure to pathogens and immunosuppressing compounds. Indeed, the Navy has conservatively assumed in its EISs for active sonar training that any effect sufficient to cause hearing loss or produce a behavioral response sufficient to cause take under the MMPA will also produce a stress-response and contribute to a marine mammal's allostatic load. *See e.g*., U.S. Navy, Southern California Range Complex: Environmental Impact Statement/Overseas Environmental Impact Statement, at 3.9-102 (2008). The proposed IHA for Statoil's surveying, however, simply dismisses the possibility of stress impacts, claiming a lack of "definitive evidence." 75 Fed. Reg. at 32,382. NMFS has too quickly eliminated stress from consideration.

NMFS should also consider impacts to bowhead whales deflected from their migratory route. Such a deflection constitutes a significant disruption of normal migratory behavior. *See* Ex. 1 at 6-7. Once bowheads are deflected, it is unknown how long or how far they travel before returning to their normal migratory pathway. It is likely that this deflection at least extends to the 120-dB contour, but actual deflection may begin at even lower sound levels. Richardson, W.J., Miller, G.W., and Greene, C.R., *Displacement Of Migrating Bowhead Whales By Sounds From Seismic Surveys In Shallow Waters Of The Beaufort Sea*, J. ACOUST. SOC. AM. 106: 2281 (1999). The consequences of extending the whales' migratory route and requiring the expenditure of additional energy must be considered.

2. The effects of other activities in the Arctic combined with Statoil's surveying may harm marine mammals

NMFS cannot ensure that permitted activities will have no more than negligible impacts on the stock of bowhead whales without looking at all of the oil activities scheduled to take place this summer in the Arctic Ocean. As a result of its failure to look beyond Statoil's proposed

activities, NMFS understates the potential effect on bowhead whales. The Western Arctic population of bowhead whales relies on habitat in both the Chukchi and the Beaufort seas and is particularly susceptible to disturbance from industrial activity.

NMFS must consider the cumulative impacts of Statoil's surveying in the context of other activities taking place in the Arctic, such as Shell's surveying in the Chukchi and Beaufort seas. Shell proposes multiple surveys in both the Chukchi and Beaufort seas, including shallow hazard surveying in the bowhead migratory corridor. Concerns about the effects of Shell's surveys are detailed in the comments submitted to NMFS on June 17, 2010. In addition, NMFS should consider seismic surveys that will take place in whale habitat outside of U.S. waters. Four seismic surveys are planned in the Canadian Beaufort, which provides important summer feeding habitat for the bowhead whale.[7]

NMFS cannot accurately assess the potential for harm from Statoil's proposed marine mammal harassment without considering effects in the context of the other activities occurring in the Arctic. *See* Ex. 1 at 5-7. Without taking this into account, NMFS's estimates of take are inaccurate. According to NMFS's Alaska Stock Assessment Report, the "accumulation of impacts from vessels, seismic exploration, and drilling are of concern across the North Slope of Alaska." R. P Angliss and B. M. Allen, *Alaska Marine Mammal Stock Assessments, 2008*, U.S. Dep. Commerce., NOAA Tech. Memo, NMFS AFSC-193, at 198 (April 2009). The National Research Council (NRC) has advised agencies to assess cumulative effects to the population from multiple effects to multiple individuals:

> At the individual level, the biological significance of an effect must be judged by changes in the ability of an animal to grow, survive, and reproduce. The population effect involves the cumulative impact on all individuals affected. . . . Population consequences of behavioral change result from the accumulation of responses of individuals.

NRC, Marine Mammal Populations and Ocean Noise, Determining When Noise Causes Biologically Significant Effects, at 19-20 (2005). The Open Water peer review panel agreed that there is a need "for better analysis of the potentially interacting influences of multiple oil and gas activities co-occurring in time and space[.]" Panel Review at 9.[8]

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[7] Canadian Environmental Assessment Agency, Assessment Registry, Geographic View Northwest Territories Search Results, *available at* http://www.ceaa.gc.ca/050/output-eng.cfm?nav=3&evaluations=54749,54752,55407,55408.

[8] NMFS should also consider the potential impacts of surveying on gray whale feeding opportunities. Gray whales rely on the Northern Bering Strait and Chukchi Sea as primary feeding grounds. LS 193 EIS at III-79. In the Chukchi, they typically favor coastal areas and offshore shoals and have increasingly been found around the Hanna Shoal. Although the proposed IHA does provide for a 160-dB safety zone for aggregations of feeding whales, it does not specifically analyze the potential effects of surveying near Hanna Shoal.

E. The proposed IHA does not adequately consider measures to reduce impacts to the lowest level practicable

Pursuant to the MMPA, an IHA must prescribe "means of effecting the least practicable impact" on a species or stock and its habitat. 16 U.S.C. § 1371(a)(5)(D)(ii)(I). As is clear from the language chosen by Congress, the emphasis is on reducing the impact to the lowest level possible. NMFS has previously recognized that "practicable" qualifies "impact" not "means." When defending the conditions of an IHA against an industry challenge, the agency argued that the emphasis of the inquiry, thus, is on "the practicability of further reductions in harm (*i.e.*, can the reductions be achieved) rather than the economic costs of the 'means' used to obtain those reductions." Defendants' Opposition to Plaintiff's Motion to Stay at 22, *ConocoPhillips v. NMFS*, Case 3:06-cv-00198-RRB (D. AK Sept. 11, 2006).

NMFS should require a safety zone that is triggered by the presence of cow-calf pairs. Females with calves are considered to be more susceptible to noise disturbances, and NMFS must at least evaluate the necessity of additional mitigation to protect this vulnerable segment of the population. *See* LS 193 EIS IV-81 (noting that females baleen whales with calves "show a heightened response to noise and disturbance"). The proposed IHA must also clarify how marine mammal observers on the support vessels will assist in monitoring safety zones. As noted in the peer review comments, even with the addition of two support vessels, Statoil "will be able to monitor only a limited area." Panel Report at 22.[9]

In order to mitigate some of the difficulties that arise from relying on observers, NMFS should consider restricting surveying to times in which the safety zones are visible to marine monitors. Statoil should not operate in conditions – such as darkness, fog, or rough seas – in which the observers are unable to ensure that the safety zones are free of marine mammals. More importantly, NMFS must evaluate the benefits that would come from halting the surveying during the peak of the bowhead migration through the Chukchi Sea. There is general consensus that spatial-temporal avoidance of high value habitat represents one of the best means to diminish potential impacts. *See*, *e.g.*, Agardy, T., Aguilar Soto, N., Cañadas, A., Engel, M., Frantzis, A., Hatch, L., Hoyt, E., Kaschner, K., LaBrecque, E., Martin, V., Notarbartolo di Sciara, G., Pavan, G., Servidio, A., Smith, B., Wang, J., Weilgart, L., Wintle, B., and Wright, A., *A Global Scientific Workshop On Spatio-Temporal Management Of Noise*, REPORT OF WORKSHOP HELD IN PUERTO CALERO, LANZAROTE, JUNE 4-6, 2007 (2007).

F. The proposed IHA has not adequately justified its finding as to subsistence uses

The MMPA also requires that any incidental take authorized will not have "an unmitigatable adverse impact on the availability of such species or stock for taking for subsistence uses" by Alaska Natives. 16 U.S.C. § 1371(a)(5)(D)(i)(II). NMFS must ensure that Statoil's activities do not reduce the availability of any affected population or species to a level insufficient to meet subsistence needs. 50 C.F.R. § 216.103.

[9] In what is perhaps an inadvertent recognition of the difficulty in monitoring the 160-dB zone for whales, the proposed IHA references "aerial or vessel" monitoring, despite the lack of required aerial monitoring. 75 Fed. Reg. at 32,386. MMS does conduct aerial surveys for bowheads in the Chukchi Sea so it does not appear that safety issues are insurmountable.

In addition to the other issues already noted in these comments, NMFS should also, as part of its MMPA review, evaluate the potential impacts of future activities in both seas and the acknowledged uncertainty regarding the effects of noise in the marine environment. The importance of bowhead and beluga whales to coastal communities and their acknowledged sensitivity to noise impacts strongly favor a precautionary approach. To do so, NMFS should first undertake a comprehensive assessment of traditional ecological knowledge. For these reasons, NMFS has not adequately supported its MMPA finding as to subsistence resources. *See* 50 C.F.R. § 216.104(c) (best available science standard for subsistence finding).

III. ENDANGERED SPECIES ACT

Although NMFS states in the Federal Register that it has begun ESA consultation on the issuance of the authorization for Statoil's marine seismic activities, 75 Fed. Reg. at 32,398, it is not clear how the self-consultation will proceed. Since at least 1988, multiple agencies have relied on NMFS's regional biological opinions when considering the impacts of oil and gas activities throughout the Arctic. For this consultation, NMFS is likely to consider a number of options, including updating the most-recent 2008 regional biological opinion or issuing a wholly new decision based on this specific action. Regardless of the path NMFS chooses, however, it must address potential future drilling in the Arctic through an appropriate baseline analysis as well as part of a comprehensive look at the "agency action" under review. It cannot isolate drilling alone for ESA review nor can it rely solely on the existing 2008 biological opinion given its failure to adequately consider Shell's proposed drilling in the Arctic and failure to adequately consider oil spill risks from future drilling.

A. NMFS's consultation must consider the impact of potential future oil and gas activities

A biological opinion must detail how the agency action under review affects the species or its critical habitat. 16 U.S.C. § 1536(b)(3)(A). The Ninth Circuit has emphasized that this requires examining the effects of the "*entire* agency action." *Conner*, 848 F.2d at 1453; *see also id*. (observing that the term "agency action" is to be interpreted broadly). The effects of the action are then added to the "environmental baseline," which consists of the past and present impacts of activities in the action area as well as "the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation." 50 C.F.R. § 402.02. The full analysis requires that agencies determine what jeopardy might result "from the agency's proposed actions in the present and future human and natural contexts." *Pac. Coast Fed'n of Fishermen's Ass'ns v. U.S. Bureau of Reclamation*, 426 F.3d 1082, 1093 (9th Cir. 2005).

Shell's proposed exploration plans for the Chukchi and Beaufort seas were approved by MMS in 2009. For the ESA consultation, those approvals relied on NMFS's 2008 regional biological opinion. *See* MMS, Environmental Assessment, Shell Offshore, Inc., 2010 Outer Continental Shelf Lease Exploration Plan, Camden Bay, Alaska, at 74 (Oct. 2009) ("Consultation with NMFS for Shell's proposed exploration activities is covered by the July 17, 2008, BO[.]"). Shell did not, however, receive final approval to begin drilling, and following the disaster in Gulf of Mexico, the Department of the Interior announced that it was suspending

further offshore activity in the Arctic. Additional review is required before Shell can move forward with its plans, but the proposals have undergone formal section 7 consultation and consequently must be added to the baseline when evaluating the effects of Statoil's seismic surveying.

Moreover, NMFS must take a comprehensive approach to Statoil's proposed seismic activity in order to capture the full scope of its potential effects. As noted, the term "agency action," is defined broadly. *Conner*, 848 F.2d at 1453; *see also Pacific Rivers Council v. Thomas*, 30 F.3d 1050, 1054 (9th Cir. 1994) (finding that "there is little doubt" that Congress intended a broad definition of agency action). Only by considering all phases of a project can a biological opinion appropriately evaluate "all the possible ramifications" of an activity. *Conner*, 848 F.2d at 1453 (quotation marks omitted) (quoting *North Slope Borough v. Andrus*, 642 F.2d 589, 608 (D.C. Cir. 1980)). As explained by one court,

> any course of agency action could ultimately be divided into multiple small actions, none of which, in and of themselves, would cause jeopardy. Moreover, such impermissible segmentation would allow agencies to engage in a series of limited consultations without ever undertaking a comprehensive assessment of the impacts of their overall activity on protected species. The ESA requires more; it "requires that the consulting agency scrutinize the *total scope* of agency action."

Am. Rivers v. U.S. Army Corps of Eng'rs, 271 F. Supp. 2d 230, 255 (D.D.C. 2003) (quoting *North Slope Borough v. Andrus*, 486 F. Supp. 332, 353 (D.C.C. 1980)). *See also Pacific Rivers Council*, 30 F.3d at 1056 n.12 (finding that consultation on an entire plan, and not just an amendment to the plan, is required, citing *Conner*).

In the oil and gas context, the Ninth Circuit has held that even at the lease sale stage the ESA requires consultations to consider the effects of subsequent exploration and production. *Conner*, 848 F.2d at 1453. The decision in *Conner* favorably quotes the D.C. Circuit for the recognition that "pumping oil" not "leasing tracts" is the aim of congressional mineral leasing policy. *Id*. (quotation marks omitted). Doing so allows the consideration, at an early juncture, of whether measures are necessary to avoid later conflicts. For example, it may be that "post-leasing activities in particular areas [are] fundamentally incompatible with the continued existence of the [protected] species." *Id*. at 1454. A forward-looking biological opinion can also identify potential conflicts due to cumulative impacts and avoid the "piecemeal chipping away of habitat." *Id*. Although precise information about later activities may be inexact, the ESA does "not create an exception to the statutory requirement of a comprehensive biological opinion on that basis." *Id*.

This reasoning applies equally to Statoil's seismic surveys. The surveys are taking place on Statoil's Chukchi Sea lease holdings in furtherance of its undeniable intent to pump oil out of the ground. The stated purpose of the 3D surveying is the "support of future oil and gas development within the area of coverage." Statoil USA E&P Inc., Request for an Incidental Harassment Authorization by Statoil to Allow Incidental Harassment of Marine Mammals During a 3D Marine Seismic Surveying in the Chukchi Sea, Alaska, 2010, at 1 (April 14, 2010).

Indeed, NMFS itself generally categorizes seismic surveying as part of the leasing and exploration phase of oil and gas development, to be followed by development and production. 2008 BiOp at 2; *see also* 75 Fed. Reg. 6,175, 6,176 (Feb. 8, 2010) (noting that information from seismic activities "enables industry to accurately assess potential hydrocarbon reservoirs, helps to optimally locate exploration and development wells, maximizing extraction and production from a reservoir, and to locate shallow geologic hazards"). Whether the area is appropriate for future industrial activity – and whether protective measures are needed – should be considered in light of the best available science as it exists today. Reviewing the surveying in isolation would ignore the appropriate context of the activity and impermissibly segment NMFS's analysis under the ESA.[10]

Because Shell has existing proposals for drilling in the Arctic and because Statoil's proposed surveying is part of longer-term plans that potentially culminate in production wells, a comprehensive assessment of impacts on endangered species should take place before resources are committed to an effort that may ultimately jeopardize listed species.

B. NMFS's existing regional biological opinion is inadequate

To satisfy the requirements of the ESA, NMFS's consultation for Statoil's surveying must go beyond the analysis in 2008 regional biological opinion to consider probable impacts based on the best information available, including both the site-specific details of Shell's exploration drilling plans and what is known about the potential for oil spills and oil spill response capabilities.

1. The 2008 biological opinion does not adequately consider site-specific information related to Shell's proposed drilling

Shell's proposed Camden Bay exploration drilling in the Beaufort Sea requires a site-specific ESA analysis. As NMFS found in the 2008 biological opinion, it is the "timing, location, and number" of the disturbances that determine whether oil and gas related noise disturbances will result in a biologically significant impacts. 2008 BiOp at 86. NMFS must use the data related to Shell's drilling proposal (dates of operation; projected noise levels from vessels / equipment) combined with the exact location of the project to develop a complete picture of the likely effects.

Concentrations of loud noise and disturbance activities during the open water period "have the potential to cause large numbers of [bowhead] whales to avoid using areas for resting and feeding for long periods of time (days to months) while the noise producing activities continue." *Id*. at 89. The consequences of this avoidance "would be of particular concern if [inaccessible] areas included those used for feeding or resting by large numbers of individuals or

[10] In the past, NMFS has maintained that an IHA authorizes only the harassment of marine mammals and not the underlying action. This distinction is overly formalistic. Shell's seismic activity would be illegal absent NMFS's authorization, and stripping the IHA of its context would undermine the operation of the ESA. *Cf. Ramsey v. Kantor*, 96 F.3d 434, 444 (9th Cir. 1996) (noting that the issuance of an incidental take statement that allows an activity to take place that would otherwise be illegal is a federal "action" for NEPA purposes).

by females and calves." *Id*. at 86; *see also id.* at 47 ("Increased noise levels could . . . alter normal behavior, such as causing avoidance behavior that keeps animals from an important area or displace a migration route farther from shore."). Due to the "potential for noise disturbance to displace whales from important feeding areas," NMFS has advised that "special scrutiny should be given to seismic and drilling operations which may impact these areas." *Id*. at 99; *see also id.* at 68 (stating that "[s]mall deflections in individual bowhead-swimming paths and a reduction in use of possible bowhead-feeding areas near exploration units may result in adverse effects on the species").

Camden Bay has been repeatedly identified as a resting and feeding area for migrating bowheads. *See* Donald K. Ljungblad, Sue E. Moore, and Janet T. Clarke, *Assessment of Bowhead Whale (Balena mysticetus) Feeding Patterns in the Alaskan Beaufort and Northeastern Chukchi Seas via Aerial Surveys, Fall 1979-84*, 36 REP. INT. WHAL. COMM'N 265, 270 (1986) (feeding whales seen in "four of the six years north of Camden Bay and Prudhoe Bay"); Donald K. Ljungblad, Sue E. Moore, and Janet T. Clarke, *Bowhead Whale (Balaena mysticetus) Spatial and Temporal Distribution in the Central Beaufort Sea During Late Summer and Early Fall 1979-86*, 39 REP. INT. WHAL. COMM'N , 283, 289 (1989) (feeding bowheads seen north of Camden Bay in 1982 and 1984). Whaling captains from Nuiqsut and Kaktovik "consistently report bowhead whales feeding, resting, and caring for young in Camden Bay waters." Alaska Eskimo Whaling Commission, *Summary of Key Research on Bowhead Whale Impacts Due to Offshore Oil and Gas Activity During the Beaufort Sea Fall Open Water Season and Bowhead Whale Use of the Alaskan Beaufort Sea During Fall Westward Migration*, at 1 (Aug. 2009) (attached as Exhibit 3).

Recent monitoring has reaffirmed the past usage. In 2008, Shell conducted aerial surveys in support of seismic activities at its Torpedo and nearby Masva prospects. LGL, Marine Mammal Monitoring and Mitigation During Open Water Seismic Exploration by Shell Offshore Inc. in the Chukchi and Beaufort Seas, July-October 2008: 90-Day Report, at 9-3 (Jan. 2009). Based on those whales whose activity could be characterized, just over 75% were determined to be feeding, with 15% resting. *Id*. at 9-51. In 2007, Shell conducted aerial surveys associated with seismic activity on its Sivilluq prospect. LGL, Marine Mammal Monitoring and Mitigation During Open Water Seismic Exploration by Shell Offshore Inc. in the Chukchi and Beaufort Seas, July-November 2007: 90-Day Report, at 5-92 (Jan. 2008). It estimated that just over 50% of the bowheads were feeding, with approximately 13% resting. *Id.* at 5-109. Based on the number of observed whales, as many as 4,826 whales may have been present in the Camden Bay area in mid-September. *Id*. at 5-100. *See* Shell Offshore Inc., 2010 Outer Continental Shelf Lease Exploration Plan Camden Bay, Alaska, Appendix H, at 130 (June 2009) (Shell's Environmental Impact Analysis noting that in "2007 and 2008 bowhead whales also used areas near Camden Bay to feed during the migration"). The industry's joint monitoring report for activities in 2006 noted more than a third of the whales in Camden Bay were using the area for resting. LGL, Joint Monitoring Program in the Chukchi and Beaufort Seas, July-November 2006, at 8-14 (Table 8.3) (Nov. 2007).

The biological opinion's concern with limiting the number of displaced whales – and the elevated concern for cow-calf pairs – is consistent with the agency's past regulatory decisionmaking in the Arctic. In 2006, NMFS issued a finding of no significant impact for

multiple seismic operations in the Arctic based on the imposition of a 120-dB safety zone for 4 or more cow-calf pairs and a 160-dB safety zone for aggregations of feeding whales. *See* 71 Fed. Reg. 66,912, 66,913 (Nov. 17, 2006) (noting that the 120-dB requirement was "essential" to NMFS's finding of no significant impact). As NMFS has recognized, "protective measures should be designed to reduce the potential for disruption of biologically significant behaviors or help ensure that whales do not avoid important key habitat areas (*and thus potentially negate a negligible impact finding under the MMPA*)[.]" 73 Fed. Reg. 49,421, 49,429 (Aug. 21, 2008) (emphasis added); *see also* MMS, Final Programmatic Environmental Assessment, Arctic Ocean Outer Continental Shelf Seismic Surveys – 2006, at 111 (OCS EIS/EA MMS 2006-038) ("To the extent that information exists, we have highlighted potential effects that could affect the use of areas used for calving, feeding, resting, and breeding by large numbers of whales."). NMFS should re-examine the potential impacts of Shell's proposed drilling in light of its long-standing policy and the cautionary language contained in its 2008 opinion.[11]

2. The 2008 biological opinion does not adequately consider oil spills

In the 2008 biological opinion, NMFS recognized the potential dangers of a large oil spill. Whales contacting oil, particularly freshly-spilled oil, "could be harmed and possibly killed." 2008 BiOp at 99. This is especially problematic were aggregations of whales or females and newborns/young calves exposed, in which case "highly significant effects could occur[.]" *Id*. at 113; *see also id*. at 103 (potential for population-level effects "may exist" if females and newborn / young calves are exposed). Overall, however, NMFS found that several "coincidental events" would have to take place for such harm to occur: 1) a spill; 2) that coincides with the whales' seasonal presence; 3) that is "transported to the area the whales occupy (e.g. the migrational corridor or spring lead system)"; and 4) is not successfully cleaned up. *Id*. at 99 (reviewing oil spill effects at the exploration stage); *see also id*. at 115 (reviewing oil spill effects at the production stage and finding that significant adverse effects would only be expected "if all of the low probability events occurred at the same time").

Existing circumstances demonstrate that this combination of events is not as remote as NMFS appears to have assumed. First, NMFS's analysis of whether a spill may occur relies in part on statistical probabilities based on past incidents. 2008 BiOp at 90-91 (exploration drilling). The ongoing disaster in the Gulf of Mexico, however, has revealed that current regulatory safeguards are insufficient to prevent large-scale spills from happening. There appears to have been a significant breakdown in the system that was intended to both prevent spills from occurring and require adequate oil spill response capabilities to limit the harm.[12] Moreover, problems with the adequacy of MMS's environmental reviews have been previously documented. According to a GAO report, the Alaska office of MMS has been subject to

[11] Although NMFS downplayed the potential effects of missed feeding and resting opportunities in its proposed IHA for Shell's Camden Bay drilling, its dismissal runs counter to the agency's long-standing practice and ignores existing science.

[12] *See, e.g., Tracking down Minerals Management Service's dysfunctional history of drilling oversight*, available at http://www.denverpost.com/headlines/ci_15236764; *U.S. agency overseeing oil drilling ignored warnings of risks*, available at http://www.washingtonpost.com/wp-dyn/content/article/2010/05/24/AR2010052401974_pf.html.

allegations by former MMS scientists that it suppressed or altered work. Government Accounting Office, GAO-10-276, *Offshore Oil and Gas Development: Additional Guidance Would Help Strengthen the Minerals Management Service's Assessment of Impacts in the North Aleutian Basin*, at 24 (March 2010). NMFS must take into account that there are likely gaps in the current regulatory regime. Given those flaws, an analysis that relies on the safety record of previous drilling is doubtful as a predictive tool.

As for the second and third contingencies, Statoil's surveying could support production from within the bowhead whales' migration corridor, proximate to the historical spring lead system. Shell's proposed Chukchi drilling is located to the west of Statoil's leases, but is similarly situated when considering potential effects to bowheads. Shell's Beaufort Sea drilling is, as noted, proposed for an established feeding and resting area in Camden Bay. In all, these possible drill sites present scenarios in which the probability of spilled oil reaching areas utilized by bowhead whales is 100%. *See* 2008 BiOp at 114 (recognizing that depending on the location of the drilling "many scenarios" will present a 100% probability).

Finally, the recent events in the Gulf of Mexico also underscore the fact that cleaning up a large-scale oil spill is exceptionally difficult, and this is especially true were a spill to occur in the Arctic. Even the biological opinion observes that spill response drills in the Beaufort had "failed to demonstrate industry can adequately respond under [broken or newly formed ice] conditions[.]." 2008 BiOp at 100. In the Chukchi, spill response protocols, technologies, plans, and infrastructure at the time of the opinion were either not fully developed or are untested. *Id*. NOAA reiterated its concerns last year in its comments to MMS regarding the draft 2010-2015 leasing plan. NOAA, Comments on the U.S. Department of the Interior / Minerals Management Service Draft Proposed Outer Continental Shelf Oil and Gas Leasing Program for 2010-2015, at 5 (September 9, 2009). The inability to effectively clean up spills weighs on the other factors as well – oil remaining in and around an area like the spring lead system at the end of the season could freeze in the ice, only to return to the open water during spring thaw. The biological opinion does not, however, adequately consider the possibility that oil will carry over from season to season.

CONCLUSION

For the above reasons, Statoil's request for an IHA for marine mammal harassment incident to its 2010 seismic surveying should be denied. Thank you for your consideration of these comments.

Respectfully,

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EXHIBIT 1

Comments of Dr. David E. Bain on Takes of Marine Mammals Incidental to Specified Activities; Taking Marine Mammals Incidental to Open Water Marine Seismic Survey in the Chukchi Sea, Alaska

I am currently a contracting scientist for the National Marine Fisheries Service. I received my B.A. with majors in Biology and Psychobiology with Physics in 1980 and Ph.D. in Biology in 1989 from the University of California at Santa Cruz. I have authored over 30 peer-reviewed papers and reports on the behavioral ecology of marine mammals, especially of killer whales (*Orcinus*). A substantial portion of this work has been concerned with audition, sound production, and other aspects of the acoustic ecology of these species. I have conducted studies for the National Marine Mammal Laboratory and other branches of the National Marine Fisheries Service, Minerals Management Service, and U.S. Geological Survey on the impacts of acoustic disturbance on individuals and populations of marine mammals. Reports based on these and other disturbance related studies have been published in books and peer-reviewed journals and presented at scientific meetings of the International Whaling Commission, the Society for Marine Mammalogy, and the Acoustical Society of America.

