Effects of Oil and Gas Activities in the Arctic Ocean

Supplemental Draft Environmental Impact Statement

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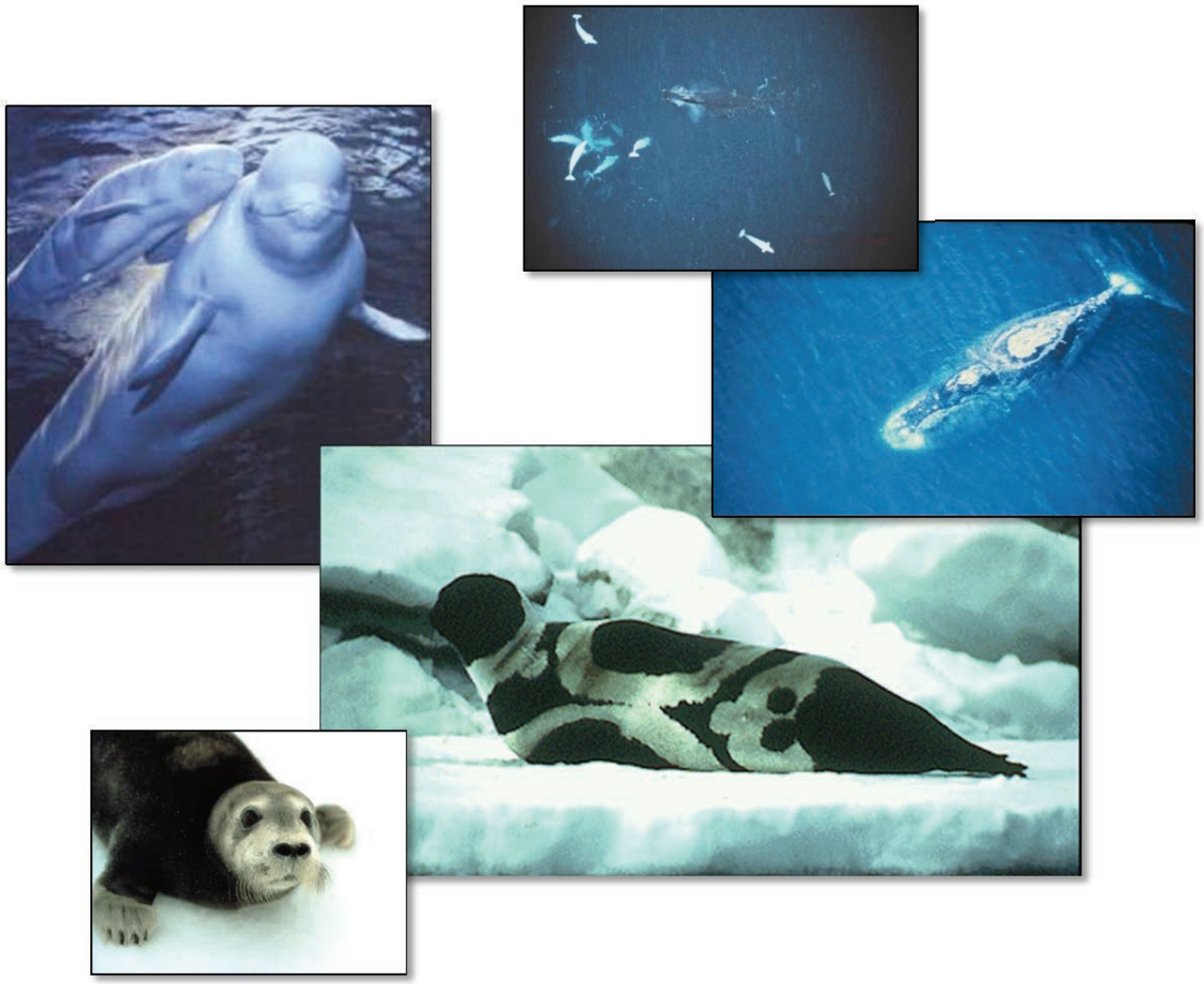

March 2013

United States Department of Commerce
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
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conducting the level of activity proposed for Alternatives 2 and 3. However, the difference in the level of direct impacts between Alternative 4 and Alternative 3 is not expected to be as large as the difference between Alternative 3 and Alternative 2.