The proposed seismic surveys are highly likely to adversely affect the Bering-Chukchi-Beaufort stock (BCBS) of the bowhead whale. The recovery of the BCBS stock is in contrast to the recovery of other stocks. There is no evidence that other bowhead stocks have increased, although data are limited (Reilly et al. 2008). The Sea of Okhotsk stock may have been exposed to excessive harvest as part of illegal Soviet whaling. All stocks face potential impact from entanglement, vessel collisions, and disturbance (Allen and Angliss 2010). Maintaining the BCBS bowheads is the best way to ensure survival of the species as a whole. Protecting them from expanding threats such as oil exploration and drilling, and the associated activities that may have limited the recovery of other stocks, are important steps in sustaining this species.

In addition, they are likely to harm harbor porpoises, belugas, and the four seal species present in the area. They may also contribute to a small increase in gray whale mortality.

NMFS lacks the basic data to make management decisions regarding harbor porpoises, bearded, ringed and spotted seals. It also lacks basic data for ribbon seals, although NMFS felt the data were sufficient to determine they are not endangered. In addition, species like bowhead, fin, humpback, beluga and killer whales have low availability for additional takes (<20) before the total exceeds PBR. Emaciated gray whales have been stranding this year, suggesting their population is currently food limited. It is difficult for NMFS to justify a finding that, even with the proposed mitigation measures, it has sufficient data to find these species will not be adversely affected by the proposed seismic survey.

Species of concern

The following summarizes species descriptions in Allen and Angliss (2010).

Bowhead whales are “endangered” under the ESA and “depleted” under the MMPA. PBR has been set 95, of which 67 (plus 15 from unused quotas in past years) have been set aside for subsistence harvest in the U.S. and Russia. Additional bowheads are sometimes harvested in Canada. Although additional takes occur during fisheries, the number is unknown due to lack of observer effort. “The accumulation

of impacts from vessels, seismic exploration, and drilling are of concern across the North Slope of Alaska." Given the existing level of impact already authorized, there is little room for additional impact from new seismic exploration. Although the population was still growing when last censused in 2001, it may now be approaching carrying capacity.

Gray whales were taken off the endangered species list in 1994. Although the population continued to increase after that, there has been a recent decline to the level at which delisting occurred. It is possible that the population has exceeded carrying capacity. The result is that many individuals have become emaciated, and further result on the population is likely to result in mortality. However, human caused mortality is currently well below PBR. Thus disturbance from seismic surveys that displaces individuals from feeding grounds poses risk of lethal effects on individuals, but is less likely to threaten the survival of the species as a whole.

Humpback whales are endangered and the stock inhabiting Northern Alaska has a small PBR. Due to uncertainty over the exact amount of human caused mortality, it is unknown whether ongoing human caused mortality exceeds PBR. Although humpback use of the project area is likely to be minimal, any impact on humpbacks poses threats at both the individual and population level. The story is the same for fin whales, except that ongoing human-caused mortality is believed to be near 0 if one does not consider ship strikes.

The Eastern Chukchi beluga stock is not listed under the ESA or MMPA. The PBR is undetermined, because no recent population data are available. If PBR were estimated from old data, it would be 74, with an average annual subsistence harvest of 59. This leaves 15 individuals for other human-caused mortality, which is smaller than many aggregations of belugas. That is, if seismic surveys had lethal effects on a single group of belugas, it could put human-caused mortality over PBR.

Killer whales have been observed in the project area, but the stock(s) present is unknown. They are most likely members of the Gulf of Alaska, Aleutian Islands, and Bering Sea Transient Stock, which has a PBR of 3.1, some of which is used by fishery interactions. A little less likely to be present are members of the Eastern North Pacific Alaska Resident Stock, which has a PBR of 11.2, with an existing human caused mortality of 1.5 per year. For members of either stock, lethal effects of noise to a single group would exceed PBR.

Harbor porpoises currently assigned to the Bering Sea Stock occur in the project area. However, the SAR contains the following caveat:

> " NOTE – March 2008: In areas outside of Alaska, studies have shown that stock structure is more fine-scale than is reflected in the Alaska Stock Assessment Reports. At this time, no data are available to reflect stock structure for harbor porpoise in Alaska. However, based on comparisons with other regions, smaller stocks are likely. Should new information on harbor porpoise stocks become available, the harbor porpoise Stock Assessment Reports will be updated."

Further, PBR is undetermined as recent population estimates do not exist. Similarly, data on incidental takes in fisheries is "sparse." In summary, NMFS does not know the population size or range of the stock(s) that may be affected, what the population trend is, or what activities are already affecting the stock(s). With the exception of an approximation of the number of subsistence takes, NMFS lacks the

information needed to manage harbor porpoises in this area.

NMFS responded to petitions to list bearded, ribbon, ringed and spotted seals under the Endangered Species Act with a finding that a review of their status was warranted. As with harbor porpoises, no recent information on population size or trends is available, although incidental take and subsistence harvest data are available. Further, the potential impact of receding ice may be significant. NMFS completed review of the petition to list ribbon seals and decided not to list them.

Risk of serious injury

Serious injury may occur in two ways. First, sound can directly lead to injury. Attention to this mechanism has generally been focused on temporary or permanent hearing damage. However, gas bubble lesions have been postulated to be another mechanism, although this has lost favor in recent years. The other mechanism is behavioral responses leading to indirect injury.

Southall et al. (2007) provided a useful framework for discussing behavioral responses. They developed a severity scale to allow a graded description of behavioral changes rather than forcing a binary decision about whether a particular change constitutes a take. Changes low on the scale would only have population-scale effects if the changes were long lasting due to long-term exposure, or were widespread due to sources affecting a large percentage of populations. I.e., the population consequences of a single vessel passing by a dolphin would be expected to be less than a fleet of vessels spending many hours per day for months every year dolphin watching, even if the behavioral responses were the same to each vessel approach (Lusseau et al. 2006). Changes high on the scale could result in immediate injury or death through mechanisms such as stranding, gas bubble formation, separation of mothers from calves, stampedes, etc., if they occurred in the relevant settings (Southall et al. 2007).

Southall et al. (2007) also began an effort to associate received levels with types of behavioral changes for various species. As their review relied on published reports, they were selective for datasets reported in a way that fit their categorization scheme. However, other workers have access to raw data and can rescore behavioral responses using Southall et al.'s system (e.g., Bain and Williams in review). As these reports, and reports based on new data become available, the variation among species in response to given levels of stimuli will become more clear. These reports are likely to include evidence that many marine mammals are more sensitive to noise than the cases considered by Southall et al. (2007).

In the meantime, there has been an effort to generalize responsiveness based on morphological group, such as pinnipeds, high-frequency hearing specialists (small odontocetes), low-frequency specialists (mysticetes), etc. However, Bain and Williams (in review) found this approach was unlikely to be valid, as sibling species such as Dall's and harbor porpoises differed dramatically in their responses to noise from the same airguns in the same geographic area, and harbor porpoises appeared more responsive to airguns than low-frequency specialists like gray whales.

In summary, Southall et al.'s (2007) paper is likely to be seminal in providing a framework for discussing the effects of noise on marine mammals, but it considered only a subset of the existing literature, and hence did not provide a comprehensive view of the available knowledge.

Direct injury

Richardson *et al.* (1995) described the concept of zones of influence. The zone of most concern is the one in which there is risk of immediate injury or death. One mechanism is damage to the ears that causes permanent threshold shifts (PTS, Syka and Popelar 1980, Blakeslee *et al.* 1978, Nielsen *et al.* 1978, Solecki and Gerken 1990, Clark 1991, McCauley *et al.* 2003). There is great uncertainty over levels that may cause this. Estimates have been based on research on a handful of terrestrial mammals, birds, and fish. An often stated assumption is that the threshold for PTS must be higher than the threshold for Temporary Threshold Shift (TTS), which has been addressed in a few marine mammal species (Nachtigall *et al.* 2003, Kastak *et al.* 2005, Finneran *et al.* 2002 and 2005). However, in humans, chronic exposure to levels of noise too low to generate a TTS can result in PTS (Henderson *et al.* 1991, OSHA 2007).

Bubble formation may be caused by moderate levels of noise. Rectified diffusion (Crum and Mao 1996) and decompression sickness (Jepson *et al.* 2003) are two postulated mechanisms for this. In rectified diffusion, acoustic energy causes gas to diffuse from the blood into small bubbles. Since bubbles are smaller when compressed, and larger when rarified, the net diffusion is into the bubble, leading to bubble growth in blood, fat, or other tissues, to injurious size. As mentioned above, behaviorally mediated decompression sickness is considered more likely than rectified diffusion as the cause of bubble formation (Cox et al. 2006).

Studies of TTS in marine mammals have suggested both received level and duration are important in the degree of TTS inflicted. Thus NMFS has been inclined to establish safety zones to prevent a single pulse from causing TTS. NMFS has assumed that animals will move away from airguns to limit the number of high-intensity pulses they will receive. However, observations of marine mammals in the presence of airguns indicate the assumption that moving away will be a response is often flawed. There are both physical and behavioral reasons for this.

Airgun arrays do not project noise equally in all directions, as can be seen by comparing the measurements of received level ahead of and beside the array reported by the applicant. The beams formed by the array can cause an animal moving from high exposure toward lower exposure to move toward the travel path of the seismic survey vessel, ultimately resulting in higher exposure.

Second, the flight path of animals moving away is not always optimal. Animals may begin by swimming directly away from the array. However, if the array is moving toward them at faster than their sustained swimming speed, the array will approach them. After a while, animals may change tactics to moving orthogonal to the direction of array movement. While orthogonal movement will ultimately reduce the maximum noise level experienced, it allows the seismic survey vessel to close on their location faster. Shortly before the animals are orthogonal to the survey vessel, they may turn and head in the opposite direction of the survey vessel, briefing approaching it, but then increasing the distance between them at close to the highest possible rate.

Third, pinnipeds have been observed visually orienting toward the seismic survey vessel (apparently watching it) rather than move away. As they are not moving away, the seismic survey vessel can approach them. Orienting behavior is interrupted with occasional swimming behavior. While the

swims can increase the distance between the pinniped and the vessels track line, submerging exposes the ears to the full intensity of the received pulses.

Fourth, marine mammals may tolerant injury while feeding. Extreme examples are found in fishery interactions (Reeves et al. 1996). Fishers and NMFS personnel have shot animals and used seal bombs to inflict pain in unsuccessful efforts to deter depredation (Yano and Dahlheim 1995). Predators sometimes swallow hooks along with their prey(pers. obs.).

Of interest in this context is the use of sound to deter California sea lions at "Ballard Locks" in Seattle, WA (Reeves et al. 1996). Devices that were completely ineffective at deterring sea lions that had fed there were very effective at deterring naive sea lions. That is, 195 dB noise sources were disturbing enough to deter sea lions who did not know it was a good feeding area, but were ineffective against sea lions that had been feeding there. These observations are important because they show that noise discourages efforts to find food in a place it is available (i.e., there was harm from deflection from a feeding area), while at the same time showing that animals expose themselves to harm (from noise and projectiles) to remain in a feeding area.

Similarly, killer whales have been shown to withstand injuries (even some that eventually proved fatal) to continue to feed on sablefish hooked on long lines (ref.).The same species has been shown to give up on foraging in the presence of noise above about 105 dB (Williams et al. 2006, Lusseau et al. 2009, Holt). Again, noise that in one case is sufficient to cause harm through inhibiting foraging behavior can also cause injury once prey have been located. Similarly, baleen whales can be displaced by whale watching boats less easily while feeding than during other behavior states.

In the arctic, on many occasions vessels have had to shut down because seals were discovered within the safety zone. As discussed above, it is likely that for each one observed, many more were present but not observed. Given the behavior of temperate pinnipeds, it is not surprising that arctic pinnipeds are also closely approached by seismic survey vessels. Cetaceans may in general avoid seismic survey vessels more effectively than pinnipeds, but escape responses may be limited land, ice, or other noise sources.

In summary, many pinnipeds would be expected to be exposed to airgun blasts where one or a few pulses are sufficient to cause temporary threshold shifts. Cetaceans may also be exposed to injurious levels of noise, although the circumstances resulting in such exposure are more likely to be less common for cetaceans than pinnipeds.

Indirect injury

A behavioral change, remaining submerged for an extended period of time followed by rapid surfacing, may also lead to bubble formation. In decompression sickness, gas diffuses into the blood under pressure at depth, and diffuses out of the blood when pressure drops as the animals surface. Rather than safely diffusing back into the lungs, if animals surface too rapidly, bubbles may form in the blood, or excessive gas my diffuse into other air sinuses around the ears and in the skull, as well as into other tissues such as liver or fat. This latter mechanism is behaviorally mediated, rather than a direct effect of sound.

Behavioral changes may lead to injury or death through a number of other mechanisms. One example is that hearing loss due to PTS or TTS (Mills *et al.* 1978, Gao *et al.* 1992) may prevent animals from detecting approaching vessels, leading to collisions between marine mammals and vessels. Such collisions are often ultimately fatal. Impaired hearing may also lead to entanglement (Todd *et al.* 1996) and increased risk of predation (Dahlheim and Towell 1994).

Another behavioral response to noise is flight. Flight can result in stranding (NOAA and Navy 2001), or extreme exhaustion resulting in muscle damage or heart failure (Williams and Thorne 1996). When animals differ in their flight response, social units can be split (e.g., Dall's porpoises in response to airguns [Bain and Williams 2006], killer whales in response to mid-frequency sonar: Bain pers. obs.). If splits occur between mother and calf, the outcome could be fatal for the calf.

Another consequence of exposure to noise is stress (Romano *et al.* 2004). Stress can lead to physiological damage, susceptibility to illness, termination of pregnancy, and injury in aggressive interactions. Resonance of tissue (Finneran 2003) provides a mechanism other than hearing for detecting noise that has the potential to lead to stress. The absence of refuge from stress will be particularly difficult for species that reside in the area.

Many noise exposure protocols consider movement of animals out of the area an acceptable outcome, as the animals are not exposed to high levels of noise. However, such movement requires expenditure of significant amounts of energy. Assuming animals were in optimal habitat, moving out of that habitat is likely to have consequences such as reduced foraging efficiency. They may also move into habitat where they face increased risk of predation.

While high levels of noise lead to TTS and PTS that impair hearing even after exposure to noise has ended, hearing ability can also be impaired during exposure to low levels of noise. Masking can lead to increased risk of predation and reduced foraging efficiency (see Au *et al.* 1988, Bain and Dahlheim 1994, Fisheries and Oceans Canada 2008).

Chukchi Sea specific Impacts

With the above types of impacts in mind, specific consideration can be given to the effects of the proposed seismic surveys.

Bowheads and gray whales are likely to be displaced from parts of the Chukchi Sea during the summer feeding season and fall migration. This will result in a loss of resting and feeding areas to bowheads and gray whales that otherwise might have resided there. In turn, this will reduce growth and reproduction, and increase vulnerability to disease and perhaps predation.

During the fall migration (Moore et al. 2000), whales will be displaced from the main migration route. This will increase the distance they need to travel. It is likely to disrupt some rest and feeding that would have occurred while bowheads passed through the Chukchi, and the increased travel distance will likely reduce the time available to rest during the migration.

During both periods, stress is likely to result from noise exposure, and in turn that can lead to reproductive failure and increased vulnerability to disease (Reeves et al. 2001).

Even successful avoidance of significant noise exposure may have negative survival consequences. Although many noise exposure protocols consider movement of animals out of the area an acceptable outcome, as the animals are not exposed to high levels of noise, such movement requires expenditure of significant amounts of energy.

Marine mammals typically have a metabolic scope of about 6. That is, energy consumption at rest is about 6 times lower than fast travel. In killer whales, travel at moderate speeds requires expenditure of about twice the energy as resting (Kriete 1995). Harbor porpoises moving away from airguns travel at a speed that is likely to put them closer to their physiological maximum (pers. obs.).

Assuming animals were in optimal habitat, moving out of that habitat is likely to have consequences, such as reduced foraging efficiency. This is of particular importance in the Arctic, where nutrients from fresh water sources, ice cover, bottom topography, currents, and other factors influence prey density (National Research Council 2003a, Minerals Management Service 2004). Such factors vary temporally, resulting in the location of patches of high quality habitat varying through time. Feeding studies noted that prey density averaged 230 mg/m^3, while feeding appears to require a density of 800 mg/m^3 (Minerals Management Service 2004). Such highly productive patches are likely to be rare, so displacement from these areas would negatively affect individuals.

Taken together, these two factors will impair the energy balance of affected individuals (see Bain 2002a). When whales are displaced from optimal habitat, rates of energy acquisition are reduced. Bowhead whales typically forage where prey density is at least four times higher than the average prey density. Thus, displacement from optimal foraging habitat may result in a four-fold reduction in food intake.

The actual situation may be worse, as foraging may be abandoned altogether when conditions are poor. For example, killer whales are 40% less likely to forage at all when vessels are nearby (Lusseau et al. 2009), perhaps because vessel noise masks echoes from prey, making the probability of foraging successfully negligible (Bain and Dahlheim 1994). While bowheads do not rely on echolocation, these results do indicate cetaceans do sometimes abandon foraging due to noise. The likely reduction in food intake due to reduced foraging effort is significant to food limited populations (e.g., killer whales: Ford et al. 2005, Olesiuk et al. 2005, Fisheries and Oceans Canada 2008).

Reduced feeding opportunities will lead to less successful calf recruitment. Bowhead whales are a slow growing species (Allen and Angliss 2010). Impairing the energy balance will slow growth further. In turn, this will lead to delayed onset of sexual maturity. A consequence of this will be reduced recruitment of calves to the population. In addition**,** lactation requires approximately twice as much energy expenditure by new mothers than by non-reproductive females (Oftedal 1997). As a result, bowheads spend years storing the energy needed to reproduce successfully. Impairing the energy balance will increase the interval between successful calf recruitment (Lockyer 1984). In turn, this will result in a reduction in the number of calves recruited to the population.

Reduced feeding opportunities can also reduce adult survival. Bowheads are a long-lived species, with some individuals living well over 100 years (George et al. 2004). Such a long lifespan requires successfully overcoming disease. Many diseases inhibit feeding until the immune system overcomes the infection. To survive this period of non-feeding, individuals must have an adequate blubber layer.

Impaired energy balance reduces the probability that an individual will survive an infection. In turn, this would lead to additional mortalities in the population. Further, females who die young will not produce as many calves as they would have if they lived a normal lifespan.

Displacement from feeding areas is an even greater concern for harbor porpoises. Harbor porpoises have been observed to be displaced from airgun arrays to a distance of over 60 km (Bain and Williams in review), and by low levels of noise from other sources (see discussion below). Due to their small size, even a few days without food can be fatal (pers. obs.). While some prey may be available outside the exclusion zone, the loss of many thousands of square kilometers of feeding habitat will result in intense competition for prey in quieter waters.

Harbor porpoises in Juan de Fuca Strait and Haro Strait experienced a doubling of mortality rates following exposure to a series of mid-frequency sonar exercises. Although the Navy dismissed many of these deaths as occurring prior to the exercise that also exposed southern resident killer whales on May 5, 2003, they did not consider that there were other uses of mid-frequency sonar in the area near strandings prior to that exercise as well (pers. obs.)..

Stress from noise exposure can also lead to reduced survival. Stress concurrent with Level B harassment would have additional population consequences. Stress may occur in the absence of behavioral change, or the absence of change in significant behavioral patterns such as foraging or nursing, or exclusion from optimal habitat. (Lusseau *et al.* 2006) While they noted vessel strikes were occurring (Level A takes), cumulative behavioral effects (Level B takes) due to exposure to noise levels not capable of directly causing immediate injury or death were believed to be the primary threat to the population.

Noise exposure is likely to result in stress to bowhead whales, and stress can impair the immune system (Rolland et al. 2006and Romano et al. 2004), resulting in an increase in mortality from disease.

The impacts discussed above, and similar impacts on beluga and other cetaceans, are all expected to occur at levels well below 160 dB. As these behavioral changes would be maintained for the 60 working days of the project, they have the potential to affect population dynamics of these species, and should be considered takes.

Problems with take estimates

Density

The methods used in the supporting documents are extremely difficult to compare with standard terminology in this field, and consequently, it is exceedingly difficult to follow the calculations of marine mammal density. For example, it seems that the original data collection had effort and sightings data alone, while best practice estimates density using perpendicular distances to calculate the effective strip width searched. This leads to the peculiar term, “lateral distance factor”, which appears to be related to the traditional f(0) parameter in distance sampling (Buckland et al. 2001). Rewriting this section with use of the terms “f(0), detection function, effective strip half-width, and μ” in a way that is consistent with accepted syntax in the field would facilitate a better understanding of what was done. The accepted definitions follow.

> "The parameter f(0) corresponds to the probability density function of the perpendicular distances, evaluated at zero. f(0) is more readily interpreted as 1/μ, where μ corresponds to the perpendicular distance from the transect line within which the number of undetected objects is equal to the number of objects that were detected beyond it. μ is termed the effective strip half-width and, when multiplied by 2L gives the effective area surveyed. Thus estimation of the density of objects can be easily obtained from estimates of encounter rate (n/L) and f(0)." http://www.ruwpa.st-and.ac.uk/Research/DistanceSampling/ See Thomas et al. (2010) for more details.

It appears there are now 891 "transect" sightings of bowheads. Rather than estimating f(0), the authors have taken an average value from their surveys, and applied this as a correction factor to the encounter rate. It is now straight-forward to use newer versions of program Distance (Thomas et al. 2010) to fit models to the perpendicular sightings data to estimate f(0), and more importantly to evaluate, quantitatively, whether detectability varies with factors other than perpendicular distance, such as ice cover, depth, sighting conditions, flying altitude, the plane being used, the number of observers, etc. These new models have been around for at least 10 years, and it is reasonable to expect these analyses to have been done with bowhead data by now. An analysis of all 891 sightings should be conducted using the multiple covariate distance sampling (MCDS) engine in Distance 6 (Thomas et al. 2010). In the standard text on distance sampling (Buckland et al. 2001), there are some formulas for calculating log-normal confidence intervals for density. This log-normal distribution is important, because abundance cannot be negative. The lower and upper bounds on 95% confidence intervals are given by: $\hat{D}/C$, $\hat{D} \bullet C$, respectively, where

$$C = \exp\left[z_\alpha \bullet \sqrt{\text{var}(\log_e \hat{D})}\right]$$

and

$$\hat{\text{var}}(\log_e \hat{D}) = \log_e\left[1 + \frac{\hat{\text{var}}(\hat{D})}{\hat{D}^2}\right]$$

Using the three point estimates of summertime density of bowhead whales, I calculate mean density ($\hat{D}$) = 0.0334, and var($\hat{D}$) = 0.00112. Thus, the best point estimate to use is 0.0334, not 0.0186. And the lower confidence interval is 0.0114 and the upper confidence interval is 0.0980.

Similarly, analysts of bowhead sighting data noted, "The standard errors associated with the single-survey estimates were typically about as large as the estimates themselves (Richardson and Thomson 2002, section 9.22)". A precautionary approach would estimate the number of animals exposed to the noise based on the upper confidence interval of the density estimate (approximately three times the best estimate in this case). But this uncertainty is ignored at every subsequent stage (see below, for more details).

Another methodological issue in density estimation is that Richardson and Thomson (2002, section 15-

18) used the method of Magnusson et al. (1978), to estimate the number of singles or groups present within a 400-m strip. Methods for estimating g(0) have come a long way since 1978. This approach assumes that detection probability within the 0-400m strip is constant, but the detection functions shown in the previous section indicate that in some planes, detection probability at 400m can be as low as 70% (Figure 15.5). The applicants should run double-platform trials in Distance 6 (Thomas et al. 2010) to estimate g(0) in a robust way to estimate g(0) and associated measures of confidence in that measure.

Similarly, every one of these stages introduces uncertainty: encounter rate (# of whales per km of trackline); effective strip half-width (what the applicants are calling a 'lateral distance factor' "f(0)"); and correction factors for g(0) based on availability and perception bias. The uncertainty in each of these steps is currently noted, but then ignored when it comes to estimating the total number of animals "taken". But statistical methods to incorporate all sources of uncertainty are trivial. These different sources of variance should be added – either using the delta method, or by bootstrapping – and then the resulting density estimates (plus upper and lower confidence intervals) can be used to assess the number of animals that would be exposed to seismic survey with some associated measure of confidence in that number. A precautionary approach would put all of these measures, and all sources of uncertainty, into one framework, along with the best, lowest and highest number of animals estimated to be taken by the proposed activities.

In terms of spatial and temporal analysis, instead of doing what is considered best practice, the applicants have done what is called post-hoc stratification of their data. This splits the data to test whether sighting rate varied with habitat type (depth, distance from ice edge etc). It is occasionally necessary to do this, but it is absolutely unnecessary in this case. Since 1999, there have been a number of quantitative methods available to model encounter rate as functions of spatial, temporal and environmental variables, and to use these models to predict whale density throughout a study area (Hedley et al. 1999, Bravington and Hedley 2009). These spatial modeling methods are now so standard and conventional that they have been integrated into the program Distance for years. It is inappropriate for the applicants to split the original dataset in ways that it was never designed to be split, or to test relationships that could easily be spurious and subject to the vagaries of how the applicants chose to split their data. Instead, the spatial modeling methods use an information-theoretic approach to allow the data to tell us how (and if) whale distribution varies spatially and temporally, and the role of static variables such as depth and dynamic variables such as ice conditions. The use of these newer and statistically robust methods would: (1) allow the applicants to borrow strength from their large dataset; (2) build spatially and temporally valid relationships; (3) predict density in any area, at any point of the year when the applicants have some data (effort or sightings); (4) make statistically defensible predictions for regions or seasons when the number of sightings is low (or zero); (5) better quantify uncertainty around all of these parameters; and (6) create more transparency, because reliance on ad hoc correction factors would be reduced, and the data and models could be made available in one package. I strongly recommend a reanalysis using the density surface modeling engine in program Distance (Thomas et al. 2010), and making that Distance project publicly available. The approach recommended here is being adopted by navies in the US and the UK[1], and the offshore oil and gas industry as a whole[2], to build spatially and temporally explicit estimates of whale distribution in order to mitigate impacts of sonar on whales. This spatio-temporal modelling approach, which

[1] http://mmc.gov/sound/plenary2/pdf/plenary2summaryfinal.pdf
[2] http://www.onepetro.org/mslib/servlet/onepetropreview?id=SPE-124301-MS&soc=SPE

acknowledges and deals with uncertainty explicitly in a quantitative risk-assessment framework, should be adopted here, to better understand how many whales are being exposed to seismic surveys, and again, to guide mitigation measures.