4.2.6 Estimating Take of Marine Mammals

Background

The MMPA prohibits the taking of marine mammals with certain exceptions, one of which is MMPA incidental take authorizations. Incidental take authorizations allow for the take of small numbers of marine mammals if NMFS finds that the activity will have a negligible impact[2] on the affected marine mammal species and will not have an unmitigable adverse impact[3] on subsistence uses, and provided mitigation and monitoring requirements are set forth. Applicants for these authorizations are required by the MMPA implementing regulations to estimate (in advance) the number of individuals of each species that may be taken by their proposed activity [50 CFR 216.104 (a)(6)]. Take estimates are also necessary to inform the analyses that NMFS must conduct.

In order to help applicants with noise-producing activities understand when their activity might be expected to take a marine mammal (i.e., when an ITA would be needed) and to assist in the necessary quantification of likely takes, NMFS has established acoustic thresholds (discussed below). Acoustic thresholds identify received sound levels above which marine mammals would be expected to be taken (either by behavioral harassment or injury), if exposed. In short, animals predicted to be exposed to levels at or above the acoustic threshold are predicted to be taken in the specified manner (e.g., by behavioral harassment or injury).

The estimated number of animals that will be exposed at or above acoustic thresholds (and, therefore, predicted to be taken) is a valuable piece of both the "negligible impact" and "unmitigable adverse impact" analyses and directly informs whether the take numbers are "small," however, it is only one piece of an effects analysis under the MMPA. The expected occurrence of a take or a particular *number* of estimated takes does not necessarily relate directly to the biological significance of the impacts, i.e., whether the takes will result in adverse impacts on the fitness or health of the individuals taken. The potential and likelihood of impacts on the health and fitness of individuals taken must be determined in consideration of the manner, context, duration, and intensity of those takes.

For example, some takes (such as injuries or those with significant negative energetic impacts) may have the potential to negatively affect reproductive success or survivorship, depending on the circumstances, while other takes may have no impact on the health or fitness of the affected individual. If the analysis predicts that the activity is likely to adversely affect the reproductive success or survivorship of any individual marine mammals, then additional analysis must consider how the anticipated fitness affects to those individuals would likely affect the population (e.g., rates of recruitment and survival), in consideration of the species status. Additionally, the negligible impact analysis must consider the impacts on marine mammal habitat, such as impacts on prey species or the more difficult-to-quantify acoustic

[2] Under the MMPA implementing regulations, 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 CFR § 216.103).

[3] An unmitigable adverse impact is defined as an impact resulting from the specified activity that is: 1) likely to reduce the availability of the species to a level insufficient for a harvest to meet subsistence needs by: causing marine mammals to abandon or avoid hunting areas; directly displacing subsistence users; or, placing physical barriers between the marine mammals and the subsistence users; AND 2) cannot be sufficiently mitigated by other measures to increase the availability of marine mammals to allow subsistence needs to be met.

habitat impacts that necessitate the consideration of the chronic effects of longer-term exposure to increased sound levels.

Finally, the need to ensure "no unmitigable adverse impacts" to the availability of subsistence uses requires consideration of far more than just take numbers, both because activities can interfere with a hunt without ever affecting a marine mammal (e.g., by blocking access of hunters to marine mammals), and because it is possible for noise to affect marine mammals in a way that would make them more difficult to hunt without always rising to the level of a take (e.g., as traditional knowledge suggests, making them "skittish.")

Current Acoustic Thresholds

When assessing impacts to marine mammals from sound sources, NMFS has historically used the following acoustic thresholds (meaning that take is predicted to occur, or assumed to have occurred, if animals are exposed at or above these levels). These thresholds have been applied to all marine mammal species under NMFS' jurisdiction.