The threshold for behavioral impacts

Behavioral changes that have the potential to lead to immediate injury appear to be associated with received levels of around 135 dB in killer whales. Bain and Dahlheim (1994) observed behavioral changes in a captive killer whale exposed to 135 dB (in a band below 5 kHz), and Bain (1995) used noise with a received level of around 135 dB (with a predominant frequency at 300 Hz) to drive killer whales from Barnes Lake, where two individuals in the group had previously died rather than leave. Killer whale watching guidelines prohibit close approaches that would result in received levels exceeding approximately 135 dB (Bain 2001). Olesiuk *et al.* (2002) found noise from acoustic harassment devices with a source level of 195 dB excluded harbor porpoises within a radius of 3 km (individuals may have been kept farther away, but porpoises are difficult to see at all beyond that range), where received levels probably dropped below 135 dB. North Atlantic right whales exhibited changes in diving behavior when exposed to noise below 135 db (Nowacek *et al.* 2004). Belugas have been observed to respond to icebreakers by swimming rapidly away at distances of up to 80 km, where received levels were between 94 and 105 dB. Bowheads appeared to be displaced to distances of about 20-30 km when seismic devices were inactive, and distances of 30-40 km when airguns were active (Miller *et al.*1999), suggesting major behavioral effects to noise in the 105-125 dB range (NRC 2003b). Morton and Symonds (2002) found the same type of acoustic harassment devices as studied by Olesiuk *et al.* (2002) not only excluded killer whales from the area around the devices, they kept them from accessing the area beyond the devices. It is reasonable to conclude that seismic surveys could similarly prevent various whale species from accessing areas around the surveys.

Behavioral changes unlikely to lead to immediate injury but with the potential to contribute to injury or death after prolonged exposure to disturbance can occur at received levels from 90-110 dB re 1 µPa or lower. Porpoises avoid pingers with source levels of about 130 dB at distances of from 100-1000 m, depending on experience and environmental context (Bain 2002b, Barlow and Cameron 1999, Cameron 1999, Cox *et al.* 2001, Gearin *et al.* 1996 and 2000, Kraus *et al.* 1997, Laake *et al.* 1997, 1998, 1999). Kastelein *et al.* (1997, 2001) found behavioural responses to even lower levels. Bain *et al.* (2006ab) and Williams *et al.* (2002ab, 2009) found killer whales exhibited behavioral changes in the presence of a single vessel producing a received level in the neighborhood of 105-110 dB re 1 µPa. Belugas exhibited minor behavioral changes such as changes in vocalization, dive patterns and group composition at distances up to 50 km (NRC 2003b), where received levels were likely around 120 dB. It should be further noted that these behavioral responses occurred where noise was barely detectable above ambient noise, suggesting that noise whose total level is below ambient but occurs at a frequency where ambient noise is low may have effects. In addition, the range at which effects are observed would be expected to vary with natural ambient noise, with effects occurring at greater ranges on quiet days and shorter distances on noisy days.

It is clear from the above review that marine mammals respond to noise at levels far below 160 dB. Thus implications of takes must be considered at far lower received levels of noise, which will occur over much larger areas, and hence affect much greater numbers of individuals than when 160 dB or higher is set as the threshold for concern. There are three main ways that such behavioral changes, when experienced by numerous individuals for extended periods of time, can affect population growth. These include increased energy expenditure, reduced food acquisition, and stress (Trites and

Bain, 2000).

Although NMFS has suggested using a different threshold for continuous and pulsed sounds, odontocetes exhibit extraordinary auditory temporal resolution. Killer whales have been shown to resolve clicks at a rate 600 per second (Szymanski et al. 1998), and other species have exhibited even finer resolution. NMFS based its use of a 120 dB contour for continuous sounds primarily on studies of bowheads and gray whales. These studies were conducted based on whales close to noise sources. The 120 dB contour was commonly the level at which 50% of the animals exposed to noise showed observable changes in behavior, such as deflection of the travel path away from the source.

There are two problems with this interpretation of the data. First, this implies that 50% of the whales observed responded to levels lower than 120 dB. That is, 120 dB is not a threshold for a species but a median value of thresholds of individuals. The likelihood that individuals will be taken by exposure to noise levels below 120 dB declines with received level, but does not approach 0 until the received level approaches the limit of audibility. Second, individuals that responded to levels much lower than 120 dB were not included in these studies, as they did not approach close enough to be observed.

The data of Calambokidis *et al.* (Calambokidis, J., D. E. Bain and S. D. Osmek. 1998. Marine mammal research and mitigation in conjunction with air gun operation for the USGS "SHIPS" seismic surveys in 1998. Contract Report submitted to the Minerals Management Service) on Dall's and harbor porpoises illustrate well the problem with basing results on a platform that only allows observation near the noise source. They used multiple platforms to observe responses to airguns in the Salish Sea in Washington and British Columbia. The platforms included the large vessel towing the airguns, aerial surveys, and a small vessel that operated at long distances from the airguns.

From the airgun vessel, initial sightings only occurred within 3 km of the vessel, and approximately 90% of all porpoises seen were Dall's porpoises. None of the harbor porpoise groups contained more than two individuals.

In contrast, the majority of porpoises seen in aerial surveys were harbor porpoises. This suggests that harbor porpoises were actually the more abundant species along the trackline, and a far larger proportion of the harbor porpoise population than Dall's porpoise population avoided the airgun vessel's study area. That is, conclusions based on the handful of harbor porpoises that were approached by the airgun vessel would not have been representative of the vast majority of the species.

This point was confirmed by the observations from the small vessel. Observations from the small vessel revealed the median received level at which harbor porpoises were observed was far lower than the level for Dall's porpoises, and the responses of harbor porpoises were nevertheless stronger than for Dall's porpoises observed at higher received levels than those at which harbor porpoises were observed (Bain, D.E. and R. Williams in review.)

I believe the segregation of populations by noise tolerance (and physical ability to avoid the noise source) provides an explanation for why some studies detect marine mammals close to noise sources, and others show responses to received levels in the neighborhood of 90 dB or less at great distances. More extensive analysis of existing data, and perhaps new data, will be required to get a better handle on the proportion of individuals within a population likely to be taken by a given received level of noise. Further work will be needed to elucidate nuances of how those probabilities are influenced by

non-noise factors such as location, activity state, or individual factors like age, sex, reproductive status, health status, group composition, and previous experience with noise exposure.

In summary, bowhead and gray whales can be expected to respond out to the 120 dB contour, with more sensitive individuals perhaps responding at the 105 dB contour. Killer whales and belugas would be expected to respond at the 105 dB contour, with the need for social cohesion resulting in less variability in response than seen in bowheads and grays. Harbor porpoises are likely to exhibit responses out to the level of detection, as they have shown to respond to received noise below 90 dB in quiet water.

Movement

In addition to higher density estimates and consideration of impacts at sound levels below 160 dB, which affect the number of individuals to be influenced at any given moment, migration and the meanderings of individuals will result in many more individuals being taken over the course of the project. Although only 60 days of work are planned, these days could be spread out over four and a half months. This should be sufficient time for all non-migratory individuals whose ranges overlap with the ensonified area to exposed at some point during the project. In addition, depending on the timing of the migrations, a large portion of the population could migrate through the ensonified area. For example, NMFS concluded that for a shallow hazards survey in the Beaufort, ten days of migration through the ensonified area would increase the number of individuals by a factor of more than 70. If the period of overlap is greater, as would be the case if the bulk of the surveys in the Chukchi were performed during late September-November, the increase could be even larger.

Timing

Population densities are likely to vary widely over the period requested in the permit application. This has two important implications. One, the number of individuals taken could be far larger than estimated in the proposed IHA. Second, NMFS has the opportunity to limit the potential for takes by limiting the dates available for surveying.

Uncertainty as a source of bias in take estimates

There are a number of sources of bias in estimating the number of marine mammals likely to be affected by underwater noise. These include interspecific and individual variation; variability in sound propagation conditions; the interaction of uncertainty with the non-linear decline of received sound levels with distance; interchangeable use of data reflecting most sensitive individuals, statistically significant results, and 50% effect thresholds; studies based on subsets of populations least sensitive to noise; sociality; and extrapolations from experiments on species that tolerate captive relatively well. Sensitivity analysis was performed to determine the importance of bias in parameters used to estimate numbers of individuals likely to be influenced when individual variation is considered. Data from a variety of platforms used to observe marine mammal behavior during seismic surveys were used to demonstrate bias due to the area sampled. Sociality can result in individuals being affected due to

behavioral changes by the most sensitive member of the group. Controlled experiments with captive marine mammals have generally been limited to the species that exhibit good survivorship in captivity, but experiments with stranded porpoises indicate that species that have survived more poorly may be more sensitive to noise. Increasing uncertainty leads to increasing bias toward underestimating the number of individuals to be affected. These results have important implications for mitigation monitoring, identifying habitat-specific risks, estimation of cumulative effects, and the data needed for more accurate estimation of the effects of noise (primarily the level at which 50% of individuals respond in many species).

Ineffectiveness of mitigation

The proposed mitigation measures are premised on the ability to detect marine mammals close enough to the array to shut down the airguns and prevent exposure to levels sufficiently high to result in injury. However, the proposed detection methods have limitations in effectiveness as discussed below (see also Barlow and Gisiner 2006). As in the Gulf of Mexico, where mitigation methods such as dispersants, booming and burning have failed to prevent oil from reaching beaches and the animals that live there, injuries will be reduced but not prevented by the proposed mitigation measures.

When calculating density, a detection function f(x) was used to describe the relative probability of sighting a marine mammal, given that it is present, at a given distance perpendicular to the track line. The effective strip half-width is the point at which the number of animals sighted beyond that distance equals the number missed inside. That is, if μ is the strip half-width, and w is the maximum distance at which the species of interest can be sighted, then the number of animals missed closer to the vessel than μ equals the number of animals sighted between μ and w (Thomas et al. 2002).

Consider the case where μ is the distance to the 180 dB contour (say 2.5 km as given in the IHA, and the approximate value of μ in Figure 15.3 of Richardson and Thomas [2002] for Beaufort 0-3) and w is the distance to the 160 dB contour (say 13 km as given in the IHA). If one whale is seen in the outer zone where the sighting probability is say 9% or less, that would suggest that one whale was missed in the inner zone, and 10 were missed in the outer zone. That is, the sighting of a single whale outside the strip half-width would be strong evidence that 12 are present. In summary, if a whale is sighted in the inner zone, the airguns would shut down per the 180 dB rule. If a whale is sighted in the outer zone, that would imply that 12 are present within the 160 dB contour, and hence the airguns should shut down per the 160 dB rule. That is, sighting a single bowhead or gray whale, regardless of distance, is evidence the shutdown criteria have been met.

However, even if no whales are seen, the shut down criteria may have been met. In Figure 3.27, Funk et al. (2010), show that under ideal sighting conditions (Beaufort 0-1), and from high observation platforms (11-27m in eye height), a pair of observers has about a 60% chance of detecting a mysticete whale at the 180dB contour (2.5km). With only one observer working, this falls to 20%. For the paired observation team plots, where sample size is larger, the observers are estimated to have about a 50% chance of seeing a whale at 2.5km. That is, a whale can be in the zone where there is a risk of immediate injury or death and have only a 50% chance of triggering a shut down under ideal conditions. As discussed below, the applicant is willing to work under less than ideal conditions, when the chance of the whale triggering a shut down is even less.

In Figure 3.28, they show that with lower observation platforms (3-10m), observers have a 20-30% chance of seeing a whale at 2.5km under ideal sighting conditions. As conditions worsen, probability of detection falls quickly to <10%. That is, smaller support vessels may not provide the visibility to substantially improve detection of nearby whales.

At the 120dB contour, of course, detection probability is zero from the source vessel, as whales would be well beyond the horizon.

At the 190dB contour for seals, even from high platforms, under ideal sighting conditions, detection probability of a seal at 600m by a single observer is around 10%, and only 20% for a pair of observers. Under poorer sighting conditions, detection probability is near zero, even from a high platform. From lower platforms (Figure 3.48), detection probability of a seal at 600m is near zero, under all scenarios except when sighting conditions are ideal (Beaufort 0-1) and when three observers are working. Even then, detection probability is around 40%. Since a seal within 700 m should trigger a shut down, it can be seen that a high proportion of seals within the 190 dB contour will fail to trigger a shutdown. These data also emphasize the importance of having multiple observers rather than a single observer on duty.

Forney and Barlow (1998) reported marine mammal sighting efficiencies of well-rested, trained observers working in pairs on vessels optimized for sighting marine mammals. He found sighting efficiencies were limited, even under ideal conditions, and deteriorated further with wind, glare, fog, precipitation, etc. Sighting efficiencies were much lower for marine mammals 1 km or more from the track line than for marine mammals directly in front of the vessel.

Since animals over the horizon would be affected, visual detection from the seismic vessel alone would be inadequate to prevent exposure. It would be advisable to deploy trained observers on all vessels, not only the one operating airguns, which would allow sighting of some marine mammals that are close enough to be affected by noise, but too far away to be seen from source-based observers.

The applicant does not propose to routinely use observers at night, but does plan to have night vision gear available. As the applicant notes, even with use of night vision gear, sighting efficiency at night is likely to be far lower than during the day due to limited fields of view and/or resolution of night vision gear. Infrared sensors have small fields of view when used with sufficient magnification to detect marine mammals, severely limiting their effectiveness as a mitigation measure at night. However, they are not completely ineffective (Perryman et al. 1999) so observers should be on duty around the clock. Minimizing operations at night and when visibility is limited (e.g., in high winds and fog) would reduce unplanned impacts. Further, powering down airguns when visibility is limited would reduce the area exposed to potentially harmful levels of noise in zones where monitoring is not effective. NMFS assumes that individuals will move away given enough time, and while this appears to be true for many individuals, shut-downs have occurred because marine marine mammals were sighted within the safety zone, indicating the need for constant rather than intermittent vigilance.

Passive acoustic detection is limited to individuals that are vocalizing, and limited further to animals with vocal patterns that are recognized. While this technique has limited effectiveness, it can allow some detections (e.g., Sirovic 2006, Wade et al. 2006) and should be employed.

Using sonar to detect marine mammals raises the same concerns as noise exposure in general. The applicant does not plan to use this technique, and I concur with that decision.

It is encouraging to see that experimental techniques, such as infrared radar will be employed to increase the likelihood of detection. While the effectiveness of such techniques is unknown, all seismic surveys are potential platforms for pursuing technological advancement.

Short ramp-up periods do not allow individuals to move out to the contour at which behavioral effects no longer pose risks of immediate injury prior to onset of full power operation. The above review concluded that many marine mammal species would at least need to reach the 135 dB contour to be safe from behaviorally mediated injury. For the airgun array used in this survey, that is likely to be over 40 km away. At normal sustained swimming speeds of 3-4 knots, that is likely to be at least 5-6 hours away.

Distances to Contours for Behavioral Effects

The applicant used the equation RL = 157.2 – 35.3 LOG (R / 10000) – 0.0000064 (R – 10000) to estimate the distance to relevant contours from 190-120 dB. I have applied the same equation to estimate the distance to the 135 dB, 105 dB, and 90 dB contours, and the results are shown in Table 1. As discussed above, many of the species in the project area have exhibited biologically significant behavioral changes in response to noise outside the 160 dB contour.

As can be seen, there are two significant changes when considering that some species are known to respond to exposure at levels below 160 dB. First, the zone of influence has an area that is orders of magnitude larger. Second, the methods required to monitor marine mammals throughout the zone of influence change significantly, although by 7.9 km, the possibility of detecting marine mammals is already near 0. Further, the zones of influence extend to shore and the ice edge, and effects in those habitats need to be considered (e.g., the potential for cetacean stranding would need to be considered if a noise level sufficient to cause high-speed flight in a cetacean were to intersect with land).

Summary of underestimates

Table 1 summarizes how the take estimate changes as more factors are taken into consideration.

One can start with the density NMFS used in the area ensonified to 160 dB or more. However, as explained above, the density could easily be three times that used by NMFS, whether calculated based on available point estimates or following the observation that standard errors of density estimates are on the order of density estimates, so two standard errors above the mean would be three times the mean.

Then one can consider that while some members of species are tolerant of noise, takes are to be estimated on the basis of potential, so more sensitive individuals need to be considered. The area increases considerably if one considers the 135 dB, 120 dB, 105, or 90 dB contours, respectively. Note that numbers in the table are for circular areas, but much of this area would be on land or under ice given the proximity to shore for the 120-90 dB contours. Also note that high-frequency components will attenuate faster than low-frequency components, so while harbor porpoises are known to be disturbed by 90 dB sounds, by the time airguns attenuate to 90 dB, there may not be enough high-frequency energy left to affect porpoises.

Nevertheless, long range effects of airguns have been observed. Bain and Williams (in review) found severe and sustained avoidance by harbor porpoises at the 142 dB contour in response to an airgun array, even with over 60 km of attenuation of high frequencies. Displacement of bowheads has been observed at 30-40 km in response to airguns (Miller et al. 1999), which corresponded to the 105-125 dB contours in that study. As bowheads are believed to be sensitive to low-frequency sounds, it is likely that the sound contour rather than distance will determine long range effects.

The number increases still more when the number of individuals affected at least once over the course of the project is considered rather than the number taken at any given moment. For non-migrating individuals, this includes individuals that start out the near the project area, but their day-to-day movements take them into the area. For migrating individuals, this includes all individuals whose migration route will cross the project over the course of the project. This last correction factor will depend heavily on the overlap of the timing of the work with the timing of the migration. It is likely to be quite large given that ¾ of the 3D survey work is expected to be done during the fall migration, and NMFS found that the smaller noise sources used in shallow water hazards surveys in the Beaufort would cause over 70 times as many takes in just ten days during the migration as in the rest of the project put together. It is essential that NMFS takes migration into account for this project as well.

For example, "resident" gray whales are known to move distances on the order of 100-200 km over the course of a feeding season (Calambokidis et al. 2000). Resident and Transient killer whales can easily move 1000 km in a 60 day period. Bowheads migrate at a rate of 4.5 km/hr, or 108 km/day. In ten days, they would migrate over 1000 km. In a month, they could migrate over 3000 km. Thus, gray whales in a ring about 100 km across around the ensonified area at the start of the survey could be expected to wander close enough to be affected over the course of the surveys. Depending on the timing of the survey, a very high proportion of the bowhead population could pass through the project area.

Following NMFS' concentric approach, one could imagine the initial survey area being 8 by 30 miles. However, instead of adding 8 miles corresponding to the 160 dB contour to get about 1100 mi^2, one could add 26 miles corresponding to the 135 dB contour, making the area roughly 60 miles by 82 miles, or about 4920 mi^2. One could then add another ring, say 100 miles across on two sides (considering the other two sides could be approaching ice and shore), to get an area 260 by 82 or 21,300 mi^2 (55,000 km^2). By defining take in terms of animal responses rather than sound contour, and allowing for day-to-day movements, the number of takes could easily be 20 times what NMFS estimated. Also allowing for densities to be at the high end of the 95% confidence interval brings the total number to 60 times the number NMFS estimated for the first quarter of the survey.

Similarly for the fall, the surveyed area will be about 23 by 30 miles. Adding 26 miles rather than 8 gives roughly 75 by 82 miles or 6150 mi^2. However, movement in the fall becomes directional. At a migration speed of 4.5 km /hr (Koski et al. 2002), bowheads from 3200 km (2000 mi) away could reach the survey area within a month. The 135 dB contour would be 84 km in diameter (approximately 52 miles). Thus whales in a box 84 by 3200 km (268,800 sq km, or big enough to hold most of the bowhead population) could move through the area.

Accepting the behavioral changes that occur at the 135 dB contour as takes (blocking migration [Quackenbush 2007] or displacing bowheads from feeding areas [Miller et al. 1999]) significantly

increases the area in which takes occur. Taking migration into account allows calculation of the number of different individuals taken rather than simply looking at the number affected at any given moment. This dramatically changes the perspective on the project. Rather than affecting only about 1% of the population, the project has the potential to affect over 50% of the population if it coincides with the fall migration. Similarly, calculating takes for a scour and strudel surveys proposed for this year, NMFS concluded including ten days of work during migration increased the number of takes over 70 fold.

Table 1. Potential correction factors for take estimates

Density basis	Relative Density							
NMFS	1							
95% CL	3							
Contour (db)								
	Best fit	Relative area		90th percentile	Relative area		NMFS	Relative area
190	370	N/A		450	N/A		700	0
180	1100	N/A		1400	N/A		2500	0.04
170	3200	N/A		3800	N/A		N/A	N/A
160	7900	N/A		9100	N/A		13000	1
135	42000	10		45000	12		N/A	N/A
120	110000	72		116000	80		70-120k	29-85
105	270000	431		285000	311		N/A	N/A
90	620000	2274		650000	2500		N/A	N/A
Movement		Relative area						
None		1						
Day-to-day		4						
		Number		Number				
Migration 4.5 km/hr		Threshold = 135 dB Density = .03/km^2		Threshold = 120 dB Density = .03/km^2				
10 days		2721		7128				
20 days		5442		14256				
30 days		8163		N/A				
40 days		10884		N/A				
50 days		13605		N/A				

Cumulative effects

Cumulative effects should be considered in two ways. One, other projects have been proposed for this open water season. Consequences include that some individuals will be disturbed multiple times, some individuals will be exposed simultaneously to multiple noise sources, and some will experience extended periods of exposure. Further, the assumptions that displaced individuals will find adequate feeding areas elsewhere and not have their migration significantly extended become even less likely to be true when they are also excluded from other areas by other activities. The implications of this will be discussed below.

Consideration of cumulative effects will be especially important for a few species. Bowheads are endangered, and many threats unrelated to oil have limited recovery of other bowhead populations, so need to be considered.

Gray whales were delisted in the 1990's, but recent declines in number have resulted in the population dropping below the level at which they were delisted. Emaciation has been observed in many gray whales that have stranded this year, so exclusion from potential feeding grounds is of extra concern this year.

Harbor porpoises can be affected at large distances from noise sources, and hence large numbers would be expected to be affected by this and other activities. Although NMFS currently recognizes only a single, large stock whose range includes the project area, genetic and movement studies in other parts of harbor porpoise range have shown that stocks tend to be much smaller and have limited ranges.

Belugas are another species for which cumulative effects are likely to have been underestimated. The greater range at which they are likely to be affected and the potential for greater overlap between the project activities and migration through the area than considered by NMFS for this and the shallow water survey make this the case.

While by definition Level B behavioral changes do not result in immediate injury or death, they may have cumulative effects that result in increased mortality and/or reduced fecundity (birth rates) for the population as a whole. Behavioral changes may result in increased energy expenditure (e.g., swimming farther to travel around disturbances or faster to flee them). The behavioral changes may also reduce energy acquisition (e.g., prey missed due to masked echolocation signals or displacement from optimal habitat for foraging). These energetic consequences result in individuals competing more intensely for resources. The effects on rates of population growth or decline of these energetic consequences can be estimated with population dynamics equations that take intra-specific competition into account (Bain 2002b, Bain *et al.* in prep.). Noise can cause stress in marine mammals (Romano *et al.* 2004), but no quantitative approach to estimating changes in mortality or fecundity due to stress have been identified. Qualitative effects may include increased susceptibility to disease and early termination of pregnancy.

By allowing this project to proceed based on inadequate data, inadequately analyzed data, and the assumption that work will not proceed at the time it would be worst for protected species, NMFS has set itself up to underestimate the effects on these species, and hence not consider the implications of this project in a precautionary or even realistic manner.

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EXHIBIT 2

Responses of marine mammals to airgun noise at long range in coastal waters of British Columbia and Washington State

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Running title: Long-range responses of marine mammals to airgun noise

Abstract

Effects of seismic survey noise on marine mammals must be understood to ensure appropriate mitigation. This study examined effects of large airgun arrays on behaviour of marine mammals in the waters of British Columbia, Canada and Washington State, USA, using a small boat to monitor out to long ranges (1 to > 70 km from the source vessel). The survey was scheduled to minimise probability of marine mammal presence, which mitigated environmental impacts but also limited sample size. Received noise levels near marine mammals were measured rather than predicted, to reflect levels actually received in these geographically complex, near-shore waters. Although airguns concentrate energy at low frequencies, noise was detectable above ambient to at least 100 kHz. A significant relationship was observed between the magnitude of behavioural response and peak-to-peak received level. Response appeared to vary by species, but sample size prevented rigorous comparison among all species. Species with similar audiograms exhibited markedly different response patterns, suggesting that audiograms alone will not predict which species are most disturbed by acoustic stimuli. The long distances at which behavioural responses were observed (>60 km for harbour porpoises), along with counter-productive behaviour that occasionally brought individuals into higher-intensity acoustic zones, indicate that long ramp-up times would be required to prevent harmful exposure. Scheduling surveys around seasonal distribution patterns of marine mammals, limiting exposure periods, and routing airguns to minimise risk of stranding may be more important than monitoring safety zones to prevent injuries and death.

KEYWORDS: AIRGUN, BEHAVIOUR, CETACEAN, MARINE MAMMAL, NOISE, SEISMIC SURVEY

INTRODUCTION

High intensity sound is a useful tool in marine geophysical research. It has been used in seismic surveys to map sub-seafloor structures (e.g. Brocher et al. 1999), to perform acoustic tomography, and to communicate among marine equipment (Elisseeff et al. 1999). Richardson et al. (1995) reviewed the effects of noise on marine mammals, and more recent updates that focus on cetaceans have been reported by Nowacek et al. (2007), Southall et al. (2007) and Weilgart (2007). Recent work has quantified the extent to which cetacean communication may be masked by chronic noise (Clark et al. 2009), but much of the concern about intense, pulsed sounds has to do with their ability to generate behavioural responses or more serious effects (Southall et al. 2007). Ongoing concern about the effects that noise could have on protected species such as marine mammals led to efforts to establish safety standards. Such efforts have focused on the potential for noise to cause acoustic trauma leading to immediate injury or death (Federal Register 2005). However, behaviourally-mediated effects of noise, including seismic survey noise (IWC 2004, Taylor et al. 2004, Hildebrand 2005), may lead to injury or death through other mechanisms such as stranding (e.g. Frantzis 1998, NOAA & US Navy 2001, Brownell et al. 2004) and decompression sickness (Jepson et al. 2003, Fernández et al. 2005, Cox et al. 2006). These consequences sometimes occur at much lower exposure levels than are thought to cause temporary threshold shifts ('TTS', Hildebrand, 2005). Still lower levels of noise may cause effects that, while not directly resulting in injury, can contribute to harm to marine life through indirect mechanisms such as stress (Romano et al. 2004), displacement from habitat (Morton & Symonds 2002, Olesiuk et al. 2002), and potential energetic consequences of disrupting whales' feeding activities or movement patterns (Williams, Lusseau & Hammond 2006). For highly social odontocetes, even small levels of anthropogenic mortality can affect the functioning of the social network

as a whole (Williams & Lusseau 2006) and may threaten the viability of small populations (Wade & Angliss 1997).

Southall et al. (2007) proposed a scale for scoring behavioural responses to facilitate a more nuanced consideration of their biological significance. The ordinal scale goes from 0 (no visible response) to 9 (for the strongest response). Levels of noise sufficient to cause responses high on the scale are more likely to interact with environmental factors to result in increased rates of serious injury or death.

Stone & Tasker (2006) performed an analysis of over 200 studies of marine mammal behaviour in the presence of airguns in the North Atlantic. Direction of movement relative to the noise source is one of the behavioural endpoints they analysed. The authors noted stronger responses in small odontocetes than large mysticetes. This was unexpected, as mysticetes are thought to be better specialised than odontocetes to hear the low frequencies at which airgun noise is most intense. Stone & Tasker (2006) hypothesised the presence of high frequencies in airgun blasts to help explain the unexpected responses of odontocetes, and postulated that effects might extend well beyond the 8 km observation range limit in their study. Unfortunately, all of the observations in the Stone & Tasker (2006) report were made from the seismic survey (source) vessel itself, so little information was available on the stimulus (i.e., the received level) to which the animals were responding and no observations could be made at very large distances. In fact, a recurring theme in the literature on responses of cetaceans to anthropogenic noise is an absence of quantitative data on the received levels of noise (Nowacek et al. 2007). Certainly, having information on received noise level is crucial to plotting dose-response curves (Nowacek et al. 2007), but it is also important to have information on the tolerance of various species to noises of different intensity (Weilgart

2007). Some gaps in the literature to date include studies in which exposure to high frequency noise could be detected and behavioural responses at long distances were recorded.

In March 1998, the United States Geological Survey (USGS), in collaboration with a number of other government and academic institutions, conducted seismic surveys in the Strait of Juan de Fuca, Strait of Georgia, Puget Sound, Hood Canal, and other marine waters in British Columbia and Washington to investigate earthquake hazards. The project was named SHIPS (Seismic Hazards Investigations in Puget Sound) and employed an array of airguns with a total capacity of up to 110 L. Prior to scheduling the survey, USGS consulted with marine biologists to evaluate the biological implications of alternative timings and routes to determine the one likely to result in the least impact. Baseline condition of the habitat was determined in the course of long-term projects in the region (e.g., Bigg et al. 1990 and long-term field research conducted by Center for Whale Research, Cascadia Research Collective and others). In addition to monitoring marine mammals from the seismic survey vessel from which possible responses to high-intensity noise could be observed, the monitoring protocol also called for observations from other platforms to allow marine mammal monitoring up to tens of kilometers distant from the airgun array where responses to lower levels of noise might occur. Post-exposure monitoring was also planned to determine whether any effects occurred that were not apparent during the survey itself through continuation of long-term studies and consultation with the regional stranding network (J. B. Norberg, personal communication). This process was considered by the participants as a model that could be used for planning future seismic surveys and accompanying mitigation, monitoring, and noise impact studies.

The topographic complexity of the inshore waters was expected to result in a complex relationship between received level and distance. Therefore, received sound levels and

spectra were measured where possible, and this allowed measuring deviation of measured sound levels from a best-fit spreading loss model.

The study area is inhabited by a variety of marine mammal species, including: pinnipeds, such as harbour seals *Phoca vitulina*, California sea lions *Zalophus californianus* and Steller sea lions *Eumetopias jubatus*; odontocetes, such as killer whales *Orcinus orca*, harbour *Phocoena phocoena* and Dall's porpoises *Phocenoides dalli*; and mysticetes, such as gray *Eschrictus robustus* and common minke whales *Balaenoptera acutorostrata*. Each of these taxa has different auditory sensitivities, and thus expected to have different sensitivities to airgun noise (Richardson et al. 1995). The presence of this variety of species therefore presented the opportunity to conduct a taxonomically diverse study of the effects of airgun noise on marine mammals. However, by scheduling the survey when marine mammal presence was at a minimum, the number of groups of each species exposed to airgun noise was expected to be low.

In some respects, this situation forms a conundrum. The permitting procedure under the US Marine Mammal Protection Act led to a paradigm shift occurring in the policy and science arenas surrounding marine mammals and noise, in which reduced power sources and non-lethal end points are used for research directly on marine mammals. Further, researchers conducting geophysical studies are required to minimise 'incidental takes' of marine mammals, both in terms of the number of animals exposed and in terms of the intensity of exposure. From an impact-assessment standpoint, though, this limits the statistical power to detect effects of intense noise on marine mammals during monitoring of such studies. A consequence is that simplifying assumptions have been made by management agencies, such as the National Marine Fisheries Service's assumption that species with similar phylogenetic

history and hearing ability will respond to noise in similar ways (Southall et al. 2007), but these assumptions need to be tested as new data become available.

It is important to identify the received noise levels at which marine mammals do not show obvious responses, show responses that are only likely to result in harm with chronic exposure or short-term exposure in a limited set of conditions, as well as those levels of intense noise that unconditionally cause serious harm, such as temporary or permanent threshold shifts, stranding or death. While ongoing government and industry efforts, including control-exposure experiments attempt to estimate the points along the noise spectrum at which lethal takes and serious injuries occur for various species, the goal of our study was to provide information on long-range responses of multiple marine mammal species to relatively low received levels at long ranges.

METHODS

Seismic Survey

Two vessels, the *R.V. Thomas Thompson* ('TT'), which towed the airgun array, and the *R.V. John P. Tully* ('JPT'), which towed a receiving streamer, were involved in the seismic research (see Brocher et al. 1999, Ramachandran et al. 2004) and were platforms for observations of marine mammal behaviour. In addition, a smaller vessel served as a platform for some more detailed observations well beyond the field of view of the ship, and allowed measurement of actual received sound levels near marine mammals. This paper describes the observations recorded from that smaller vessel.

Approximately 33,000 airgun blasts were generated, typically at 20- or 40-second intervals, from 10 to 24 March 1998. The survey consisted of generating shots, which were relatively omni-directional in the horizontal plane, with a towed array of 13 or 16 air guns with a total volume of 79 or 110 L, respectively. Maximum theoretical source level for the larger array was calculated to be on the order of 260 dB (re 1 μPa at 1m), and signals could be recorded up to 370 km away. The seismic survey methods are described in detail in Brocher et al. (1999). The seismic survey vessel that towed the array was a platform for observing marine mammals close to the airgun array. Observers aboard the seismic survey vessel used binoculars to assist with observation by day and an AN/KAS-1A chemical weapons detector to observe thermal infrared images at night. The infrared gear was also used outside the survey period to test its effectiveness when marine mammal encounter rate was high. Methods and results of this research component are detailed elsewhere (Calambokidis, Bain & Osmek 1998).

Acoustical Monitoring

Two sampling regimes were used. The first involved measuring ambient noise and received sound levels at selected distances and orientations from the airgun array, and at locations of interest in the study of sound propagation, such as on banks to examine upslope enhancement and nearshore shadow zones, and beyond reefs to examine high-pass filtering by shallow water. The second regime involved measuring ambient noise and sound levels from locations near marine mammals to produce a best estimate of actual noise exposure. Due to complicated sound propagation in inshore waters, measurements of the actual sound field near marine mammals were used rather than modelled levels. Measurements were based on two-minute recordings to allow both determination of received level and ambient noise. These recordings provided an opportunity to try to detect marine mammals using passive acoustic monitoring.

The recording system consisted of a Bruel & Kjaer 8105 hydrophone connected to a B&K 2635 charge amplifier. The output of the charge amplifier was connected a Tucker-Davis Technologies AD2 digitising module, which was connected to a TDT AP2 signal processing board. The waveform was digitised at a sample rate of 200kHz, yielding a maximum analysed frequency of 100 kHz, and stored directly to disk on an IBM PC-compatible notebook computer with docking station. In parallel to the input to the analog-digital converter, the signal was also sent to an oscilloscope, to allow monitoring of signal quality. The oscilloscope was used to amplify the signal and output it to an amplified speaker to allow auditory monitoring of the signal. A sine-wave inverter was used to power the analog signal processing equipment, and a modified sine-wave inverter was used to power the computer. The recording depth was 7 m.

The digitised waveform was read from disk and analysed using custom software. Blasts were reviewed aurally and in time-frequency amplitude mode to identify the most intense portion. Then a 10.24 msec segment was selected to be Fourier transformed to determine the frequency spectrum, and for calculation of peak-to-peak and RMS sound levels.

The acoustics vessel was a launch carried aboard the *Tully*. The launch was placed in the water and a sound level measurement was performed. The launch then travelled along a line at approximately 20 km/h until either marine mammals were closely approached, or the launch had travelled 10 km. Then the next acoustic measurement was made. When marine mammals were sighted, behavioural observations were made in as much detail as possible. In many cases, this was minimal (species, group size, behaviour state, location, and direction of travel). In others, what appeared to be the same individuals were followed for tens of minutes

(allowing notation of behavioural events and narrative comments in addition to the basic information), and multiple sound level measurements were obtained in their vicinity.

The goal was to observe marine mammals exposed to sounds across as wide a range as possible of received levels, in order to identify a threshold above which groups of individuals in each species behaved in a consistent fashion. Thus, the launch travelled ahead of the seismic survey vessel and then turned to approach the seismic survey vessel and passed behind it, before returning to a position near the seismic survey vessel at the end of the observation period. This allowed observing marine mammals exposed to low but increasing levels noise while ahead of the airguns, and low and decreasing levels of noise while behind the airguns. In addition, marine mammals were observed while exposed to moderate levels of noise as the launch moved between the endpoints of its route.

Position of the recording vessel was determined using differential GPS. Position of the airguns was approximated by the DGPS position of the *Thomas Thompson*. The distance between these two locations was calculated to determine the distance between the source and the recording vessel. When possible, the recording vessel was positioned near marine mammals, to determine actual noise exposure.

A regression line for received level as a function of distance was calculated. Points that deviated from this line by about 6 dB or more were analysed for possible propagation anomalies due to factors such as poor shallow water propagation, reflections off sides of channels, and diffraction.

Scoring behaviour

Field notes described behaviour when marine mammals were first observed. These notes included time, location, species, group size, behaviour state, and direction of travel. The observations continued during approach to the sound measurement location, sound recording, and initial travel to the next observation station, allowing several minutes to review the accuracy of behavioural classification. Observations were subsequently assigned a score based on a response severity scale (Southall et al. 2007). Pinnipeds that were hauled out were not included in the statistical analysis of data in Table 1. Other observations excluded from the analysis were 3 cases in which species identity was uncertain.

By scoring behaviour out to distances of tens of kilometres from the noise source, responses were evaluated to determine their magnitudes at a variety of received levels. While the sample sizes within species were generally small (reflecting the success of scheduling the seismic survey at the time of year when marine mammal densities were likely to be minimal), a response score at an intermediate received level suggests that a response at least as strong would be expected at all higher received levels but would be no stronger at all lower received levels. Thus observations at maximal and minimal levels provided a check on the interpretation of observations at intermediate levels.

Behavioural studies face methodological concerns due to the subjectivity of observers. The same observer (D.E.B.) scored each observation, so inter-observer reliability was not a concern. Secondly, the observer was unaware of the received level when recording field notes, because the measurement of the stimulus (the received level) was made in the laboratory, long after the behavioural observations were recorded.

Behavioural data were analysed in R using a proportional odds logistic regression[1] (Venables and Ripley 2002), which is well suited to an ordered factor response like the 0-9 severity scale (Southall et al. 2007). Candidate explanatory variables were: species, range (km); peak-to-peak received level (referenced to 1 μPa); and RMS received level.

RESULTS

Received sound level as a function of distance

Approximately one-third of the sound level measurements deviated by 6 dB or more from values predicted by simple spreading loss models. Values lower than expected could be attributed to shadow zones. Shallow water was sufficient to reduce sound levels, and land formed an effective barrier to direct propagation. Most cases of higher-than-expected levels might be attributed to upslope enhancement. In addition, long-range propagation through the Strait of Juan de Fuca was better than expected, resulting in the airguns being clearly audible at ranges of 60-70 km, the maximum distance at which signal measurement was attempted in the biological component of the study (Fig.1).

The airguns produced energy above ambient levels at all frequencies up to 100 kHz (the highest frequency measured), although the peak frequency was quite low. Low frequencies were filtered out by propagation through shallow water, and high frequencies attenuated faster with distance. A sample spectrum is shown in Fig. 2.

[1] http://pbil.univ-lyon1.fr/library/MASS/html/polr.html

Marine mammals sighted from the recording vessel

Marine mammal sighting locations and the track line of the vessel towing the airgun array are shown in Fig. 3. RMS levels were generally 9-14 dB lower than peak-to-peak levels. Peak-to-peak received levels explained more of the residual deviance in response severity in the proportional odds logistic regression model, but had only marginally lower AIC than models that contained RMS level (ΔAIC=0.51) or range (ΔAIC=0.11). A model that used an interaction term of Species*ReceivedLevel failed to converge.

Marine mammals exhibited a variety of responses to airgun noise that generally declined with received level, according to the proportional odds logistic regression model. At the highest noise levels at a which marine mammals of a given species were observed, all individuals moved away from the noise source, but at lower noise levels orientation was less consistent. However, the threshold at which orientation became variable appeared to differ among species.

Responses of six species of marine mammals for which received sound levels were measured are summarised in Table 1 and Fig. 4.

Harbour Seal. Although this species was observed at received levels up to approximately 190 dB re 1 µPa p-p, individuals were generally moving away from the airguns at exposure levels above 170 dB re 1 µPa p-p. A common behavioural change noted was floating at the surface and visually orienting toward the airguns. Individuals were sometimes observed closer together in the water than is typically the case. These behaviours were counted as

responses because harbour seals orienting randomly were unlikely to orient toward the seismic survey vessel and they are rarely gregarious except when hauled out on land.

California Sea Lion. This species was observed at received levels up to approximately 180 dB re 1 µPa p-p. All individuals were moving away from the airguns at the lowest exposure levels observed.

Steller Sea Lion. This species was recorded at received levels up to about 170 dB re 1 µPa p-p, but all individuals were moving away from the airguns at this level. One group moved away at normal swimming speed, one moved away rapidly, and one displayed behaviour typical when searching for a haul-out site, although none was available in the steep-walled location.

Gray Whale. This species was observed at received levels up to approximately 170 dB re 1 µPa p-p, but no behavioural response was obvious at this level. Most individuals milled with variable orientation relative to the airgun array. Although one individual was moving away from the airguns, it was actually moving toward higher exposure levels (that is, moving into deeper water outside the near-shore shadow zone).

Dall's Porpoise. This species was observed at received levels up to approximately 180 dB re 1 µPa p-p. Individuals were moving away from the airguns at the highest exposure levels. This species initially responded by moving away while travelling in the same direction as the seismic survey vessel, but as the airguns got closer (the towing speed exceeded the sustained swimming speed of this species), individuals changed direction to move at right angles to the path of the airguns. Once the airguns passed the porpoises, they turned again and moved in

the opposite direction to the seismic survey vessel's path. Travel speed was higher during the orthogonal and reverse movements than during the initial avoidance response.

Harbour Porpoise. This species was recorded at received levels up to 155 dB re 1 µPa p-p, and all individuals were moving away at this level. Although the number of independent groups observed was small, these groups were unusually large, synchronous in their surfacings, and consistently directional in their travel, suggesting these individuals were responding to the airguns at distances over 60 km. Harbour porpoises normally travel singly or in small groups in this location. When in groups, it is rare for many individuals to surface at the same time, and direction changes are frequent.

Statistical comparison of species pairs. An unpaired t-test with Welch's correction showed a significant difference between Dall's and harbour porpoises in the received level at which they were observed ($p<0.05$, $t=2.80$, d.f.=7). This is consistent with the qualitative observation that all harbour porpoises showed strong responses at received levels at which Dall's porpoises showed no observable response. While a similar qualitative pattern was also observed for the California and Steller sea lion species pair, the sample was too small for a quantitative analysis.

Acoustic detections. None of the marine mammals observed visually was detected acoustically, even at close range, indicating that passive acoustic monitoring alone would have been inadequate to reliably detect the species of marine mammals encountered in this study. Although the hydrophone was only monitored for a few minutes at a time, rather than continuously, it was monitored cumulatively for hours over the course of the study when marine mammals were known to be present.

Efficacy of survey timing. Survey timing was chosen to minimise impact on marine mammals in general and killer whales in particular. No killer whales were observed during the seismic survey.

DISCUSSION

This study has generated several results that can be used to inform ongoing efforts to predict impacts of noise on marine mammals. These include: 1) airguns generated substantial noise at high frequencies; 2) complex propagation pathways between source and receiver confound the ability to predict received levels as a function of distance; 3) passive acoustic monitoring offered limited utility in detecting marine mammals; 4) species with similar phylogenetic history and hearing ability responded differently to received noise; 5) responses were detected to low received levels and at long range; and 6) not all species responded to noise by avoiding it upon first exposure.

This study found that while airguns concentrated their sound output at low frequencies, substantial high frequency energy (to at least 100 kHz) was also present. Detection of high frequencies was facilitated by using equipment designed to record ultrasonic vocalizations, large dynamic range of the recording, and making some measurements in shallow water where low frequencies were filtered out by the environment, increasing the relative strength of the high frequency end of the spectrum.

Long-distance propagation in narrow channels was more efficient than would be expected from simple spreading and absorption loss models, suggesting the sides of channels served as something of a waveguide rather than allowing all sound to spread into the substrate.

Barlow and Gisiner (2006) also concluded that passive acoustic monitoring alone would have limited value.

It is important that Dall's and harbor porpoises, species with similar hearing ability, differed in the noise level tolerated and the noise level at which strong behavioural changes were observed. Parallel observations of Steller and California sea lions suggest a larger sample is likely to show similar differences between that species pair. California sea lions and Dall's porpoises are known for their tolerance of human activities (Richardson et al. 1995). Similarly, Stone & Tasker (2006) reported that white-beaked dolphins *Lagenorhynchus albirostris* were more than four times as likely to move away than toward shooting airguns, while Atlantic white-sided dolphins *L. acutus* exhibited no difference in direction of movement relative to shooting airguns.

Gray whales were expected to be the most responsive to airgun noise, because they are believed to have the best sensitivity to low frequency sound among the species observed (Richardson et al. 1995). However, gray whales appeared to be more tolerant of airgun noise than harbour porpoises, the species with the highest frequency of best sensitivity observed in this study, and Steller sea lions (Figure 4). Similarly, Stone & Tasker (2006) reported mysticete responses to airguns were less obvious than responses of small odontocetes. That is, behavioural responses to noise did not correlate well with expectations based on estimated hearing sensitivity to low frequency sound for the species studied. Au (1993) reviewed odontocete hearing and found some audiograms appeared to be limited by ambient noise, so ambient noise may offset low-frequency hearing superiority at times.

For reasons stated above, use of smaller safety zones for species believed to have poor low-frequency hearing does not appear to be well founded. In fact harbour porpoises appeared to be the species least tolerant of airgun noise (Figure 4). It is worth noting that harbour porpoises were the only species in Stone & Tasker's (2006) study that were never reported moving toward shooting airguns. While "…one of the most important aspects to assess the effects of high intensity sounds on marine mammals is to understand their hearing sensitivity" (Federal Register 2007), our results suggest that other aspects of behavioural ecology may be more important. Behavioural responses are not just a function of hearing ability, but rather are mediated by tolerance, sensitisation and habituation (Bejder et al. 2009).

Strong behavioural changes occurred at long ranges (>60 km in harbour porpoises). This is consistent with recent information that low-frequency, pile-driving noise caused habitat displacement in harbour porpoise at ranges exceeding 20km (Tougaard et al. 2009). The

potential for strong behavioural changes to lead to injury or death (Jepson et al. 2003, Fernández et al. 2005) suggests that safety zones when behavioural implications are considered need to be far larger than the size thought to be necessary to prevent hearing loss. For some species, that safety zone will need to be larger than the range at which animals can be seen from seismic survey vessels. Even with a 180 dB safety zone, this could require observing marine mammals on the order of 3 km or more from the seismic survey vessel.

The long range at which some species appeared to show evasive behaviour suggests that displacement from habitat and the duration of that displacement need to be considered when estimating cumulative effects (Tougaard et al. 2009). Further, habitat can be significantly degraded before marine mammals will leave it for alternate habitat that is poorer in quality (Morton & Symonds 2002). In other words, population-level effects could occur in the absence of displacement, and displacement to poorer quality alternate habitat could result in population-level effects in the absence of immediate injury or death.

Dall's porpoises observed in this study followed curved paths rather than moved directly away from the source. Harbour seals commonly stopped to orient visually rather than moving continuously away. Bain (cited in US Navy 2004) observed killer whales remaining in a shadow zone rather than moving away while being approached by a vessel emitting mid-frequency sonar. That is, avoidance tactics adopted by marine mammals were not optimal for limiting the maximum exposure received as noise sources passed by. Direct movement away from noise sources may not occur until it is too late to limit received noise to safe levels. The fjord habitat where this study took place also restricted movements perpendicular to the array's path, and prevented individuals from moving as far away as conspecifics might in open water.

The long range at which strong behavioural changes were observed indicates that 20-30 minute ramp-up procedures are inadequate, because marine mammals cannot sustain swimming speeds sufficient to leave the area before the noise source reaches full power. Species swimming at 6-10 km/h would require roughly 2-3 hours to travel a distance of 20 km.

Southall et al.'s (2007) response severity scale provides a useful framework for classifying behavioural responses, but few statistical models cope well with ordinal response variables. The proportional odds logistic regression approach offers a useful framework that retains information in the rank of the response variable, but large sample sizes will be needed to fit models that allow interactions between species and received level. In the future, modifications to multinomial families of generalised linear or additive models could be developed to allow more flexible analyses that are robust to missing values or small sample size that will always hinder studies of this kind.

Although strong behavioural changes were observed even at long distances, the precautions utilised in the SHIPS survey were sufficient to prevent any detectable marine mammal mortalities during the survey, and none were reported subsequently by the regional marine mammal stranding network (Norberg, personal communication). Scheduling surveys at a time when protected species are minimally present is an important mitigation step that contributed to the success of SHIPS and could contribute to the success of future surveys. The availability of baseline data from many long-term studies in the region made such

scheduling possible. The results of this and similar studies provide a partial basis for establishing relationships between received level and species-typical response patterns. In turn, these relationships can be used to estimate the likelihood that behavioural changes will ultimately lead to physical harm depending on geographic setting and whether exposure is scheduled to last hours, days, or months.

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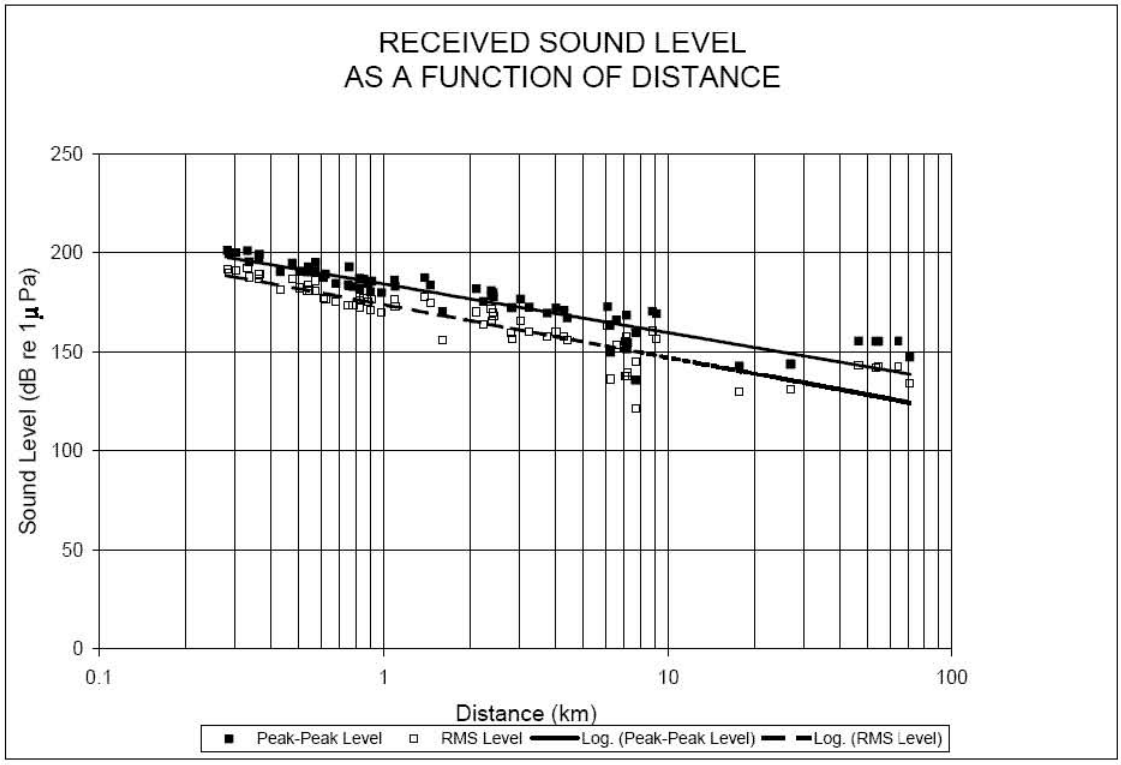
1Table 1.