- ***Level A Harassment (potential injury) from all non-explosive sound sources: 180 and 190 dB re 1 µPa (rms) received level for cetaceans and pinnipeds, respectively***. These received levels represent the levels above which, in the view of a panel of bioacoustics specialists convened by NMFS before additional TTS measurements for marine mammals became available, one could not be certain that there would be no injurious effects, auditory or otherwise, to marine mammals (NMFS 1995, 2000).
- ***Level B Harassment (behavioral harassment) from impulsive sources (e.g., seismic airguns): 160 dB re 1 µPa (rms) received level for all species.*** This sub-injurious threshold was based on measured avoidance responses observed in whales in the wild. Specifically, the 160 dB rms re: 1µPa threshold was derived from data for mother-calf pairs of migrating gray whales (Malme et al. 1983, 1984) and bowhead whales (Richardson et al. 1985; Richardson et al. 1986) responding when exposed to seismic airguns.
- ***Level B Harassment (behavioral harassment) from continuous sources (e.g., drilling): 120 dB re 1 µPa (rms) received level for all species.*** This threshold originates from research on baleen whales, specifically migrating gray whales (Malme et al.1984; predicted 50% probability of avoidance) and bowhead whales reacting when exposed to industrial (i.e., drilling and dredging) activities (non-impulsive sound source) (Richardson et al. 1990).

Revision of Acoustic Thresholds[4]

NMFS is currently in the process of revising and updating our acoustic thresholds to incorporate newer science and utilize improved methods. NMFS is using a phased approach to conduct these update. The thresholds currently being revised include: 1) the injury (Level A Harassment) thresholds to be applied to all sound sources and; 2) the behavioral (Level B Harassment) thresholds to be applied only to seismic activities and seismic-like sound sources (e.g., primarily mobile and impulsive sources). In addition to ensuring that NMFS is using the appropriate acoustic thresholds in its decision-making processes, the development of these revised acoustic thresholds will create a single document/ reference that clearly articulates the thresholds, how they were scientifically derived, and how NMFS plans to apply them pursuant to the multiple NOAA authorities that address noise impacts (e.g., MMPA, ESA).

The process for revising the acoustic thresholds is separate from this NEPA process for Arctic Oil and Gas Exploration. The acoustic threshold revision process will include extensive internal (NOAA) review,

[4] This information is distributed solely for the purpose of predissemination peer review, including public review and comment, under applicable Information Quality Guidelines. It has not been formally disseminated by NOAA. It does not represent and should not be construed to represent any agency determination or policy.

an external peer review, and public review. Currently, NMFS is in the internal review part of this process and we expect the other steps (peer and public review) to occur generally in parallel with the development of the Final EIS for Arctic Oil and Gas Exploration. This means that we expect final or near-final acoustic threshold revisions for inclusion in this Final EIS. However, importantly, the revised acoustic thresholds specifically referenced here will not be used in any final management decisions pursuant to the MMPA or ESA until they have undergone both public and peer review and have been officially finalized by NMFS. Until then, NMFS will continue to use the current thresholds referenced above.

Government agencies must make decisions every day based on the best available science. NEPA requires agencies to conduct environmental impact analyses, some of which span multiple years during which science and policy related to the actions being considered are constantly evolving. As noted above, NMFS is currently in the internal review phase of our revision of the acoustic thresholds and some facets of the revisions are not yet ripe for consideration by the public. Additionally, both peer review and public review will create opportunities for any draft thresholds available now to change, potentially significantly. However, enough basic information about the likely nature of the revisions to the thresholds is available to provide valuable input into the environmental analysis contained in this Supplemental DEIS, and not including an introduction to these anticipated changes here and (in fuller form) in the Final EIS would lessen the value of the Final EIS to inform NMFS decision-making. As noted above, a full draft of the revised acoustic thresholds will be made available to the public for review in a separate process (anticipated later in 2013) and the input from that process will inform both the final acoustic thresholds that are ultimately adopted, as well as NMFS' effects analysis in the Final EIS for Arctic Oil and Gas Exploration.