Time	Species	Group Size (min. est.)	RMS	P-P	Range (km)	Response Score	Corresponding Behaviour
1117	Harbour seal	1	121.3	135.5	7.7	n/a	hauled out
1421	Harbour seal	1	129.8	142.8	17.8	0	no observable response
1349	Harbour seal	1	131	143.5	26.9	1	brief orientation response
1711	Harbour seal	2	136	149.5	6.3	n/a	hauled out
1111	Harbour seal	41	137.3	151.3	7.2	n/a	hauled out
751	Harbour seal	1	143.2	155.3	46.5	3	prolonged orientation behaviour
1659	Harbour seal	1	145	159.3	7.7	6	minor individual avoidance
1717	Harbour seal	1	149.5	162.9	6.2	3	prolonged orientation behaviour
1027	Harbour seal	1	153.1	165.9	6.6	3	prolonged orientation behaviour
1624	Harbour seal	1	155.6	166.9	4.4	3	prolonged orientation behaviour
1457	Harbour seal	43	156.1	169.1	9.1	3	prolonged orientation behaviour and hauled out
1204	Harbour seal	2	157.5	169.3	3.8	3	minor change in locomotion
1131	Harbour seal	2	157.8	170.7	4.3	6	minor group avoidance
1510	Harbour seal	1	159.5	172.1	2.8	6	no observable response
1150	Harbour seal	1	160	172.4	3.2	6	minor individual avoidance
1645	Harbour seal	1	163.5	175.4	2.2	3	prolonged orientation behaviour
1643	Harbour seal	2	177.5	187.4	1.4	6	minor group avoidance
956	Harbour seal	2	183.2	192.7	0.8	6	minor group avoidance
1441	Harbour seal	1	185.8	194.9	0.6	3	prolonged orientation behaviour

1726	California SL	1	170	181.8	2.1		0	no observable response
1435	California SL	1	172.8	182.9	1.1		6	minor individual avoidance
1452	California SL	1	176.4	186.1	1.1		6	minor individual avoidance
956	California SL	1	183.2	192.7	0.8	n/a		no record
1117	Steller SL	100	121.3	135.5	7.7	n/a		hauled out
1349	Steller SL	1	131	143.5	26.9		0	no observable response
1111	Steller SL	100	137.3	151.3	7.2	n/a		hauled out
1707	Steller SL	1	155.6	170.2	1.6		7	clear anti-predator response
1039	Steller SL	3	160.1	171.9	4.0		6	minor individual avoidance
1210	Gray whale	1	139.3	154.3	7.2		0	no observable response
1012	Gray whale	1	137.7	155	7.0		0	no observable response
1039	Gray whale	1	160.3	170.3	8.8		0	no observable response
1257	Gray whale	1	163.4	172.5	6.1		0	no observable response
1349	Dall's porp.	3	131	143.5	26.9		0	no observable response
1649	Dall's porp.	2	157.4	168.3	7.1		0	no observable response
1340	Dall's porp.	4	156.6	172.2	2.8		6	minor group avoidance
1311	Dall's porp.	4	165.4	176.5	3.0		6	minor group avoidance
1445	Dall's porp.	4	169.5	179.8	2.4		6	minor group avoidance
1314	Dall's porp.	4	171.3	180.8	2.4		6	minor group avoidance
1349	Harbour porp.	3	131	143.5	26.9		0	no observable response
726	Harbour porp.	7	142.5	155.2	54.7		7	severe and sustained avoidance
734	Harbour porp.	7	142	155.2	53.5		7	severe and sustained avoidance
702	Harbour porp.	1	142.4	155.3	64.8		7	severe and sustained avoidance
758	Unid. porp.	3	167.9	177.8	2.4	n/a		no record

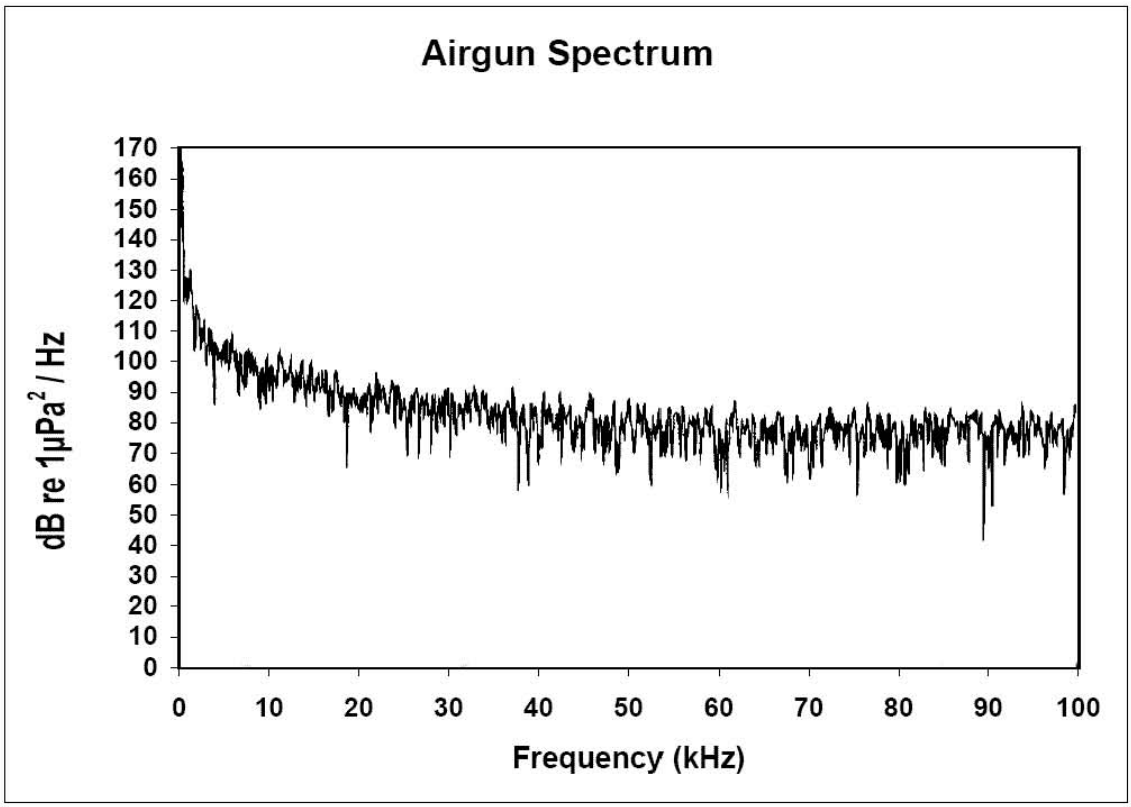
1305	Unid. porp.	3	165.6	178.4	2.4	0	no observable response

2Figure 1


RECEIVED SOUND LEVEL
AS A FUNCTION OF DISTANCE
Sound Level (dB re 1 µ Pa)
250
200
150
100
50
0
0.1
1
10
100
Distance (km)
Peak-Peak Level
RMS Level
Log. (Peak-Peak Level)
Log. (RMS Level)

3

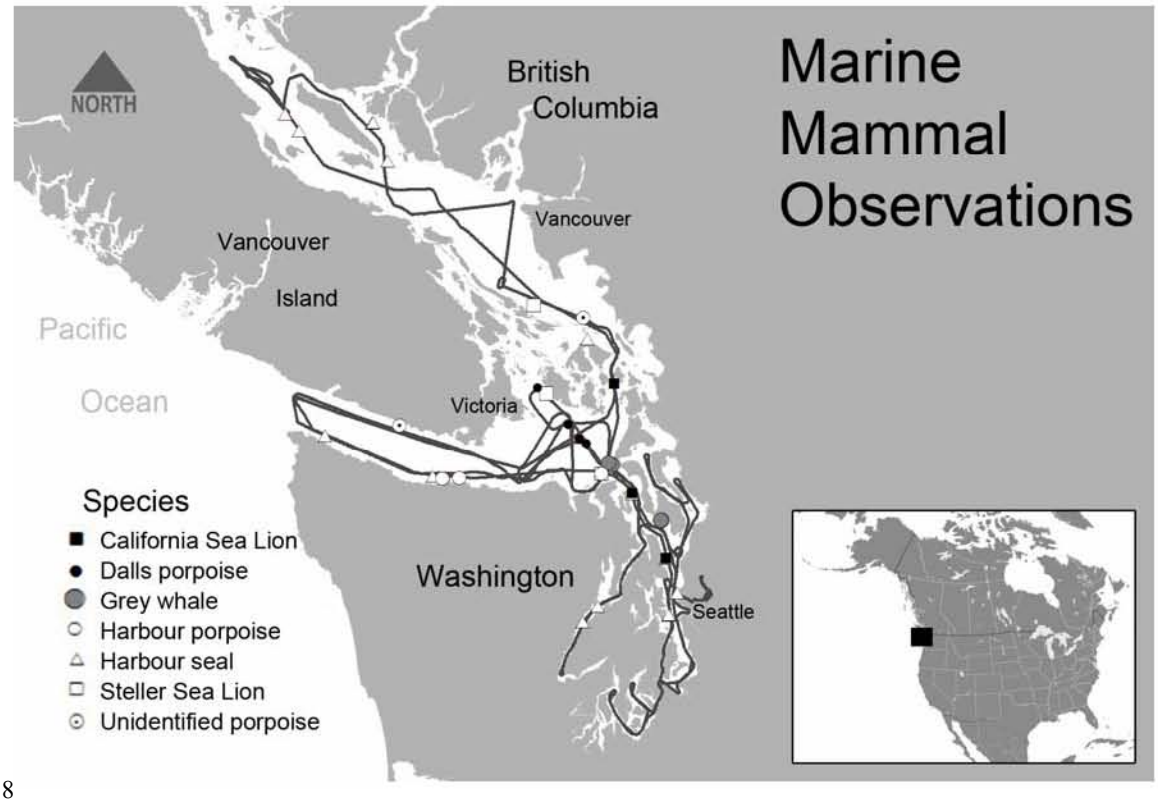
4Figure 2


Airgun Spectrum
dB re 1µPa² / Hz
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
0
10
20
30
40
50
60
70
80
90
100
Frequency (kHz)

5

6Figure 3.

7


Marine
Mammal
Observations
NORTH
British
Columbia
Vancouver
Vancouver
Island
Pacific
Ocean
Victoria
Seattle
Washington
Species
California Sea Lion
Dalls porpoise
Grey whale
Harbour porpoise
Harbour seal
Steller Sea Lion
Unidentified porpoise

8

9Figure 4

11

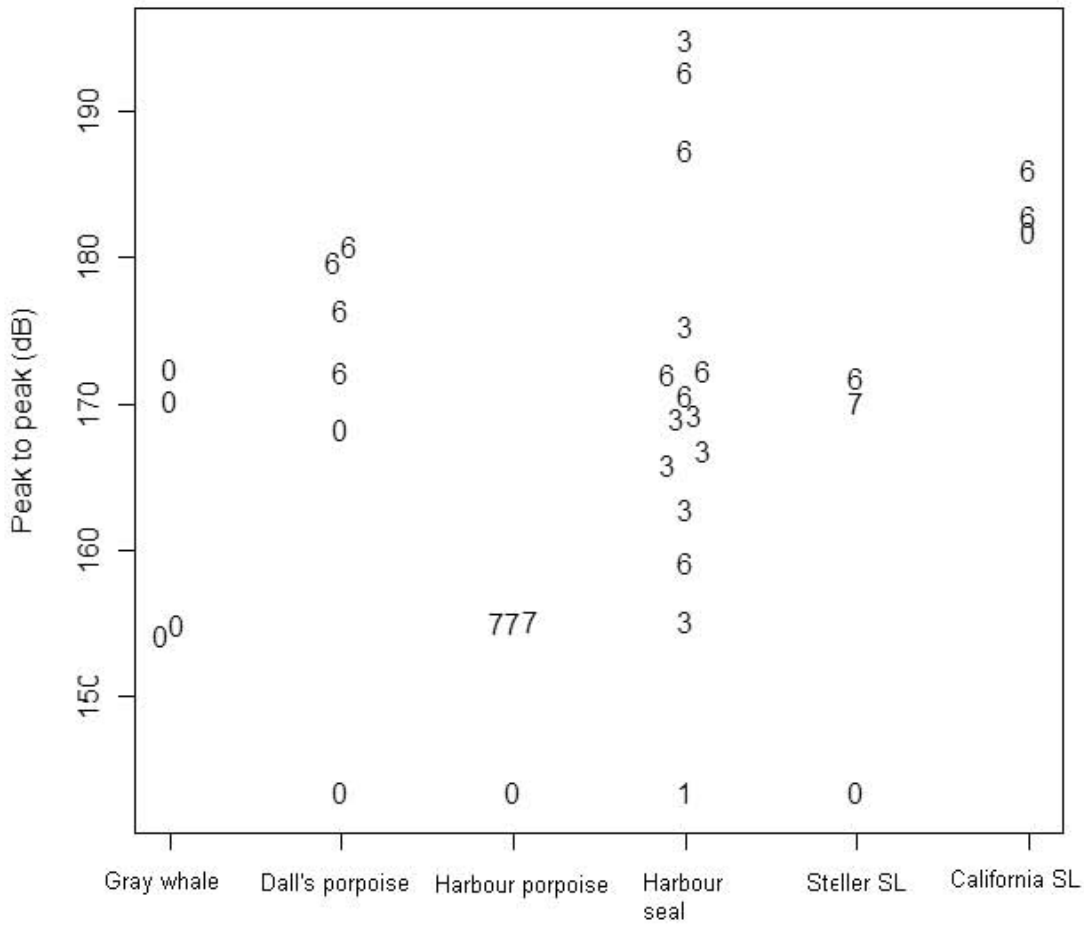

Peak to peak (dB)
150
160
170
180
190
Gray whale
Dall's porpoise
Harbour porpoise
Harbour seal
Steller SL
California SL

EXHIBIT 3

SUMMARY OF KEY RESEARCH ON BOWHEAD WHALE IMPACTS DUE TO OFFSHORE OIL AND GAS ACTIVITY DURING THE BEAUFORT SEA FALL OPEN WATER SEASON AND BOWHEAD WHALE USE OF THE ALASKAN BEAUFORT SEA DURING FALL WESTWARD MIGRATION

August 2009

NOTE: All results corroborate observations reported by AEWC whaling captains prior to research being conducted. Whaling captains' observations are used by the North Slope Borough, NMFS, and operators to identify research needs related to offshore impacts. While not exhaustive, the information here provides a summary of key research results regarding fall bowhead whale use of the Alaskan Beaufort Sea and offshore oil and gas development impacts. The very small number of research citations provided here demonstrates the very limited amount of baseline research available on bowhead whale use of the Beaufort Sea habitat.

BOWHEAD WHALE USE OF THE BEAUFORT SEA DURING FALL WESTWARD MIGRATION.

CAMDEN BAY: Whaling captains from Nuiqsut and Kaktovik consistently report bowhead whales feeding, resting, and caring for young in Camden Bay waters. Aerial surveys have also documented feeding in Camden Bay (Moore et al. 1989).

EASTERN, MIDDLE, AND WESTERN BEAUFORT: Bowhead whales feed regularly in the nearshore waters of the eastern, central and western Alaskan Beaufort Sea during September-October. This entire region should be considered an integral part of the summer- autumn feeding range of bowhead whales (Lowry, et al., 2004, p. 221; Conclusion).

BOWHEAD WHALE DISTURBANCE EFFECTS DUE TO OFFSHORE DRILLING AND ICE MANAGEMENT IN THE BEAUFORT SEA, CAMDEN BAY (See NRC, 2003, p. 100; Richardson, et al., 1995, p. 276.; *Attachment 1*) .

HAMMERHEAD/SIVULLIQ 1986 (with little ice management): "Zone of avoidance" by fall migrating bowhead whales appeared to extend 15-25 km (9-15 mi) from the drill ship. No whales were detected closer than 9.5 km (6 mi) from the drillship (received sound at 15 km was 105-130 dB), few were seen closer than 15 km (9 mi),

and one whale was observed for 6.8 hours as it swam in an arc of about 25 km (15 mi) around the drillship (LGL and Greeneridge 1987).

CORONA 1986 : Received sound levels at 15 km (9 mi) were reported to be 105-125 dB (LGL and Greeneridge 1987).

KUVLUM 1992 (with daily ice management): Whales began to deflect at about 32 km (19 mi) away from the drill rig (Brewer et al. 1993). Whaling captains reported behavioral changes (swimming patterns and respiratory rates) at 20+ miles. (See Attachment 1).

KUVLUM 1993: The whales were nearly excluded from an area within 20 km (12 mi) of the drilling platform (Davies 1997, Hall et al. 1994).

BOWHEAD WHALE DISTURBANCE EFFECTS DUE TO OFFSHORE GEOPHYSICAL ACTIVITY IN THE BEAUFORT SEA, CAMDEN BAY (See LGL Ltd., et al., 1999, pp. 5-60, F-7; Attachment 2.)

In 1996, 1997, and 1998, bowhead whales were rarely seen within 20 km of an active seismic operation. Near total avoidance extended to 15-20 km in two years, with substantial avoidance extending out to 30 km in the third year. Significantly elevated sighting rates at 20-30 km during seismic activity the first year and 30-40 km during seismic activity in the third year are consistent with the interpretation that whales concentrated at those distances while avoiding the areas closer to the seismic operations.

BOWHEAD WHALE DISTURBANCE DUE TO VESSEL TRAFFIC (See Richardson, et al., 1995, p. 270). Bowheads react strongly and consistently to approaching vessels of a wide variety of types and sizes; interrupt normal behavior and swim rapidly away; surfacing, respiration, and diving cycles are affected. Research at BP's Northstar Island, where oil production is occurring, also showed bowheads deflecting away from the island at very low levels of received sounds (Richardson 2008).

RESEARCH AND MITIGATION RELYING SOLELY ON MARINE MAMMAL OBSERVERS (MMOs) (See Richardson, et al., 1995, p. 268). Some bowhead whales begin to avoid approaching diesel-powered vessels 4 km or more away -- too far away

to be observed from the vessel. Therefore, MMOs are not an appropriate means of documenting disturbance.

ACTIVITIES MOST LIKELY TO AFFECT BOWHEAD WHALES. These include marine seismic exploration, exploratory drilling, ship and aircraft traffic, discharges into the water, dredging and island construction, and production drilling (NRC, 2003, p. 100).

Marine seismic exploration produces the loudest industrial noise in the bowhead whale habitat (NRC, 2003, p. 100). Aside from seismic vessels, the strongest noise sources known to occur near bowhead whales are icebreakers (Burns, et al., 1993, p. 639).

CONSEQUENCES OF DISTURBANCE._"The significance of short-term behavioral responses to the long-term well-being of individuals and populations is rarely known. Most brief interruptions of normal behavior may have little affect on overall energy balance and reproductive performance. However, physiological reactions may occur even if no overt behavioral response is evident (e.g., MacArthur, et al. 1979; Section 11.8.4). Uncertainties about physiological, long-term, and population consequences are common for all types of marine mammals and all sources of disturbance." (Richardson, et al., 1995, p. 242, citing, MacArthur, R.A., V. Geist and R.H. Johnston. 1979. *Factors influencing heart rate in free-ranging bighorn sheep: A physiological approach to the study of wildlife harassment. Can. J. Zool.* 57(10):2010-2021).

In most studies, little or no information has been obtained about the duration or biological significance of altered behavior after disturbance (Richardson, et al., 1995, p. 242). This is a very serious base line research need in the Arctic. The AEWC has requested support for this research for more than 20 years.

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Sierra Club

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The Wilderness Society

Layla Hughes
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World Wildlife Fund

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July 8, 2010

Via Electronic Mail: PR1.0648-XW13@noaa.gov

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Re: Take of Marine Mammals During Open-water Marine Survey Program in the Chukchi Sea, Alaska between July and November 2010. 75 Fed. Reg. 32,379 (June 8, 2010).

Dear Mr. Payne,

Thank you for the opportunity to comment on Statoil USA E&P Inc.'s (hereafter "Statoil") application for an Incidental Harassment Authorization ("IHA") to the National Marine Fisheries Service ("NMFS") pursuant to the Marine Mammal Protection Act ("MMPA") for oil and gas related activities in the sensitive Chukchi Sea. *See* 75 Fed. Reg. 32,379 (June 8, 2010). These comments are submitted on behalf of the Alaska Eskimo Whaling Commission ("AEWC"). AEWC represents the eleven bowhead whale subsistence hunting villages of Barrow, Nuiqsut, Kaktovik, Pt. Hope, Wainwright, Kivalina, Wales, Savoonga, Gambell, Little Diomede, and Pt. Lay.

At the outset, I must state that the AEWC is extremely disappointed in the approach taken by the Office of Protected Resources in the Federal Register notice that is the subject of these comments.

As we have stated many times in the past, NMFS continues to issue IHAs in the Arctic without an adequate scientific basis to do so, repeatedly dismissing concerns about impacts to marine mammals despite a large body of science that documents the potential impacts of anthropogenic sound in the marine environment. NOAA has called for the use of sound science and implementation of a marine spatial planning process for the Arctic. Yet NMFS' Office of Protected Resources continues to authorize industrial activity based on inadequate information, using a results-oriented approach reminiscent of the past Administration and the decision processes at the Minerals Management Service that have brought the wrath of the public down on this Administration. We expected more by way of substance and sound analysis given the new leadership at the agency charged by Congress with protection of marine mammals, marine habitat, and our subsistence livelihood that is dependent on that habitat.

For instance, the Office of Protected Resources continues to dismiss the potential cumulative effects to the bowhead whale population resulting from numerous exposures to industrial noise across the Arctic. As NOAA itself stated in comments on the Draft Proposed Five-Year Plan, there is a "potential for significant cumulative effects to the Western Arctic stock of bowhead whales from development in waters off Alaska." Jane Lubchenco, Ph.D., Comments on Draft Proposed Outer Continental Shelf (OCS) Oil and Gas Leasing Program for 2010-2015 (Sept. 21, 2009). Dr. Lubchenco stated that it is "premature to characterize the cumulative impacts of seismic work to bowhead whales as not having population-level impacts without a comprehensive assessment including the development of an acoustic integration model to consider multiple exposures over time and space." Despite making these statements, NMFS continues to issue IHAs without conducting *any* assessment of the cumulative impacts resulting from activities throughout the range of the bowhead whale. Moreover, Dr. Lubchenco called for a marine spatial planning process for the Arctic, a process that has been started by the President's Join Ocean Policy Task Force, and yet in the meantime NMFS continues to approve numerous industrial activities that threaten to alter the existing baseline and foreclose future management options.

In submitting its application, the corporation failed to comply with applicable statutory and regulatory application requirements and has otherwise failed to demonstrate that its activities comport with the requirements for issuing an IHA. For its part, NMFS has accepted many of Statoil's assertions that are contrary to both scientific research and agency experience, continues to fail to provide for independent verification of offshore operators' compliance with IHA provisions, and has otherwise failed to follow the letter of the law. The lack of information about marine mammals in the Chukchi Sea, as demonstrated throughout Statoil's application and NMFS's notice, makes it clear that NMFS is not in a position to make the statutory findings required by Congress through the Marine Mammal Protection Act. Moreover, despite this lack of information, NMFS failed to rely on the best available science about marine species in the

Chukchi Sea. For these reasons and those discussed below, NMFS's preliminary determinations are arbitrary.

In addition to the above, NMFS should be aware that Statoil has refused to sign the 2010 Open Water Season Conflict Avoidance Agreement ("CAA"), despite very significant concessions by our whaling captains, made in an effort to reach accord. Of greatest concern here is the fact that ***NMFS must find, on behalf of the Secretary, that Statoil's proposed operations with not have and unmitigable adverse impact on the availability of marine mammals for subsistence uses. In the absence of a CAA, NMFS has no independent basis on which to make this finding.***

Therefore, in the absence of a CAA and given the very significant legal infirmities underlying NMFS review of this application, the AEWC objects to the issuance of an IHA to Statoil. However, the AEWC will withhold this objection, despite the numerous legal issues discussed in these comments, should NMFS choose to adopt the precautionary mitigation measures worked out by our whaling captains, in lengthy discussions with industry operators, and adopted previously both by NMFS and operators. These measures are set forth in the 2009 CAA, sent as a separate attachment to these comments.

Finally, we note that in recent years NMFS did not publish its response to comments on proposed IHAs activities conducted during the open water season until well after the fall subsistence hunt at Cross Island had concluded and geophysical operations had already taken place. There can be no excuse for allowing operations to take place within important areas of the Arctic Ocean prior to NMFS explaining to the local communities and whaling captains how agency responded to their comments. The fact that NMFS would not release its response to comments until after the activities had taken place casts serious doubt on the validity of NMFS' public involvement process and the underlying analysis of impacts to subsistence activities and marine mammals.

I. NMFS Should Not Issue An IHA Given The Current Suspension of Offshore Drilling In Alaska And Pending Reorganization Of The Minerals Management Service.

The United States has just experienced an environmental disaster in the Gulf of Mexico unlike any our nation has ever seen. The continuing environmental and economic damage is both shocking and saddening. In light of this recent event, President Obama wisely announced the suspension of exploration off the coast of Alaska and a six-month suspension of new deepwater oil drilling permits. The AEWC now requests that NMFS follow the President's lead in taking a second, more critical look into the risks associated with offshore activities.

The harm caused by an oil spill is not the only risk to marine mammals posed by oil and gas activities on the OCS. For many years, AEWC and the scientific community have raised concerns regarding underwater noise from geophysical activities and the threats posed to marine

mammals from noise and chemical pollution, as well as increasing vessel traffic. MMS, just as it does with the risk of an oil spill, habitually downplays threats to marine mammals, and NMFS has routinely granted IHA's for geophysical operations authorized by MMS. Many times, these IHAs have been issued over the objections of the scientific and subsistence communities as well as the agencies' own scientists. In short, the systemic problems highlighted by the Deepwater Horizon incident are not limited solely to the oil spill context but also plague the government's assessment and regulations of other impacts and risks associated with oil and gas activities on the OCS.

As the Administration steps back from the rush to open the Arctic to exploratory drilling, NMFS should also take this time to reassess its approach to regulation of geophysical activities. In particular, in cooperation with the Council on Environmental Quality and other agencies of the Administration, NMFS should determine whether and to what extent the systemic problems within MMS have impacted the government's regulation of offshore oil and gas activities in addition to drilling. Until the Administration completes the reorganization of MMS and determines whether and how exploratory activities can move forward, NMFS should not be approving geophysical activities that carry with them the threat of adversely affecting marine mammals and our subsistence activities.

II. Applicable Legal Requirements.

A. The Marine Mammal Protection Act

The findings required of the Secretary pursuant to Section 101(a)(5)(D) of the MMPA are mandatory. Congress directs that the Secretary *shall find* that there will be *no more than a negligible impact* to marine mammals and *no* unmitigable adverse impact to the availability of marine mammals for subsistence taking. Thus, Congress does not give the Secretary discretion in making the mandatory findings.

This nondiscretionary congressional directive is consistent with the MMPA's overall treatment of both marine mammal and subsistence protections. Congress has set a "moratorium on the taking ... of marine mammals," 16 U.S.C. § 1371(a), with the sole exemption provided for the central role of subsistence hunting by Alaska Natives. Thus, Congress has given priority to subsistence takes of marine mammals over all other exceptions to the moratorium, which may be applied for and obtained only if certain statutory and regulatory requirements are met. One such exception is an IHA. However, incidental harassment authorizations are available only for specified activities for which the Secretary makes the mandated findings. Thus, the pursuit of those activities is subordinated, by law, to the critical subsistence uses that sustain Alaska's coastal communities.

Furthermore, an IHA can only be granted if the activity has *no* potential to result in serious injury or mortality. 16 U.S.C. § 1371(a)(5)(D). If such injury or mortality is possible, take can

only be authorized pursuant to a Letter of Authorization ("LOA") that complies with 16 U.S.C. § 1371(a)(5)(A) and 50 C.F.R. § 216.105.

In order to obtain an IHA, the applicant must submit an application that comports with applicable regulatory requirements, *see* 50 C.F.R. §§ 216.104, 216.107, and NMFS "shall publish a proposed authorization" for public comment. 16 U.S.C. § 1371(a)(5)(D)(iii). If the activity to be covered by the IHA "may affect the availability of a species or stock for taking for subsistence uses" then NFMS "shall prescribe" "requirements for the independent peer review of proposed monitoring plans or other research proposals." 16 U.S.C. § 1371(a)(5)(D)(ii)-(ii)(II). Under no circumstances can the activity "reduce the availability of the species to a level insufficient for a harvest to meet subsistence needs." 50 C.F.R. § 216.103. In deciding whether to issue an IHA, NMFS "shall evaluate each request to determine, based upon the best available scientific evidence, whether the taking . . . will have a negligible impact on the species or stock and . . . will not have an unmitigable adverse impact on the availability of such species or stock for subsistence use." 50 C.F.R. § 216.104(c).

Additionally, an application for an IHA triggers both consultations under section 7 of the Endangered Species Act ("ESA") regarding the impacts to ESA listed species, 16 U.S.C. § 1536(a)(2), and review of the environmental impacts of activities NMFS may authorize under the National Environmental Policy Act ("NEPA").

III. NMFS Is Not In A Position To Issue An IHA Until Both The Agency And Statoil Comply With All Procedural And Informational Requirements Of The MMPA .

A. Statoil's Application Must Be Returned As Incomplete And Inappropriate.

At the outset, we note our disappointment in NMFS for putting out for public comment a woefully incomplete application from Statoil for an IHA that fails to provide the mandatory information required by the MMPA and NMFS's implementing regulations. Without the required information, NMFS cannot make the determinations required under the MMPA. *See* 16 U.S.C. § 1371(a)(5)(D)(iii). For this reason, we ask that NMFS return Statoil's application as incomplete, *see* 50 C.F.R. § 216.104(b)(3) ("Applications that are determined to be incomplete or in appropriate for the type of taking requested will be returned to the applicant"), or else the agency risks making arbitrary and indefensible determinations under the MMPA.

Indeed, NMFS has previously explained that:

> in order for NMFS to accept an incidental harassment application, such application must be complete, accurate (to the extent possible), and address in some detail the information items requested as part of the application. If an application does not provide documentary evidence sufficient for NMFS to make a preliminary determination that the activity is likely to result in only a small take (by harassment) of marine mammals and have no more than a negligible impact

on the species or stocks impacted or their habitat, *NMFS will return the application as Sincomplete*.

60 Fed. Reg. 28,379, 28,381 (May 31, 1995) (emphasis added). The following is a list of information that is missing from Statoil's application:

- For several species, a thorough "description of the status, distribution, and seasonal distribution (when applicable) of the affected species or stocks of marine mammals likely to be affected." 50 C.F.R. § 216.104(a)(4);
- A description of the "age, sex, and reproductive condition" of marine mammals that will be impacted, particularly in regard to bowhead whales. 50 C.F.R. § 216.104(a)(6);
- An adequate detailing of "the anticipated impact of the activity upon the species or stock of marine mammals." 50 C.F.R. § 216.104(a)(7);
- The economic "availability and feasibility . . . of equipment, methods, and manner of conducting such activity or other means of effecting the least practicable adverse impact upon the affected species or stocks, their habitat, and on their availability for subsistence uses, paying particular attention to rookeries, mating grounds, and areas of similar significance" 50 C.F.R. § 216.104(a)(11);
- "Suggested means of learning of, encouraging, and coordinating research opportunities, plans, and activities relating to reducing such incidental taking and evaluating its effects." 50 C.F.R. § 216.104(a)(14).

B. The IHA Cannot Be Approved Because NFMS Has Failed To Provide Public Comment On The Draft Authorization

The plain language of both the MMPA and NMFS' implementing regulations require that NMFS provide the opportunity for public comment on the "proposed incidental harassment *authorization*," 50 C.F.R. § 216.104(b)(1)(i) (emphasis added); 16 U.S.C. § 1371(a)(5)(D)(iii), and not just on the application itself as NMFS has done here. The authorization itself must prescribe certain requirements such as "permissible methods for taking by harassment," "means of effecting the least practicable impact on such species," measures to "ensure no unmitigable adverse impact on the availability of the species or stock for taking for subsistence use," requirements pertaining to "monitoring and reporting" and for "independent peer review" of such monitoring and reporting if the taking may affect subsistence use. 16 U.S.C. § 1371(a)(50(D)(ii). Indeed, NMFS's regulations further provide that "[a]ny preliminary finding of 'negligible impact' and 'no unmitigable adverse impact' shall be proposed for public comment along with [] the proposed incidental harassment authorization . . .." 50 C.F.R. § 216.104(c).

Given Statoil's failure to sign the CAA, without a complete draft authorization and accompanying findings, AEWC cannot provide meaningful comments on Statoil's proposed activities, ways to mitigate the impacts of those activities on marine mammals, and measures that are necessary to protect subsistence uses and sensitive resources. We are aware that NMFS takes the position that the Federal Register notice provides information equivalent to a draft of the

IHA itself, however that position is both contrary to the plain language of the law and common sense. In particular, the language of the IHA governs the specific mitigation, monitoring and reporting requirements, and Statoil's ultimate legal obligations will be interpreted based not on what is in the Federal Register notice but what is in the authorization itself. Only by reviewing the specific language governing Statoil's activities can the AEWC provide meaningful input into the IHA process.

IV. Statoil's Application Does Not Meet the Minimum Substantive Requirements of the Marine Mammal Protection Act.

A. The Likely Take Of Marine Mammals Due To Statoil's Operations Exceeds The Limits Set By Congress .

With respect to the "take" of marine mammals, NMFS may only issue an IHA if the activity will result in only incidental take by "harassment of small numbers of marine mammals," 16 U.S.C. § 1371(a)(5)(D), and that "based on the best scientific evidence available, that the total taking by the specified activity during the specified time period will have a negligible impact on the species or stock . . .." 50 C.F.R. § 216.102(a).

Harassment is defined under the MMPA 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; 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." 16 U.S.C. § 1362(18)(A).

1. Statoil's Proposed Activities Carry the Potential to Cause Level A Take And Serious Injury.

Take as the result of airgun and pinger system use and other seismic operations are the focal point for both NMFS and Statoil. In terms of assessing the impacts of airgun use on marine mammals, there are two basic reactions that must be addressed: threshold shifts from exposure to sound and deflection of marine mammals from the ensonified area.

With respect to sound exposure, NMFS has previously explained in enacting the Arctic specific MMPA regulations that:

> if an application indicates that an acoustic source at its maximum output level has the potential to cause a temporary threshold shift in a marine mammal's hearing ability, that taking would constitute a 'harassment' take, since the animal's hearing ability would recover and the section 101(a)(5)(D) application would be appropriate. However, if the acoustic source at its maximum level had the potential to cause a permanent threshold shift in a marine mammal's hearing ability, that activity would be considered to be capable of causing serious injury to a marine

mammal and would therefore not be appropriate for an incidental harassment authorization.

60 Fed. Reg at 28,381 (May 31, 1995). NMFS admits that "the potential effects . . . might include . . . at least in theory, temporary or *permanent* hearing impairment." 75 Fed. Reg. at 32,389 (citing (Richardson et al. 1995)) (emphasis added). Since Statoil's operations at their maximum level have the "*potential to cause permanent threshold shift*" if marine mammals did not leave the ensonified area, an LOA and not an IHA is required here.

Additionally, research is increasingly showing that marine mammals may remain within dangerous distances of seismic operations rather than leaving a valued resource such as a feeding ground. *See* (Richardson, 2004) (Attachment 2) ("For Bowhead whales, a recent LGL Ltd. study of migrating animals showed that deflection began at lower received levels than had been previously documented, with most individuals remaining >20 km from the airguns." And more recent data showed that "bowheads are more tolerant of airgun pulses when feeding in summer than when migrating in autumn."). The International Whaling Commission ("IWC") scientific committee has indicated that the lack of deflection by feeding whales in Camden Bay (during Shell Offshore Inc. and Shell Gulf of Mexico Inc.'s seismic activities) likely shows that whales will tolerate and expose themselves to potentially harmful levels of sound when needing to perform a biologically vital activity, such as feeding (mating, giving birth, etc.). Statoil even noted that various sources have reported "that some marine mammals that show no obvious avoidance or behavioral changes may still be adversely affected by noise." *See* Statoil IHA Application Appendix C at 110. Statoil also acknowledged that "[s]ome research suggests that animals in poor condition or in an already stressed state may not react as strongly to human disturbance as would more robust animals." *Id*.

Thus, the noise from Statoil's proposed operations could injure marine mammals if they are close enough to the source. Statoil intends to employ marine mammal observers ("MMO") and defines "safety zones to prevent any hearing impairment . . . as the distance from the source to the received level of ≥190 dB for pinnipeds and ≥180 dB for cetaceans." Statoil App. at 52. "The distances to received sound levels of ≥160 dB form the basis for estimating the number of animals potentially affected." *Id.* at 51. The safety radii proposed by Statoil do not negate the impacts.

The use of MMOs is not an adequate mitigation measure and is not effective at preventing Level A harassment.. MMOs cannot see throughout the ensonified area even in perfect visibility conditions, and such conditions are extremely rare in Arctic conditions. Richardson , W.J. *et al.* Marine Mammals and Noise. Academic Press. 1995. Based on traditional knowledge and scientific research in the Beaufort Sea, migrating bowhead whales become evasive in the presence of anthropogenic sound, spending more time under water thus further reducing opportunites to spot them. The safety radii only function as well as the observers on the vessels can see and report marine mammals within the radii or the general vicinity of the vessel.

Statoil fails to adequately address these drawbacks. NMFS, however, acknowledges that "humans observing objects of more-or-less known size via standard observation protocol" are still only "able to estimate distances within about =20%." 75 Fed. Reg. at 32,387. Even this unacceptable level of accuracy is attainable only if the MMO is "given immediate feedback about actual distances during training." *Id.* In addition to this, Statoil proposes *not* having MMO on duty at all times seismic operations are underway. Although Statoil plans to conduct its surveying 24 hours per day, MMO will not be on duty at night, "given the very limited effectiveness of visual observations at night." Statoil App. at 54. Instead of these trained observers, bridge personnel will keep watch for marine mammals "insofar as practical." *Id.* In light of these disturbing flaws, it is clear that Statoil's proposed MMO program is not sufficient mitigation to prevent Statoil from engaging in Level A harassment.

a. Statoil's proposed activities create the potential for injury due to deflection.

NMFS does little to assess whether Level A harassment is occurring as a result of the deflection of marine mammals due to Statoil's proposed operations. Deflected marine mammals may suffer impacts due to masking of natural sounds including calling to others of their species, physiological damage from stress and other non-auditory effects, harm from pollution of their environment, tolerance, and hearing impacts. *See* (Nieukrik, 2004) (Attachment 3) ("Airgun activity . . . effect on the baleen whales studied here is unknown; possible effects include masking of conspecific sounds, increased stress levels, changing vocalizations, and ear damage (Richardson et al., 1995)."). Thus, movement of marine mammals away from noise in the marine environment is common, and constitutes take because it "disturb[s]" marine mammals "by causing disruption of behavioral pattern[s]" such as feeding and migrating. *See* 16 U.S.C. § 1362(18) (defining "harassment"). Not only do these operations disrupt the animals' behavioral patterns, but they also create the potential for injury by causing marine mammals to miss feeding opportunities, expend more energy, and stray from migratory routes when they are deflected.

Moreover, these impacts cannot be assessed in the isolation of one proposed project but must be placed in the larger context of what these animals are experiencing throughout their *ranges in Arctic waters*. *See* Angliss, R. P., and B. M. Allen. BOWHEAD WHALE (Balaena mysticetus): Western Arctic Stock Assessment (4/1/2008) NOAA-TM-AFSC-193. (last visited June 29, 2010: http://www.nmfs.noaa.gov/pr/pdfs/sars/ak2008whbh-arw.pdf) ("since 2006 there has been elevated interest in exploiting petroleum reserves in the seas around Alaska, including most areas where bowheads feed and migrate. The accumulation of impacts from vessels, seismic exploration, and drilling are of concern across the North Slope of Alaska.").

For example, Statoil's proposal is only one of the oil industry activities recently occurring, planned, or ongoing in the U.S. portions of the region. NMFS's website reveals the following additional MMPA IHA and LOA requests that were approved in the range of the species at issue here over the past few years, and those applications for the present and future seasons: 2006 LOA issued - BP, Operation of Northstar Oil and Gas Facility in the Beaufort Sea, AK; 2007

IHA approved - Shell Offshore, Inc. and WesternGeco, Inc., seismic survey program in the Chukchi and Beaufort Seas, AK; 2009 IHA approved - Shell Offshore, Inc. and Shell Gulf of Mexico, Inc., site clearance and shallow hazards surveys in the Chukchi Sea, AK; 2010 IHA applied for - Shell open water marine survey program in the Beaufort and Chukchi Seas, AK; 2011-2016 LOA applied for - BP, Operation of Northstar Oil and Gas Facility in the Beaufort Sea, AK. *See* NMFS, Incidental Take Authorizations (last visited June 29, 2010: HYPERLINK http://www.nmfs.noaa.gov/pr/permits/incidental.htm). Moreover, additional geophysical work is planned in the Russian far east and the Canadian Beaufort, which could similarly impact the Western Beaufort Stock of bowhead whales. The United States Geological Service has also released a draft environmental assessment and applied for an IHA for its own geophysical work during this upcoming open water season. NMFS must determine whether level A take is likely to result from multiple harassing events within the same year or season, which could result in whales being deflected at multiple points throughout their migration routes.

Each of these operations may deflect marine mammals altering their behavior and setting them off migratory courses or feeding grounds on numerous occasions. Each such deflection can cause the animals to expend additional energy, miss feeding opportunities, or stray from its intended course and when this occurs repeatedly, it certainly has the potential to injure marine mammals. Without an analysis of the effects of all of the planned operations on marine mammals, it is impossible to assess the level of take of these animals that is on-going. It is for this reason that we advocate NMFS implement a cap on the overall seismic related activities that can occur in Arctic waters each year.

b. Increases in carcasses/stranding also indicate the potential for injury.

Stranded marine mammals or their carcasses are also a sign of injury. NMFS states in its notice that the Agency "does not expect any marine mammals will . . . strand as a result of proposed seismic survey." 75 Fed. Reg. at 32,383. NMFS also states that "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." *Id.* In reaching this conclusion, NMFS claims that strandings have not been recorded for the Beaufort and Chukchi Seas. Had NMFS consulted with native groups it would have learned this is in fact false. The Department of Wildlife Management of the North Slope Borough has completed a study documenting twenty- five years worth of stranding data and showing that five dead whales were reported in 2008 alone in comparison with the five dead whales that were reported in the same area over the course of twenty-five years. (Rosa, 2009) (Attachment 4). Indeed, the study points to "[a]nthropogenic activities such as oil and gas development, commercial fishing, and shipping" which "create disturbance, noise, and chemical pollution, all of which have been shown to have detrimental effects on wildlife, including whales" as a potential cause for the recent increase in stranded whales documented by the Borough. *Id.*

In light of the increase in seismic operations in the Arctic since 2006, the Borough's study raises serious concerns about the impacts of these operations and their "potential to injure a

marine mammal." *See* 16 U.S.C. § 1362(18)(A)(i). While we think this study taken together with the "May- June 2008, stranding of 100–200 melon- headed whales (Peponocephala electra) off Madagascar that appears to be associated with seismic surveys" 75 Fed. Reg. at 32,383, demonstrate that seismic operations have the potential to injure marine mammals beyond beaked whales, certainly the Borough's study shows that direct injury of whales is an ongoing risk. While NMFS acknowledges the strandings in Madagascar and their apparent association with seismic surveys, it does only that. Although it has been two years since the incident, NMFS merely notes that it is currently under investigation. These direct impacts must be analyzed and explanations sought out before additional activities with the potential to injure marine mammals are authorized.

Thus, NMFS must explain how, in light of this information, Statoil's application does not have the potential to injure marine mammals.

2. NMFS Failed To Use The Best Scientific Evidence Available In Assessing The Level Of Take From Statoil's Operations.

In assessing "the total taking by the specified activity" and whether it will have a negligible impact, NMFS must use the "best scientific evidence available." *See* 50 C.F.R. § 216.102(a). It has not done so here.

a. NMFS did not use the best scientific evidence in setting the sound levels against which take was assessed.

NMFS uses exposure to sound levels ≥160 dB re 1 μPa (rms) as the measure in assessing the impacts from Statoil's proposal. 75 Fed. Reg. at 32,389; Statoil App. at 51. We disagree that 160 dB remains an appropriate measure for take of marine mammals for several reasons.

First, in conducting scoping on its national acoustic guidelines for marine mammals, NFMS noted that the existing system for determining take – *i.e.*, the 160 dB mark – "considers only the sound pressure level of an exposure but not its other attributes, such as duration, frequency, or repetition rate, all of which are critical for assessing impacts on marine mammals" and "also assumes a consistent relationship between rms (root-mean-square) and peak pressure values for impulse sounds, which is known to be inaccurate under certain (many) conditions." 70 Fed. Reg. 1871, 1873 (Jan. 11, 2005). Thus, NMFS itself has recognized that 160 dB (rms) is not an adequate measure.

Second, current scientific research establishes that 120 dB (rms) is a more appropriate measure for impacts to marine mammals. Using baleen whales as an example, studies suggest that seismic frequencies may be more damaging than originally anticipated. For example, a literature review of baleen whale sound sensitivity determined that bowhead whale vocalizations ranged from 129 to 189 dB, *see* Erbe (Attachment 5). This study concluded that

> Inferring from their vocalizations, bowheads should be most sensitive to frequencies between 20 Hz-5 kHz, with maximum sensitivity between 100-500 Hz. The lowest reported 3rd octave band level causing a behavioral response was **84dB, followed by 87, 90 and 94 dB**.

(Erbe 2002) (Attachment 5) (emphasis added). Moreover, "Richardson et al. (1999) reported that sighting rates of bowhead whales during aerial surveys in the Beaufort Sea were lower when the whales were exposed to seismic survey sounds of 120–130 dB re 1 μPa (rms), indicating a movement response at sound levels lower than had previously been reported for bowhead whales (Richardson et al. 1986; Richardson and Würsig 1997)." (Gailey 2007) (Attachment 6). Thus, if the ensonified zone around seismic operations is dropped down to 120 dB for purposes of impacts analysis, it is likely that many more bowheads will be deemed harassed by Statoil's proposed activities.

These studies and others like them are significant because research on anthropogenic sound is also showing that such noises "mask sounds associated with foraging" and "can decrease an animal's ability to find and capture food" and make communication sounds which "can decrease the ability of individuals to establish or maintain contact with group members or potential mates." (ICES 2005) (Attachment 7).

Moreover, the Erbe study also concluded that "[i]t is generally agreed that any sound at some level can cause physiological damage to the ear and other organs and tissues." (Erbe 2002) (Attachment 5). Placed in the context of an unknown baseline of sound levels in the Chukchi Sea, it is critically important that NMFS take a precautionary approach to permitting additional noise sources in this poorly studied and understood habitat. See Statoil App. at 59. (regarding proposed Acoustic Monitoring - "The main objectives for Statoil are: 1) to understand the propagation and attenuation of the seismic sounds in the waters surrounding the project area, 2) to determine the ambient sound levels in the waters surrounding the project area, where possible, and 3) assess the effects of sound on marine mammals occurring in the project area (specifically migrating bowhead whales), insofar the collected marine mammal data allows."). Thus, the best available science dictates that NMFS use a more cautious approach in addressing impacts to marine mammals from seismic operations.

b. NMFS did not use the best scientific evidence in assessing the impacts of Statoil's operations.

In assessing the level of take and whether it is negligible, NMFS relied on flawed density estimates that call all of NMFS's preliminary conclusions into question. Density data are lacking or outdated for almost all of the marine mammals that may be affected by Statoil's operations in the Chukchi Sea.

We are opposed to NMFS utilizing "survey data" gathered by industry while engaging in oil and gas related activities or from operating to estimate their take of marine mammals. Such

industry "monitoring" – like that proposed by Statoil – is designed to document the level of take occurring from the operations. *See* 75 Fed. Reg. at 32,386, Statoil App. sec. XIII. Putting aside whether the methodologies employed are adequate for this purpose, they certainly are not adequate for assessing the density or presence of marine mammals that typically avoid such operations. Research has documented that

> In general, bowheads react strongly and rather consistently to approaching vessels of a wide variety of types and sizes. Bowheads interrupt their normal behavior and swim rapidly away. Surfacing, respiration, and diving cycles are affected.

Richardson, W.J. *et al.* Marine Mammals and Noise. Academic Press. 1995: 268-270; *id.* ("Bowheads can be displaced by as much as a few kilometers while fleeing.") Thus, it is *completely arbitrary* to rely on data collected from the very vessels that marine mammals avoid in making density arguments and it is not surprising that such industry information consistently reports lower numbers for this reason. For these reasons, NMFS cannot rely on such industry information in calculating the density of marine mammals or determining whether certain species are present in the area without running afoul of the law.

Additional species specific examples are provided below that illustrate NMFS's failure to utilize the best available scientific studies in assessing Statoil's application.

Beluga Whales: NMFS's guess regarding the density of beluga whales was derived from data published ten years ago in a study from Moore *et al.* (2000). *See* 75 Fed. Reg. at 32,390. The estimate is contrary to the best available scientific information on beluga whale presence in the Chukchi Sea. Although Statoil submitted a revised version of its application as recently as April 14, 2010, it relies upon the 2008 Alaska Marine Mammal Stock Assessment. *See* Statoil App. at 22 (Angliss, R.P., and B.M. Allen. 2009. Alaska Marine Mammal Stock Assessments, 2008. U.S. Dep. Commer., NOAA Technical Memorandum NMFS-AFSC- 193, 258 p.) The most recent Alaska Marine Mammal Stock Assessment dates from 2009 and was issued in February 2010. *See* Angliss, R.P., and B.M. Allen. 2010. Alaska Marine Mammal Stock Assessments, 2009. U.S. Dep. Commer., NOAA Technical Memorandum NMFS-AFSC- 206, 276 p. (last visited June 29, 2010: http://www.nmfs.noaa.gov/pr/pdfs/sars/ak2009.pdf). This report specifically cites "increased human activity in the Arctic, including increasing oil and gas exploration and development" as a few of the current concerns related to negative impact on beluga habitat. *Id.* at 71, 75 (citing (Moore et al 2000, Lowry et al 2006)). Moreover, Angliss and Allen, as discussed by the comments of the North Slope Borough's Department of Wildlife Management, likely underestimate the size of the eastern Chukchi Sea beluga stock. NMFS must consider and disclose the limited information on stock size and discuss how this impacts its analysis.