Below, we include an introduction to the revision of the acoustic thresholds (including actual preliminary draft thresholds for injury), along with a summary of the ways in which changes of the nature discussed might be expected to shape the analysis of effects contained elsewhere in the document (and informed by the current acoustic criteria). As discussed in more detail above and below, acoustic thresholds are only one part of the analysis of marine mammal and subsistence impacts and the analysis contained elsewhere in this document (informed by current acoustic criteria) creates a solid analytical foundation upon which considerations of acoustic threshold revisions can be layered for a fuller understanding of how the anticipated changes may inform future decision-making.

Behavioral Harassment Thresholds

As noted above, NMFS is currently in the process of revising the acoustic thresholds for behavioral harassment for seismic activities, including airguns and similar sources (e.g., primarily mobile and impulsive sources). Although new numerical thresholds are not presented here (for behavioral harassment), an introduction to the anticipated change in methodology and a preview of the quantitative adjustments that could result from the inclusion of newer data are included.

The current acoustic threshold for behavioral harassment from impulsive sounds, a 160-dB rms step function, predicts that all animals exposed to levels above 160 dB would be taken, and that no animals exposed to levels below 160 dB would be taken. Both data and logic suggest that this method may oversimplify the relationship between sound exposure and behavioral harassment, and there are other methods available that can better characterize this relationship, given the available data, while also incorporating consideration of variability in individual responses to sound. Dose-response-type curves, or risk functions (see Figure 4.6-1), when supported by data and with an appropriate cut-off, can be used to more fully describe how exposures to different received levels can result in different outcomes (e.g., number of animals responding in a certain way, probability of individual responses). For example, given a specifically defined response, a risk function could describe how a higher percentage of animals exposed to higher received levels might demonstrate that response, while a lower percentage of animals exposed to lower received levels might demonstrate that response (see example used for Navy mid-frequency sources below). NMFS' preliminarily plans include exploring the use of dose-response or risk

function-like curves to characterize the relationship between received sound level and behavioral responses. Further, while other metrics have been explored, based on the available data NMFS' believes that dB rms (the metrics used in the current acoustic thresholds) is still the most appropriate metric to characterize the relationship between received level and behavioral response.

Additionally, as has become increasingly evident and more highlighted in publications (e.g., Ellison et al., 2011), the context of an exposure of marine mammals to sound (e.g., the behavioral state of the animal, whether a sound source is approaching and how fast, etc.) can affect both how an animal initially responds to a sound and the ultimate impacts of the sound exposure on that individual. NMFS is also exploring additional methods of augmenting the use of a dose-response-like curve to address contextual factors beyond received level (such as distance from the sound or behavioral state of the animal), as well as the more chronic effects of sound sources operated over longer periods of time.

Currently, based on the limited data available and what it suggests is appropriate, NMFS plans to have different basic acoustic thresholds for mysticetes, odontocetes, and pinnipeds, with the recognition that sometimes there may be sufficient data to suggest that a species within one of those groups is "sensitive" and should have different (lower) acoustic threshold. Although draft curves will not be presented here, a look at some of the data that will be used to derive the curves will help us understand how the results of using a curve may differ from the results of using the current 160-dB step function. Because data indicate that not all mysticetes exposed to received levels of 160 dB or above would be expected to be taken (Miller 2005, Malme et al. 1983, 1984, 1985), a dose-response approach for mysticetes would likely result in estimates that show fewer takes resulting from exposures to received levels above 160 dB (than when the current step function is used). However, there are also data showing that some portion of mysticetes (including, and perhaps especially, bowheads) exposed to seismic signals at received levels below 160 dB, and potentially down to around 120 dB, may respond in a manner that NMFS would categorize as a Level B behavioral take, especially in certain contexts, such as within a migratory corridor or if the activity were expected to be continuous over multiple days (Di Iorio and Clark 2009, Richardson et al. 1985/1986, Richardson et al. 1999). A dose-response-like approach incorporating these data would result in some number of animals exposed at levels below 160 dB being predicted to be taken.

Fewer data exist showing how odontocetes and pinnipeds (as compared to mysticietes) behaviorally respond to seismic airguns and similar sources. However, what data are available suggest that some percentage of odonotcetes exposed to received levels above 160dB would not be taken and that some percentage exposed to levels below 160 dB may respond in a manner that NMFS would consider Level B harassment (Miller et al. 2005). Alternately, data suggest that not all pinnipeds will be taken at received levels of 160 dB (or higher), and there are no data (with measured received levels) indicating how they would respond to levels below 160 or 165 dB.

In consideration of the acoustic threshold revisions being conducted, NMFS qualitatively considers how changes of the nature described above could potentially shape our further analyses of the alternatives in this Supplemental DEIS. As described above, much of the impact analysis occurs subsequent and in addition to the initial estimate of the number exposures that are predicted to result in a take. This additional analysis determines whether the anticipated exposures with the potential to injure or disturb marine mammals (counted as takes) would be likely to affect the health or fitness of any individuals (in a manner that would affect survivorship or reproductive success), whether altered health or fitness of the expected number of individuals would adversely affect rates of recruitment or survival, and whether any of the expected effects on individuals would have an unmitigable adverse impact on subsistence uses.

When estimating the potential number of take from a particular activity, NMFS has typically multiplied the anticipated area to be ensonified by the appropriate threshold (noted above) by the expected species density. For some activities occurring in the Beaufort Sea during the fall bowhead migration, additional factors were taken into consideration in the take estimates, such as the proportion of whales migrating past in certain water depths and how that falls within the applicable sound thresholds. When sound

propagation is considered (and the larger areas ensonified at lower levels), if the acoustic thresholds were revised in the form of dose-response curves reflecting the data referenced above (after input from the public and peer reviewers), it is likely that it would result in a change in the estimated number of takes that would result from the operation of seismic airguns (as compared to the numbers predicted using the current criteria). This change would likely be in the direction of a moderate to large increase in the number of predicted mysticete behavioral harassment takes, a small to moderate increase in the number of odontocete takes, and little change or a slight decrease in the number of pinniped takes.

Any increase in numbers of estimated take would entirely be the result of adding behavioral harassment takes that would be predicted to result from lower level exposures, which are also typically associated with lower potential severity, or lower likelihood of affecting the health and fitness of any individual marine mammals. As discussed above, the quantification of anticipated takes is only part of the larger marine mammal impact analysis and is separate from the analysis of the severity of any single one of those takes, which must consider the biological and operational context in which those takes occur. So, while these revisions could notably change predicted take numbers in some cases, we would not *necessarily* change our analyses (i.e., the analysis contained elsewhere in this Supplemental DEIS) of the biological significance of the increased total takes on the individuals or populations. The analysis of the potential health and fitness impacts of the expected take, or the population level impacts, includes consideration of the life history of the affected species, their behavioral patterns and distribution within the action area, the duration, season, geographic scope, and operational parameters of the expected activities, along with the potential implementation of multiple mitigation measures intended to minimize the intensity of the affects – and these analyses are not notably changed by the likely modification of predicted harassment take numbers.

Separately, any revisions to the acoustic thresholds also result in changes to the distances from sound sources within which we quantify impacts. NMFS has previously qualitatively acknowledged our concerns regarding the more chronic, longer-term effects of increasing noise levels (at levels below 160 dB) in potentially interfering with marine mammal's ability to detect and interpret important environmental cues (especially for low frequency specialists and low frequency sounds). For example, we outlined the 120-dB isopleths around seismic airgun operations in the original DEIS (even though the current acoustic threshold for behavioral harassment is 160 dB) to give a sense of the geographic scope of these chronic noise concerns. Revised acoustic thresholds, with which we may include methods to address the contextual and chronic concerns of noise exposure, may allow us to quantitatively augment the existing qualitative analysis of these concerns.