Bowhead Whales: NMFS's guess regarding the density of bowhead whales was derived from the same ten year old report as was used to calculate beluga densities. *See* 75 Fed. Reg. at 32,391. NMFS makes no mention of the most recent Alaska Marine Mammal Stock Assessment which

was released this year. The Assessment cites to a 2003 study that documented bowhead whales in the "Chukchi and Bering Seas in summer" that are "are thought to be a part of the expanding Western Arctic stock. Angliss, R.P., and B.M. Allen. 2010. Alaska Marine Mammal Stock Assessments, 2009. U.S. Dep. Commer., NOAA Technical Memorandum NMFS-AFSC-206, 276 p. (last visited June 14, 2010: http://www.nmfs.noaa.gov/pr/pdfs/sars/ak2009.pdf). While a study published in 2003 still is not a sufficient basis for a 2009 density analysis, this study does show that additional information is available that indicates that number of bowhead whales in the Chukchi may be higher than estimated by NMFS. We also note that industry has collected extensive data as a result of acoustic monitoring programs in the Chukchi Sea from 2006-08. NMFS and Statoil should discuss the data collected during those operations and determine whether it represents the best available information.

As a general matter, when it comes to NMFS assessing the various stocks of marine mammals under the MMPA it cannot use out-dated data – i.e., "abundance estimates older than 8 years" - because of the "decline in confidence in the reliability of an aged abundance estimate," Angliss, R. P., and B. M. Allen. 2008. HARBOR PORPOISE (Phocoena phocoena): Bering Sea Stock Assessment. (3/31/2008) (last visited June 29, 2010: http://www.nmfs.noaa.gov/pr/pdfs/sars/ak2008poha-be.pdf) – and the agency is thus, unable to reach certain conclusions. Similarly here, where data is out-dated or non-existent NMFS should decide it cannot reach the necessary determinations. These flaws in NMFS's analysis render the agency's preliminary determinations about the level of harassment and negligible impacts completely arbitrary.

Furthermore, NMFS fails to explain how and why it reaches various conclusions in calculating the marine mammal densities. One example is NMFS's reliance on Moore *et al.* 2000 in making its density determinations. This study documented sightings of marine mammals but did not estimate the total number of animals present. In all, the practices discussed above have resulted in entirely arbitrary calculations of the level of take of marine mammals and whether such takes constitute "small numbers" or a "negligible impact" as a result of Statoil's proposal.

3. NMFS's Preliminary "Small Takes" and "Negligible Impact" Determinations Are Arbitrary.

An authorization of incidental take of marine mammals from specified activities can only be issued if such take will be limited to "small numbers" and have a "negligible impact" on the species or stock. 16 U.S.C. § 1371(a)(5)(D)(i)(I); 50 C.F.R. § 216.107. These are separate and distinct statutory requirements. *Id.* However, NMFS has adopted a regulatory definition of "small numbers" that conflates it with the "negligible impact" determination and impermissibly renders it meaningless. Thus, NMFS's implementation of the MMPA fails to comport with the plain language of the Act.

Moreover, despite NMFS assurances otherwise, Statoil's IHA application does not meet either the "small numbers" or "negligible impact" requirements. NMFS has preliminarily

determined that the impact of Statoil conducting seismic surveys in the Chukchi Sea will have no more than a negligible impact on marine mammals. Neither the Federal Register notice nor Statoil's application provides any support whatsoever for this "conclusion." Indeed, without knowing more about the status and number of species present in the Chukchi this conclusion cannot be supported.

Based on the density estimates, Statoil is predicting that an average of 2253 and a maximum of 3732 ringed seals may be exposed to sound levels of 160 dB and above during the proposed 3D seismic survey and an average of 4234 and a maximum of 7012 exposed during the proposed 2D tie line survey. *See* Statoil App. table 6-7. This example shows numbers of marine mammals that will be subjected to impacts as a result of Statoil's operations that are by no means "small."

In terms of negligible impacts, NMFS has failed to fully consider several impacts in its *Negligible Impact and Small Numbers Analysis and Preliminary Determination*. 75 Fed. Reg. at 32,394, 32,395.

First, the Agency acknowledged that Statoil's activities may cause the troubling effect of causing missed feeding opportunities. However, it simply dismissed this concern by stating that "any missed feeding opportunities in the direct project area would be minor based on the fact that other feeding areas exist elsewhere." *Id.* at 32,395. NMFS has provided no support whatsoever for this arbitrary conclusion. NMFS must provide the scientific basis for concluding that interfering with feeding activities will have no more than a negligible impact on the stock.

Second, while NMFS mentioned non-auditory physiological stress as a potential concern, it responds in a conclusory fashion, stating that it is not expected to occur and that there is no definitive evidence to suggests otherwise. *See Id.* at 32,395, 32,382.

Third, the possibility of marine mammals being struck by the many vessels that will be involved in Statoil's operations needs to be considered in light of scientific evidence of harm from ship traffic to marine mammals, *see, e.g.*, (George, 1994) (Attachment 8).

Fourth, the very real impacts to marine mammal habitat, including pollution of the marine environment and the risk of "oil spills, toxic, and nontoxic waste" being discharged, Western Arctic stock. Angliss, R.P., and B.M. Allen. 2010. Alaska Marine Mammal Stock Assessments, 2009. U.S. Dep. Commer., NOAA Technical Memorandum NMFS-AFSC-206, 276 p. (last visited June 29, 2010: http://www.nmfs.noaa.gov/pr/pdfs/sars/ak2009.pdf)., all must be taken into account. NMFS cannot simply rely on the Environmental Protection Agency to regulate air and water pollution. NMFS is charged with protecting both marine mammals and subsistence use of them under the MMPA and must ensure marine resources and those who rely on them are not adversely impacted by pollution from oil and gas related activities.

Fifth, impacts to fish and other marine mammal food sources upon which marine mammals rely must also be analyzed. *See* (Nieukrik, 2004) (Attachment 3) ("Airgun activity in shallow water has been shown to significantly damage the ears of fish (McCauley et al., 2000)"). NMFS recognizes that fish have been found to react to increases in sound levels, and react more strongly to pulsed, rather than continuous sound. NMFS also acknowledges that the proposed seismic activities may cause zooplankton, a vital source food source for some mysticetes, to scatter. The Agency brushes off this concern by simply stating that "by the time *most* bowhead whales reach the Chukchi Sea (October), they will no longer be feeding, or if it occurs it will be very limited." *See* 75 Fed. Reg. at 32,383, 32,384. NMFS appears aware that little is known about the effects of geophysical activities on fish and invertebrates but illogically still determines that there will only be a negligible impact on these resources. In particular, the effects of the project on fish, zooplankton, krill, and other aspects of the marine food chain needs to be studied and assessed before a finding of only negligible impacts can be justified. Many local hunters have expressed concerns about the effects of seismic work on fish and lower-level animals – for both nearshore and offshore operations – and the ramifications to the ecosystem as a whole.

Sixth, impacts about the specific marine mammals that will be taken – including their "age, sex, and reproductive condition," 50 C.F.R. § 216.104(a)(6), needs to be accounted for. Again, this information is necessary because for example, baleen whale calves and their mothers are more sensitive to ocean noise and may suffer greater adverse impacts from vessel traffic and seismic operations. *See* (McCauley 2000) (Attachment 1) ("Cow/calf pairs are in the author's experience more likely to exhibit an avoidance response to man-made sounds they are unaccustomed to. Thus any management issues relating to seismic surveys should consider the cow/calf responses as the defining limits.").

For all these additional reasons, NMFS's preliminary negligible impacts determination is arbitrary.

B. Statoil's Proposed Mitigation And Monitoring Are Not Sufficient.

Statoil plans to rely on Marine Mammal Observers ("MMOs") to detect marine mammals that may pass within safety zones and therefore be harmed by geophysical activities. Data previously presented by Shell and ConocoPhillips from their seismic activities has made it clear that MMOs failed to detect many marine mammals that encroached within the designated safety zones. The MMOs will have access to laser rangefinding binoculars to assist in estimating distances. However, Statoil admits that while these devices are useful when training MMOs, they "are generally not useful in measuring distances to animals directly." Statoil App. at 58.

Another failing of the MMO program, as mentioned previously, is that fact that Statoil proposes *not* having MMO on duty at all times seismic operations are underway. Although Statoil plans to conduct its surveying 24 hours per day, MMO will not be on duty at night, "given the very limited effectiveness of visual observations at night." Statoil App. at 54. Instead of

these trained observers, bridge personnel will keep watch for marine mammals "insofar as practical." *Id.*

If NMFS relies on mitigation included in an IHA to find an activity will have only a negligible level of impact, that finding is "subject to such mitigating measures being *successfully* implemented." *See* 50 C.F.R. § 216.104 (emphasis added). The simple existence of a measure is not enough. Statoil must be able to demonstrate that measures can and will be implemented, thus ensuring that impacts to bowheads remain "negligible." As Statoil's proposed mitigation currently stands, this is a difficult if not impossible determination for NMFS to make.

IV. Other Legal Violations That Warrant Denial Of Statoil's Application

A. NMFS Must Undertake Sufficient Review Of The Impacts Of Seismic Operations In The Chukchi Under The National Environmental Policy Act.

With respect to the National Environmental Policy Act ("NEPA"), NMFS simply states that it is "currently preparing an Environmental Assessment" and that this "analysis will be completed prior to the issuance or denial of the IHA". 75 Fed. Reg. at 32,398. It would appear from these statements that NMFS has decided to entirely cut the public out of the NEPA process, which is in direct contravention of the law. One of the express purposes of NEPA is to ensure that "environmental information is available to public officials and citizens *before decisions are ma*de and before actions are taken . . . [because] public scrutiny [is] essential to implementing NEPA." 40 C.F.R. § 1500.1(b) (emphasis added).

In addition, in light of the impacts discussed above it is clear that Statoil's IHA application warrants review in an Environmental Impact Statement ("EIS") given the potential for significant impacts. *See* 40 C.F.R. § 1508.27. In particular, NMFS must give close scrutiny to the potential cumulative impacts of Statoil's proposed geophysical work in combination with: 1) geophysical activities in the Russian far east; 2) geophysical activities in the Canadian Beaufort Sea; 3) geophysical activities proposed by the USGS; 4) geophysical activities proposed by Shell; and 5) all other present and reasonably foreseeable activities that could impact the bowhead whales or other subsistence resources. Thus, a draft EIS must be put out for public comment and the comments must be analyzed and the EIS finalized before NMFS makes it final decision on Statoil's application.

B. Statoil Failed To Provide Adequate Description Of The General and Seasonal Distribution Of The Marine Mammals Likely To Be Affected by Its Activities.

Statoil is required to provide "a description of the . . . distribution, and seasonal distribution (when applicable) of the affected species or stocks of marine mammals likely to be affected" by it's activities. 50 C.F.R. § 216.104(a)(4). For several species likely to be affected by its activities, Statoil failed to provide adequate information. Examples of species where information is lacking include the minke whale, fin whale, and ribbon seal. These three help illustrate how

little is known about marine mammals in the region. For the ribbon seal, there is no information provided regarding fall and summer distribution. The reason for this is not because the information is not "applicable" but because, as Statoil admits, little is known on the subject. *See* Statoil App. at 19. This is similarly the case for both the minke whales (where distribution details are unknown) and fin whales (where no summer population estimate is available for the Chukchi Sea). *See Id.* at 14, 15. Gaps in knowledge cannot be used as an excuse for not meeting regulatory requirements.

C. Statoil Failed To Fully Analyze The Anticipated Impact Of The Project on Marine Mammals.

In it's IHA application, Statoil was required to provide "the anticipated impact of the activity upon the species or stock of marine mammals." 50 C.F.R. § 216.104(a)(7). While Statoil provided this information in part, it admitted that knowledge is lacking. *See* Statoil App. sec. VII. In terms of disturbance reactions, the criteria used to determine potential disturbance of marine mammals was based on prior observation. *Id.* at 36. While more study has been done on the reactions of humpback, gray, and bowhead whales, and ringed seals, less detailed data is available for other species of baleen whales, sperm whales, and small toothed whales. For many species, there is simply no data regarding responses to marine seismic surveys. *Id*. at 36, 37. In terms of Temporary and Permanent Threshold Shifts, Statoil acknowledges that "relationships between TTS and PTS thresholds have not been studied in marine mammals." *Id*. at 41. Regarding non-auditory physiological effects, Statoil concedes that "almost no information is available on sound-induced stress in marine mammals." *Id.* at Appendix C 134. As Statoil is aware "caution is warranted when dealing with exposure of marine mammals to any high-intensity 'pulsed' sound." *Id.* This caution, however, is not reflected in its IHA application.

D. Suggested Means Of Learning Of, Encouraging, And Coordinating Research Opportunities, Plans, And Activities Relating To Reducing Such Incidental Taking And Evaluating Its Effects.

Statoil is required to "suggest means of learning of, encouraging, and coordinating research opportunities, plans, and activities relating to reducing such incidental taking and evaluating its effects." *See* 50 C.F.R. § 216.104(a)(14). While Statoil's actions overall might have the effect of marginally increasing knowledge regarding the effects of seismic activities on marine mammals, it does nothing to develop methods to reduce take or encourage research.

CONCLUSION

Thank you again for the opportunity to comment. It is our hope that due to the lack of compliance with NMFS's regulatory requirements for IHA applications as well as the serious concerns Statoil's activities raise for marine mammals that NMFS will deny Statoil's application. Please feel free to contact my staff or me if you would like clarification of any of our comments.

Sincerely,

Harry Brower
Chairman

cc: Mayor Edward Itta
Eric Schwaab
Dr. Jane Lubchenco

North Slope Borough

OFFICE OF THE MAYOR

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Edward S. Itta, Mayor

July 8, 2010

Sent Via Email to PR1.0648-XW13@noaa.gov

P. Michael Payne
Permits, Office of Protected Resources
National Marine Fisheries Service
1315 East-West highway
Silver Spring, MD 20910-3225

Re: RIN 0648–XW13, Taking Marine Mammals Incidental to Open Water Marine Seismic Survey in the Chukchi Sea, Alaska.

Dear Mr. Payne:

Thank you for the opportunity to comment on the National Marine Fisheries Service's (NMFS) proposed authorization of incidental take of marine mammals from open water surveying in the Chukchi Sea by Statoil USA E&P Inc. (Statoil). Statoil proposes to conduct a 2D and 3D seismic survey in the Chukchi Sea using a 3000 cubic inch airgun array. The survey is planned to start in approximately the middle of July and possibly extend through November. Statoil anticipates that the survey will take 60 days of work time, probably being finished by mid-October.

The North Slope Borough (NSB or Borough) has the largest coastal jurisdiction of any municipal government in the United States and encompasses an onshore area larger than the state of Minnesota. We have multiple interests at stake in the Arctic Ocean Outer Continental Shelf (OCS).

The Borough and its residents are rightfully concerned about potential health impacts associated with offshore oil and gas development on the North Slope. Activities allowed by the proposed authorization pose direct, indirect and cumulative impacts on species that are critical to our people's subsistence harvest. Although many of our residents are engaged in the cash economy, we continue to depend heavily on subsistence to maintain and support cultural and nutritional needs. Traditional foods are far more nutritious than many types of imported "store-bought"

food and their continued consumption has repeatedly been shown to be critical to the health of the residents.[1] Subsistence activities are also crucial for passing skills, knowledge and values from one generation to the next, thus ensuring cultural continuity and vibrancy.

We are also very concerned that NSB communities are being overwhelmed by multiple planning processes, both because of constraints on time and expertise of communities and individuals and because of the seeming inability to meaningfully influence the decisions being made.

The ongoing disaster in the Gulf of Mexico makes clear that our concerns are well-founded. The potentially significant impacts of industrial activities and environmental changes offshore, individually and cumulatively, demand comprehensive environmental analysis and proven mitigation prior to the issuance of any additional incidental take authorization.

I. The proposed authorization must be revised to comply with the Marine Mammal Protection Act.

A. Background

The Marine Mammal Protection Act (MMPA) recognizes the central role of subsistence hunting by specifically exempting the activities of the Inupiat Eskimos and other coastal Alaska Natives from its general prohibitions against take of marine mammals.[2] Other forms of take and harassment[3] are allowed only under narrow circumstances.

To receive an authorization for an action that may harass marine mammals (an "incidental harassment authorization" (IHA), the activity (i) must be "specified" and limited to a "specified

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[1] The subsistence diet protects against obesity and diabetes, and associated problems such as hypertension and cardiovascular disease. Restricted access to subsistence foods therefore places the community at increased risk for these problems. If subsistence use in the region is reduced, very significant increases in obesity and diabetes in the impacted communities would predictably ensue. *See*

Ebbesson SO, Kennish J et al. Diabetes is Related to Fatty Acid Imbalance in Eskimos. *International Journal of Circumpolar Health*. 58: 108-119. 1999.

Shephard R and Rode A. The Health Consequences of Modernization: Evidence from Circumpolar Peoples. Cambridge University Press. 1996

Curtis T, Kvernmo S et al. Changing Living Conditions, Lifestyle, and Health. *International Journal of Circumpolar Health*. 64(5) 442-450

Jorgensen M, Bjerregaard P et al. Diabetes and impaired glucose tolerance among the Inuit of Greenland. *Diabetes Care*. 26: 1766-1771. 2002.

Ebesson S, Schraer C et al. Diabetes and impaired glucose tolerance in three Alaskan Eskimo Populations. *Diabetes Care*. 21: 563-569. 1998.

Hogan P et al. Economic Costs of Diabetes in the U.S. in 2002. *Diabetes Care.* 2003. 26: 917- 932.

[2] 16 U.S.C. § 1371(b); *see also* 16 U.S.C. 1362 (13): "The term 'take' means to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal."

[3] See 16 U.S.C. 1362 (18)(A): "The term 'harassment' means any act of pursuit, torment, or annoyance

which—(i) has the potential to injure a marine mammal or marine mammal stock in the wild; 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."

geographical region," (ii) must result in the incidental take of only "small numbers of marine mammals of a species or population stock" and can have no more than a "negligible impact" on species and stocks, and (iii) will not have "an unmitigable adverse impact on the availability of such species or stock for taking for subsistence uses."[4] Also, NMFS must provide for the monitoring and reporting of such takings and must prescribe methods and means of causing the "least practicable impact" on the species or stock and its habitat.[5]

MMPA and NMFS regulations require NMFS to provide an opportunity for public comment and review of proposed IHAs.[6] IHAs must indicate "permissible methods for taking by harassment," "means of effecting the least practicable impact on such species," measures to "ensure no unmitigable adverse impact on the availability of the species or stock for taking for subsistence use," requirements pertaining to "monitoring and reporting" and for "independent peer review" of such monitoring and reporting if the taking may affect subsistence use.[7] NMFS's regulations further provide that "[a]ny preliminary finding of 'negligible impact' and 'no unmitigable adverse impact' shall be proposed for public comment along with [] the proposed incidental harassment authorization[.]"[8]

But here, NMFS only allowed for review of Statoil's *application* for an IHA—not the IHA actually proposed. The application offered for public review lacked a Plan of Cooperation containing identifying measures to minimize adverse effects on the availability of marine mammals for subsistence uses.[9]

Without a complete draft authorization and accompanying findings, the NSB cannot provide meaningful comments on Statoil's proposed activities ways to mitigate the impacts of those activities on marine mammals, and measures that are necessary to protect subsistence uses and sensitive resources. The limited information NMFS has provided does not allow us to determine the extent to which Statoil's monitoring and reporting plans were subjected to independent peer review as required by the MMPA. Unless NMFS can demonstrate compliance with the MMPA and its own regulations, it cannot issue an IHA to Statoil.

B. The specified activities are inadequately identified.

We are concerned about the lack of specificity regarding the timing and location of the proposed surveys, as well as the lack of specificity regarding the surveys themselves. MMPA allows take authorization only for "specified activities" within a "specified geographic region."[10]

Statoil plans to conduct geophysical data acquisition activities in the period from July 15 to November 30, 2010, a span of almost 140 days. Data acquisition, however, is expected to take

[4] 16 U.S.C. 1371(5)(A).

[5] 16 U.S.C. § 1371(a)(5)(D); 50 C.F.R. § 216.107.

[6] 50 C.F.R. § 216.104(b)(1)(i); 16 U.S.C. § 1371(a)(5)(D)(iii).

[7] 16 U.S.C. § 1371(a)(5)(D)(ii).

[8] 50 C.F.R. § 216.104(c).

[9] *See* 50 C.F.R. § 216.104(a)(12).

[10] 16 U.S.C. § 1371(a)(5)(D)(i).

(including anticipated down time) approximately 60 days. More specific timing and location of contemplated activities is critical for ensuring that Statoil's proposed activities do not conflict with hunting for bowhead, beluga, walrus or seals that takes place at set times each year.

Statoil does not provide adequate information on the movements of marine mammals through the Chukchi Sea, especially during the autumn. It is not possible to assess Statoil's application without providing the appropriate and available scientific information. If Statoil's operations occur into October or November, there is a very good chance they will expose substantial portions of entire marine mammal populations to seismic sounds. NMFS must use the best available data as it carefully scrutinizes the data provided by Statoil and potential for impacts.

C. Statoil has not demonstrated that its proposed activities would take only "small numbers of marine mammals of a species or population stock," resulting no more than a "negligible impact" on a species or stock.

Statoil's approach for estimating takes is not appropriate or adequate. Statoil makes assumptions that result in unreasonably low estimates of the number of marine mammals that will be exposed to industrial sounds. Statoil assumes that marine mammals are stationary through the course of the summer and autumn seasons. But the best available scientific data show that most marine mammals move considerable distances over the course of the open water period and are not confined to a small area. This movement occurs throughout the period and is most intense during the autumn (late August through November) when marine mammals are migrating south through the Chukchi Sea. NMFS should require Statoil to use the most appropriate methods for estimating takes.

The conclusion that Statoil's proposed seismic surveying will take only small numbers of marine mammals and will have no more than a negligible impact is not justified by the information provided in the Federal Register notice.

1. <u>The proposed IHA would be issued in the face of many uncertainties regarding the impacts of Statoil's activities.</u>

In its comments on the proposed Lease Sale 193 in the Chukchi Sea, NMFS stated that without "current and thorough data which describe the habitat use and function of these waters," and without information on the distribution patterns of marine mammals, the agency would find it challenging to meet its obligations under the MMPA. NMFS explained that, lacking such information,"[I]t will be very difficult to permit and conduct seismic surveys in a manner that has no more than a negligible impact to the stock and minimizes disturbance and harassment to the extent practicable."[11]

NMFS also noted that the "continued lack of basic audiometric data for key marine mammal species" that occur throughout the Chukchi Sea inhibits the "ability to determine the nature and

[11] NMFS Comments on MMS's Draft EIS for Chukchi Sea Lease Sale 193 (Jan. 30, 2007).

biological significance of exposure to various levels of both continuous and impulsive oil and gas activity sounds."[12]

The former Minerals Management Service (MMS) agreed in its final Environmental Impact Statement (EIS) that much remains unknown. Information is limited on the bowhead fall migration through the Chukchi and the feeding that takes place during that time.[13] Basic data are still needed for other species as well, including gray whales, beluga whales and harbor porpoises, among others. Yet NMFS is prepared to issue an IHA despite these unknowns.

2. NMFS has not adequately analyzed harassment associated with noise.

MMPA defines harassment to mean any act of pursuit, torment or annoyance that 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.[14] An activity constitutes harassment if it has even the "potential" to affect marine mammal behavior.

In a previous Environmental Assessment (EA), NMFS made clear the potential for harassment from seismic surveying and the need for mitigation that includes a protective 120-dB exclusion zone:

> NMFS considers the feeding, socializing and migration of bowhead whales during the fall westward migration to be critical to bowhead whale survival. The reason for the 120-dB-related conditions and the requirement for two aerial surveys is that preliminary information from a Canadian seismic survey in 2006 indicates that a tagged bowhead whale migrating westward ceased its migration until the seismic survey ended. This reaction is of concern to NMFS principally because one animal's response to seismic sounds is a likely indicator that a larger population of bowheads could exhibit the same reaction to seismic sound and possibly even drilling noise.[15]

But here, NMFS calculated harassment from Statoil's proposed surveying based on the exposure of marine mammals to sounds at or above 160 dB.[16] This uniform approach to harassment does not take into account known reactions of marine mammals in the Arctic to levels of noise far below 160 dB.

In determining the impacts on marine mammals, Statoil and NMFS have only considered limited sources of sounds. Statoil's application focuses on airgun sounds for its estimates of take. Activities that use equipment other than airguns are mentioned, but then ignored in the

[12] *Id.*

[13] *See* LS 193 EIS at III-51-52.

[14] 16 U.S.C. § 1362(18)(A)(ii).

[15] NMFS, Environmental Assessment for the Shell Offshore, Inc. Incidental Harassment Authorization to Take Marine Mammals Incidental to an Offshore Drilling Program in the U.S. Beaufort Sea Under the Marine Mammal Protection Act, at 9 (October 2007).

[16] *See* 75 Fed. Reg. at 32,389.

assessment of impacts. Nor do ship sounds appear to be considered in determining potential impacts. The Federal Register Notice indicates only that source levels from various vessels "would be empirically measured before the start of the marine surveys,"[17] but there is no indication how the impacts of this noise, combined with Statoil's actual survey sounds, would be reviewed and considered prior to operations .

Finally, NMFS should consider global warming-induced changes relating to the oceanic acoustical environment, such as the relationship between acidification and oceanic sound absorption.

3. NMFS has not adequately analyzed the potential for serious injury.

An IHA pursuant to 16 U.S.C. § 1371(a)(5)(D) is only available if the activity has no potential to result in serious injury or mortality to a marine mammal.[18] In promulgating the regulations that govern IHAs in the Arctic, NMFS acknowledged that permanent hearing loss – or permanent threshold shift ("PTS") – qualifies as serious injury:

> Serious injury for marine mammals, such as permanent hearing or eyesight loss, or severe trauma, could lead fairly quickly to the animal's death. NMFS does not believe that Congress intended to allow "incidental harassment" takings to include injuries that are likely to result in mortality, even where such incidental harassment involves only small numbers of marine mammals.[19]

Therefore, "if the acoustic source at its maximum level had the potential to cause a permanent threshold shift in a marine mammal's hearing ability," that activity would be considered "capable of causing serious injury to a marine mammal and would therefore not be appropriate for an incidental harassment authorization."[20]

In this instance, Statoil's 2D / 3D deep 120 dB radii extends out to 120,000 meters. And its 160 dB radii extends to 13,000.[21]

If there is even the possibility of serious injury, NMFS must establish that the "potential for serious injury can be *negated* through mitigation requirements[.]"[22]While monitored (but not aerially monitored) exclusion zones have been proposed, they are likely insufficient to negate

[17] 75 Fed. Reg. at 32383.

[18] 50 C.F.R. § 216.107 ("Except for activities that have the potential to result in serious injury or mortality, which must be authorized under § 216.105, incidental harassment authorizations may be issued[.]").If such injury or mortality is possible, take can only be authorized pursuant to a Letter of Authorization ("LOA") consistent with regulations promulgated pursuant to 16 U.S.C. § 1371(a)(5)(A) and 50 C.F.R. § 216.105. Because NMFS has not promulgated any such regulations related to seismic surveys, and because such surveys and associated activities carry the potential for serious injury or death to marine mammals, neither an IHA nor an LOA can be issued for Statoil's proposed activities.

[19] 60 Fed. Reg. 28,379, 28,380 (May 31, 1995).

[20] *Id*. at 28,381.

[21] 75 Fed. Reg. at 32,385.

[22] 60 Fed. Reg. at 28,380 (emphasis added).

serious injury. Reports from previous surveys indicate that even where there are monitored exclusion zones, marine mammals routinely stray too close to the airguns.[23]

The requirement for ramp ups rests on the same foundation – that marine mammals will leave an affected area as a result of increasing noise. Yet, as the Joint Subcommittee on Ocean Science and Technology report notes, "there has never been a demonstration that [ramp ups] work[] as intended."[24]

It is notable that the above marine mammal behavior was recorded only because conditions were such that the marine mammals could be observed. Such conditions occur only a fraction of the time that airguns are operating. As discussed in NSB Wildlife Department comments below, observers cannot see animals at the surface when it is dark, and even during the day, visually detecting marine mammals from the deck of a seismic vessel may be inhibited due to glare, fog, rough seas, the small size of animals such as seals, and the large proportion of time that animals spend submerged. Shell Oil, another operator conducting survey work in the area, has acknowledged that reported sightings are only "minimum" estimates of the number of animals potentially affected by surveying, as compromised visibility and high seas "are often significant limiting factors."[25]

> The shortcomings of monitoring were reiterated by the interagency task force:
>
> [V]isual monitoring under the best of conditions may detect less than 50 percent of most marine mammals and only 1-10 percent of some deep-diving mammals . . In poor weather and at night those percentages are reduced to effectively zero.[26]

Because NMFS has not negated the possibility of serious injury from Statoil's 2010 surveying, it should do so prior to issuance of an IHA.

4. <u>NMFS has not adequately demonstrated that the proposed activities will</u>

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[23] *See*, *e.g.* Marine Mammal Monitoring and Mitigation During Open Water Seismic Exploration by ConocoPhillips Alaska, Inc. in the Chukchi Sea, July-October 2006, at 5-11-5-12 (January 2007) (identifying 50 marine mammals likely exposed to potentially injurious sound levels); Marine Mammal Monitoring and Mitigation During Open Water Seismic Exploration by Shell Offshore Inc. in the Chukchi and Beaufort Seas, July-September 2006: 90-Day Report, at 6-13 (January 2007) (identifying 24 seals likely exposed to potentially injurious sound levels); Marine Mammal Monitoring During Open Water Seismic Exploration by Shell Offshore in the Chukchi and Beaufort Seas, July –November 2007, at 5-43 (January 2008) (identifying 26 sightings of 50 walrus within the exclusion zone); Marine Mammal Monitoring and Mitigation During Open Water Seismic Exploration by Shell Offshore Inc. in the Chukchi and Beaufort Seas, July –October 2008: 90-Day Report, at 7-14 (January 2009) ("Shell 2008 90-day Report") (identifying 44 powerdowns involving 45 marine mammals).

[24] Joint Subcommittee on Ocean Science & Technology, "Addressing the Effects of Human-Generated Sound on Marine Life: An Integrated Research Plan for U.S. Federal Agencies," at 58 (Jan. 2009) ("JSOST"). Also, in the Lease Sale 193 EIS, MMS – with NMFS as a cooperating agency – acknowledged that measures such as ramp ups are "not empirically proven"; its value instead relies on "anecdotal evidence" and "professional reasoning." LS 193 EIS at II-25. The EIS does not expressly consider the industry survey results.

[25] Shell 2008 90-Day Report at 5-17.

[26] Joint Subcommittee on Ocean Science & Technology, "Addressing the Effects of Human-Generated Sound on Marine Life: An Integrated Research Plan for U.S. Federal Agencies," at 58 (Jan. 2009) ("JSOST").

not have "an unmitigable adverse impact on the availability of such species or stock for taking for subsistence uses."

NMFS acknowledges that "[n]oise and general activity during Statoil's proposed open water marine surveys have the potential to impact marine mammals hunted by Native Alaskans."[27] As such, NMFS must ensure that the surveys will not have "an unmitigable adverse impact on the availability of such species or stock for taking for subsistence uses" by Alaska Natives.[28]

As discussed above, Statoil's application is too amorphous for NMFS to be able to actually determine the impacts to subsistence uses—let alone whether they can be mitigated. This falls short of the requirement that mitigation measures be "successfully implemented."[29] We have no way of assuring that measures will be successfully implemented if they are not even revealed to the public. One of the primary proposed mitigation tools, the Plan of Cooperation (POC), has yet to be established and submitted to NMFS.

NMFS also requires IHAs to provide for adequate monitoring of takes, and to ensure that all methods and means of ensuring the least practicable impact have been adopted.[30]Again, lack of details regarding the activities and their impacts impedes our analysis of whether monitoring and mitigation are appropriate.

Statoil's proposed monitoring and mitigation plan is not sufficient for protecting marine mammals from Level A harassment. Furthermore, its proposed monitoring plan is not sufficient for adequately monitoring the safety radii for implementing mitigation measures for Level B takes. Statoil's only method of monitoring is through the use of Marine Mammal Observers (MMO). The limitations of MMOs are obvious and well known. They are completely ineffective at night or during inclement weather, and they can only monitor a portion of the safety zones in good visibility. Even using chase vessels with MMOs only provides limited monitoring of the safety zones. NMFS should require Statoil to implement appropriate and effective monitoring methods to ensure protection of marine mammals in the Chukchi Sea and subsistence hunting of those marine mammals.

NMFS should not issue an IHA for the proposed activities until adequate monitoring and mitigation techniques for avoiding adverse impacts to the marine mammals and subsistence hunting are developed.

II. NMFS Should Review the Cumulative Impacts of Statoil's Activities in Combination with All Other Past, Present and Reasonably Foreseeable Future Activities.

In the Federal Register Notice, NMFS states that it is "currently preparing an Environmental Assessment" to determine whether Statoil's activities may have a significant impact on the environment.[31] Pursuant to the National Environmental Policy Act[32] and its accompanying

[27] FR Notice at 32397.

[28] 16 U.S.C. § 1371(a)(5)(D)(i)(II).

[29] *See* 50 C.F.R. § 104(c) .

[30] 16 U.S.C. § 1371(a)(5)(D)(ii)(I).

[31] 75 Fed. Reg. at 32398.

regulations,[33]NMFS will need to adequately consider the cumulative impacts of Statoil's proposed activities combined with all other past, present and reasonably foreseeable future activities.[34]

Specifically, and as discussed in greater detail below, NMFS should ascertain the significance of multiple exposures to underwater noise, ocean discharge, air pollution, and vessel traffic—all of which could impact bowhead whales and decrease survival rates or reproductive success. NMFS should consider how many bowhead whales would be exposed to underwater noise, where those exposures could take place, what impact the noise could have on bowhead whale behavior, and the biological significance of these impacts. NMFS should also consider the cumulative impact of discharge and whether bioaccumulation of contaminants could have lethal or sub-lethal effects on bowhead whales and other marine mammals. NMFS should then synthesize that information into a health impact assessment looking at the overall combined effect to the health of our residents.

Reasonably foreseeable activities for the 2010 open water season include the following:

1) GX Technology's Beaufort Sea seismic surveys.
2) Shell's Beaufort and Chukchi open water surveys.
3) Seismic surveys planned in the Canadian Arctic.
4) U.S. Geological Survey's seismic surveys.
5) BP's production operations at Northstar.
6) Dalmorneftegeophysica (DMNG) Russian Far East Offshore Seismic surveys.

NMFS is currently in the process of preparing an EIS, in partnership with the successor to MMS (the Bureau of Ocean Energy Management, Regulation and Enforcement (BOE)), to assess the potentially significant impacts of oil and gas exploration activities in the Arctic. In choosing this course, NMFS has recognized that these activities can have significant impacts on marine mammals and that a longer term, more comprehensive review needs to be conducted of these activities. It would be counterproductive were Statoil to proceed with a one-year IHA when those activities could have a catastrophic impact on Arctic resources and could foreclose management options to be developed in the forthcoming EIS. As a policy matter, NMFS should allow exploration-related activities to proceed only after it has the opportunity to develop a robust long-term plan for balancing the needs of industry with Congress' mandate in the MMPA to prioritize the protection of our subsistence resources.

III. NMFS Should Consider and Address Disproportionate Impacts in Analyzing the IHA Application.

Federal agencies must "make achieving environmental justice part of … [their] mission[s]."[35] Compared to many U.S. residents, our residents (many of whom are part of federally recognized

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[32] *See* 42 U.S.C. 4321-4347.

[33] For specific regulatory guidance on making a significance determination, *see* 40 C.F.R. § 1508.27.

[34] 40 C.F.R. § 1508.7.

[35] Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations." Section 6-606 applies the order equally to Native American Programs.

tribes) face significant impacts from oil and gas activities in the OCS. NMFS should thus specifically address issues of environmental justice in considering this application. NMFS must also work to ensure effective public participation and access to information, and must "ensure that public documents, notices, and hearings relating to human health or the environment are concise, understandable, and readily accessible to the public."

In addition to the foregoing, below are:
Additional technical comments from the NSB wildlife scientists, page by page.

Pg. 5, penultimate paragraph:
Statoil states, "Three other cetacean species (minke whale, killer whale and narwhal) and one pinniped species (ribbon seal) could occur in the area but are rare or extralimital in the Chukchi Sea." This statement is misleading as killer whales and ribbon seals occur regularly in the Chukchi Sea and are thus not extralimital. Experienced hunters regularly report sightings of killer whales (as well as gray whale carcasses where the cause of death appears to be from killer whales) in the Chukchi Sea (George and Suydam 1998).[36]
Further, there are limited data on the presence of ribbon seals (or minke whales) in the Chukchi Sea during the summer. And Statoil's airgun array may reduce sightings of those species because of the loudness of the airguns. To be conservative, Statoil and NMFS should consider that these species occur regularly in the area. Statoil should also be required to conduct aerial surveys of each of these species in the operations area. Aerial surveys are less likely to influence the marine mammals that are being observed, because they produce less noise than airgun arrays and marine vessels. NMFS conducts aerial surveys in the Chukchi Sea and can act as an example for Statoil.

Pg. 8, paragraph 3 and 4:
Statoil's application does not provide information about the movements of the Beaufort Sea stock of belugas through the Chukchi Sea. These belugas do migrate through the Chukchi Sea during the autumn, when Statoil may be conducting seismic activities. Statoil should be required to address the potential impacts of its activities on the Beaufort Sea belugas while they are in the Chukchi Sea.

Pg. 8, last paragraph:
Angliss and Allen (2009) provide a minimal population estimate of 3,700 for the eastern Chukchi Sea stock of belugas. Statoil's description of this stock does not account for the likelihood that this value is likely much less than actual size of the population. Because the data are limited on the actual size of the stock, Statoil and NMFS should carefully state the limitations of existing data and indicate when populations may be larger (such that larger numbers of animals could be impacted). Additionally, Angliss and Allen (2009) did not survey eastern Chukchi Sea belugas. Statoil must reference the primary source literature rather than summaries.

Pg. 9, 3rd paragraph:

[36] George, J.C. and Suydam, R. 1998. Observations of killer whales (Orcinus orca) predation in the northeastern Chukchi and Western Beaufort Seas. Marine Mammal Science 14(2):330-332. All other cited references, if not already in NMFS possession, are available with NSB Department of Wildlife.

The aerial surveys conducted in 2006, 2007, and 2008 by industry were only conducted in the nearshore waters of the Chukchi Sea. But both the Beaufort and Chukchi Seas stocks of belugas migrate during through other areas of the Chukchi Sea during both the spring and autumn, and some of Statoil's 2D and 3D seismic activities will take place in these areas. Statoil should be required to consider the impacts of its activities on belugas traveling outside the nearshore waters of the Chukchi Sea.

Pg. 12 through 13:
Statoil references aerial surveys conducted by Shell and ConocoPhillips between 2006 and 2008. These surveys occurred exclusively in nearshore areas and not within Statoil's proposed operation area.

During that same time period, there was an extensive acoustic monitoring program in the Chukchi Sea that particularly emphasizedbowhead whale calls. But theseacoustic data are not referenced here. Statoil and NMFS should rely on best available data for assessing potential impacts from seismic activity. Using the acoustic data will provide a much more complete picture of the use of the Chukchi Sea by bowheads and other marine mammals. NMFS should require a full assessment of the available data or explain why the data regarding bowhead whale calls is not pertinent to Statoil's proposed activities.

Pg. 13, 2nd paragraph 4th sentence:
Statoil states, "Most bowheads migrating in September and October appear to transit across the northern portion of the Chukchi Sea to the Chukotka coast before heading south toward the Bering Sea (Quakenbush et al. 2009)."[37] This sentence is misleading. Virtually all of the tagged bowheads migrated through areas near Statoil's leases.

Furthermore, the loud sounds produced by Statoil's seismic activitieswill propagate great distances—hundreds of kilometers—from the source vessel. Thus, it is possible that the entire population of bowhead whales could be exposed to seismic sounds greater than 120 dB during their autumn migration through the Chukchi Sea.

It is also been shown that bowheads respond strongly to low levels of industrial sounds. In some studies, bowheads showed almost total avoidance of an area around seismic surveys where received sound levels were greater than120 dB (LGL Ltd. and Greenridge Sciences 1999). Using this best available science, it should be assumed that bowheads would avoid the area around Statoil's seismic surveys out to 70 to 120 km (pg. 29, Table 5 of Statoil's application). If this occurs, NMFS would be issuing a permit for activities that could potentially cause the entire bowhead population to be deflected from its migratory path. To mitigate this potential impact to the bowhead population, Statoil should not be allowed to shoot seismic once the bowhead migration has commenced in September and October. Alternatively, if Statoil is allowed to shoot seismic during that time period, there should be a much more robust monitoring and mitigation program.

Pg. 20, 1st paragraph in Section VI:

[37] Quakenbush, L.T., Citta, J.J., George, J.C., Small, R.J., and Heide-Jørgensen, M.P. Fall and winter movements of bowhead Whales (Balaena mysticetus) in the Chukchi Sea and within a Potential Petroleum Development Area. ARCTIC VOL. 63, NO. 3 (SEPTEMBER 2010) P. XXX–XXX (page number not yet assigned).

Statoil says, "The proposed open water seismic survey activities outlined in Sections I and II have the potential to disturb or displace small numbers of marine mammals." This statement is misleading. As discussed above, the best available data show that bowheads deflect away from industrial sounds, including those loud sounds made by the Statoil's proposed seismic activities. Belugas are also quite sensitive to industrial sounds, although there are fewer scientific data to determine the responsiveness of belugas. It is possible that the entire bowhead population (possibly ~14,000 animals) could be deflected from its migratory route. This is not a small number of marine mammals.

Statoil goes on to say, "These potential effects, as summarized in Section VII below, will not exceed what is defined in the 1994 amendments to the MMPA as "Level B" harassment (behavioral disturbance)." Statoil does not have the data to support this statement. Some marine mammals may have been exposed to sounds that correspond to "Level A" harassment (i.e., physical injury). There have been few surveys or examinations of dead marine mammals for harm associated with sound.

Pg. 20, last paragraph:
This paragraph describes the methods used to calculate the number of marine mammals exposed to industrial sounds greater than 160 dB. Essentially, Statoil calculates the density of marine mammals and multiplies this figure by the area it will ensonify to 160 dB. For several reasons, this approach is misleading and is biased low. First, it assumes that marine mammals are more or less sedentary through the summer. The best available science, namely satellite tracking data, shows that marine mammals move great distances during the summer and autumn months, even when not in migration. As a result, different individual belugas will occur in Statoil's operation area throughout the period. Because Statoil's approach does not account for the movement of different individuals into and out of the area, it greatly underestimates the number of marine mammals exposed to seismic sounds.

Furthermore, the available data for the Beaufort Sea show that bowheads are affected by seismic and other industrial sounds, including sounds from ships, at sound levels are as low as (or even lower than) 120 dB.[38] The 120 dB zone extends 70 to 120 km, while the 160 dB zone extends only 13 km. Thus, the area where marine mammals (particularly bowhead whales) could be harassed is likely to be much larger than the area Statoil considered. NMFS should require adequate monitoring and mitigation measures in the 120 dB zone for bowhead whales as well as other marine mammals.

Pg. 28, last paragraph, 1st sentence:
Statoil states that "the 160–190 dB re 1µPa (rms) radii for the airgun source will be measured during acoustic verification measurements at the beginning of seismic data acquisition. Based on these measurements the distance to received levels of 120 dB from the 3000 cubic inch airgun array can be calculated." Because bowheads have been shown to be responsive to pulsed sounds down to 120 dB, Statoil should be required to measure, on multiple occasions, the distance to where seismic sounds have attenuated to 120 dB. Statoil should provide multiple measurements for all safety radii so variation in propagation levels can be described.

[38] MMS's Seismic EIS from 2006 provide a good summary of the sensitivity of bowheads to industrial sounds.

Pg. 29, 1st sentence:
Statoil proposes a mitigation measure that when "mammals are detected in the water at locations within or about to enter the appropriate ≥180 dB or ≥190 dB radii, the airguns will be powered down immediately (or shut down if necessary)." The safety radii for the 180 dB zone is approximately 2.5 km. The ability of MMOs to detect marine mammals within the safety radii is limited. Therefore, Statoil's ability to prevent Level A harm (i.e., physical harm) is also limited. This is especially a concern because of the loud sound source of the full airgun array. Statoil should be required to implement additional monitoring techniques to better monitor the entire safety radii. One possible technique is through the use of a towed acoustic array.

Pg. 32 and 33, Tables 6 and 7:
The estimates provided in these tables are biased low. As discussed above, the best available science shows that bowheads respond to pulsed sounds well below the 160 dB level. Furthermore, the take estimates assume that marine mammals are relatively stationary. As discussed above, different individual belugas will occur in Statoil's operation area, such that take estimates should be much higher. A common sense evaluation of the estimates also provides insight into their appropriateness. Tens of thousands of whales and hundreds of thousands of pinnipeds migrate through the area Statoil's proposed seismic activities. Expecting that only several hundred marine mammals will be taken is not reasonable. It is likely that thousands of marine mammals will be exposed to industrial sounds from Statoil's operation.

Pg. 34, Conclusions, 1st paragraph, 1st sentence:
Statoil's first sentence is not supported by the best available data, which show that bowheads respond to industrial sounds at levels much lower than 160 dB. NMFS must use the best available data to assess impacts from Statoil's activities. A more accurate estimate of the number of bowheads taken is needed in order to make a more realistic estimate of the impacts of the proposed activity.

Pg. 34, Conclusions, 1st paragraph, last sentence:
This sentence is not supported by data. Statoil did not account for the Beaufort Sea and eastern Chukchi Sea beluga migration through the Chukchi Sea in September and October (during Statoil's proposed seismic activities). There are tens of thousands of animals in these two populations; thus it is misleading to suggest that "small numbers" will be present in the area. Given the large area that will be ensonified by Statoil's airgun array and the large number of belugas moving through the survey area, a substantial number of whales could be harassed. A more reasonable assessment of impacts to beluga whales is needed to realistically assess and mitigate impacts from Statoil's seismic survey.

Pg. 34, Conclusions, 2nd paragraph:
This paragraph is not supported by data. First, Statoil's assertion that effects will be limited to a restricted area does not account for the fact that bowheads respond to industrial sounds as low or lower than 120 dB, which could extend for 100 km from the seismic source vessel. Additionally, there are extremely little data on the duration of impacts to behavior. NMFS should require Statoil to investigate the duration of impacts to marine mammals that are disturbed by the seismic activities. This will require a much greater monitoring effort than is currently proposed—including the use of an aerial survey.

We are skeptical of claims made by some in the industry that aerial surveys would not be safe, particularly as the federal government has conducted aerial surveys in these areas. Statoil should be required to fly surveys in addition to having MMOs on vessels. If Statoil is not required to fly aerial surveys, alternative methods for adequately monitoring marine mammals should be developed and implemented.

Pg. 34, last paragraph, 1st sentence:
Statoil states, "The many reported cases of apparent tolerance by cetaceans of seismic exploration, vessel traffic, and some other human activities show that co-existence is possible." No references are given for this statement. It is not clear whether Statoil is referring to a location in the Arctic, a busy harbor in lower latitudes, or some other place. While this statement may be reasonable for some places, there are no data suggesting that marine mammals (especially cetaceans) in the Beaufort and Chukchi Seas have become tolerant of seismic exploration. The sentence is misleading.

Pg. 35, 1st paragraph:
Statoil estimates that it will expose approximately 6,500 ringed seals to seismic sounds greater than 160 dB. As mentioned above, it is likely that Statoil has underestimated the number of marine mammals that will be exposed to seismic sounds. Even if the estimate is accurate, it is hard to characterize 6,500 seals as a small number of marine mammals.

Statoil justifies the exposure of so many animals based on the assumption that the seal populations are quite large. But population estimates are not reliable. NMFS does not even use the population estimates for making management decisions within the framework of the Stock Assessment Reports. NMFS should be consistent and not permit oil companies to use those same unreliable data.

Pg. 35, Tolerance:
This paragraph is misleading, as Statoil suggests that marine mammals are only responsive a few kilometers away from airgun arrays. As discussed above, the overwhelming evidence for bowheads and beluga whales in the Alaskan Arctic suggests that they respond to airgun sounds at low levels of received sound.

Pg. 42, Strandings and Mortality:
Statoil states that "Airgun pulses are less energetic [than detonations] and have slower rise times, and there is no proof that they can cause serious injury, death, or stranding to the species occurring in the project area even in the case of large airgun arrays." While this sentence is technically true, it is also misleading. There is "no proof" that seismic surveys can cause "serious injury, death or stranding" because there have been no surveys to even examine whether those impacts have occurred. In fact, in the Chukchi and Beaufort seas, when marine mammals have been found dead in the seismic survey areas, industry has not conducted or facilitated necropsies to determine cause of death to marine mammals or potential impacts from airguns. Statoil should be required to facilitate the recovery and necropsy of any marine mammals found dead in their survey area.

Pg. 52, 1st paragraph:

Statoil's primary means of monitoring safety zones is with MMOs. Previous surveys in the Chukchi and Beaufort seas have shown that the ability of MMOs to detect cetaceans of course diminishes when the visibility conditions deteriorate, including rough seas, fog, inclement weather, and darkness beginning in mid-August. These surveys also show that the ability of MMOs to detect cetaceans decreases beginning about 1 km from the vessel. Therefore, the ability of MMOs to prevent Level A takes is diminished markedly, and monitoring the larger area for implementing mitigation measures to limit Level B takes is very difficult unless the animals happen to be are very near the vessels. (It is unlikely that animals would be very near the vessels, since vessels tend to disturb and deflect the animals.) To provide adequate monitoring and mitigation, other methods (including aerial surveys and towed passive acoustic arrays) need to be implemented.

Pg. 52, Speed and Course Alterations, Power Down, Ramp Up and Shut Down Procedures:
There are insufficient data to demonstrate the ability of the techniques described here to protect marine mammals from Level A and B harassment. NMFS should require the collection of additional data to verify the effectiveness of the procedures.

Pg. 54, Poor Visibility Conditions:
Statoil proposes to not monitor for marine mammals at night because it assumes that marine mammals will stay away from the airgun array during nighttime and inclement weather. But if Statoil is allowed to operate airguns at night, then it should be required to develop techniques for verifying that Level A takes are not occurring and that mitigation measures for Level B are not needed during darkness and inclement weather. One method for examining Level A takes is to support a standing response network with methods for towing any marine mammals (including large whales) found dead to shore and conducting necropsies. Additional and stronger monitoring programs will provide more information about the need for implementing mitigation measures during darkness.

Pg. 54, penultimate sentence:
Statoil considered using a towed passive array to monitor for marine mammals during periods of darkness and inclement weather, but decided not to use the array because it is not a proven technique. While it is true that towed passive acoustic arrays still need development, this should not excuse Statoil from monitoring during darkness and inclement weather. NMFS should require Statoil to use a towed array to ensure that at least some monitoring effort takes place during darkness and inclement weather, and to further the effectiveness ???of a towed passive array for future surveys.

Pg. 55, Marine Mammal Carcasses, 1st paragraph:
The procedure presented for handling dead marine mammals found in the operations area is not sufficient. Most MMOs do not have training or experience to determine the causes of death in a floating marine mammal. Even experienced and trained personnel would have difficulties. As mentioned above, NMFS should require Statoil to have contingency plans for responding to and necropsying dead marine mammals.

Pg. 59, Aerial Surveys:
Statoil suggests that it is unsafe to fly aerial surveys in the areas it plans to operate. As discussed above, aerial surveys have previously taken places in these areas. Furthermore, during

exploratory drilling or development, it is likely that industry will have regular flights to support the operation (as was proposed by Shell for their drilling activities planned for 2010). If conducted appropriately, aerial surveys are an effective means of monitoring and implementing mitigation measures related to marine mammals. NMFS should require Statoil to fly aerial surveys in support of its proposed activities.

Conclusion

Following our review of NMFS' proposed authorization of incidental take of marine mammals under Statoil's contemplated seismic survey in the Chukchi Sea during 2010, we do not yet see a demonstration of compliance with the MMPA and thus do not support issuance of an IHA at this time.

Thank you for your consideration of these comments.

Sincerely,

Edward S. Itta
Mayor

cc:

Bessie O'Rourke, NSB Attorney
Dan Forster, Director, NSB Department of Planning and Community Services
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