Injury

NMFS is also currently in the process of revising the acoustic criteria for determining at what received levels a marine mammal is likely to incur injury (i.e., PTS onset) from seismic activities, including use of airguns. Southall et al. (2007) identified dual criteria (using peak pressure and sound energy level) for assessing PTS from multiple pulse sounds. Using those proposed levels as a starting point, NMFS is proposing to modify them using more recent data, which suggest: 1) that phocids should be separated from otariids when estimating TTS or PTS (because of their inner ear anatomy) and likely incur hearing impairment at lower received levels based on the data currently available (Kastak and Schusterman 1998; Hemilä et al. 2006; Mulsow et al. 2011), and; 2) that cetaceans are more likely to incur TTS and subsequent PTS within the frequency ranges of their best hearing sensitivity (,Finneran and Schlundt 2010; Finneran and Jenkins 2012). An overview of these NMFS draft acoustic exposure criteria is included below. Finneran and Jenkins (2012), which describes the new weighting functions, is included here as Appendix B, and Figure 4.6-2 summarizes the weighting. Additional information regarding the derivation of these draft thresholds may be found in Southall et al. (2007) and section 3.4 of the Navy's Atlantic Fleet Training and Testing DEIS (aftteis.com). NMFS will provide our own full description of the derivation of the revised acoustic thresholds once the internal review is complete and NMFS' revised acoustic thresholds are released for public comment through the separate process referenced above.

Table 4.2-4 NOAA Draft Proposed Injury (PTS) Criteria for Marine Mammals

Draft Proposed Injury Criteria		
	PTS Onset (Received Level)	
Hearing Group	**Impulsive**	**Non-impulsive**
Low-Frequency Cetaceans	*Cell 1* *230 dB_{peak} &* *187 dB cSEL***	*Cell 2* *230 dB_{peak} &* *198 dB cSEL***
Mid-Frequency Cetaceans	*Cell 3* *230 dB_{peak} &* *187 dB cSEL***	*Cell 4* *230 dB_{peak} &* *198 dB cSEL***
High-Frequency Cetaceans	*Cell 5* *201 dB_{peak} &* *161 dB cSEL***	*Cell 6* *201 dB_{peak} &* *171 dB cSEL***
Phocid Pinnipeds (Underwater)	*Cell 7* *224 dB_{peak} &* *181 dB cSEL***	*Cell 8* *224 dB_{peak} &* *186 dB cSEL***
Otariid Pinnipeds (Underwater)	*Cell 9* *230 dB_{peak} &* *215 dB cSEL***	*Cell 10* *230 dB_{peak} &* *220 dB cSEL***

* Dual criteria: Use on one [dB_{peak} or dB cSEL] exceeded first.

** NOTE – When comparing these thresholds to existing 180/190-dB rms thresholds, two important differences must be kept in mind: 1) these thresholds are based on the frequency of highest sensitivity for each taxa and are intended to be used in conjunction with frequency weighting, and 2) the metric of these thresholds are SEL instead of SPL.

When considering how revised acoustic thresholds for injury similar to those outlined above might compare (adopted in this form after public and peer review and finalized) to the current 180/190-dB rms thresholds, it is important to note three important differences in what the two sets of thresholds (current and revised) represent. First, dual criteria are utilized, meaning that whichever is exceeded first is the one that should be used for assessing injury (in almost all cases, the cSEL metric will be exceeded first). Second, the thresholds outlined above use the cSEL metric (which allows for the consideration of how the sound accumulates over time), not the SPL rms metric of the current thresholds (which does not directly take into account the duration of exposure). This means, for example, that one 100-ms pulse with a received SPL rms level of 161 dB would only have an SEL of 151 dB. However, multiple pulses must be taken into consideration, and, if a receiver were in a position to receive 10 of those same pulses within that same distance, the cSEL would accumulate up to 161 dB (e.g, cSEL equals SPL rms levels when the total duration of exposure to the same level is 1 second). Last, the cSEL thresholds outlined above take into account the frequency range of highest sensitivity for each functional hearing group and are intended to be used in conjunction with frequency weighting functions that are depicted below (Figures 4.6-2 and 4.6-3) and outlined in more detail in Finneran and Jenkins (2012) technical memo (Appendix B). In short, applying frequency weighting functions puts the sound produced by the source in question through

a functional hearing group-specific and frequency-specific filter and for any part of the signal that is not in the area of highest sensitivity for that functional hearing group, i.e., more energy is needed to reach the threshold (e.g., range to isopleth decreases). Of note, the values of highest sensitivity for mysticete hearing specialists depicted below are extrapolated from mid-frequency hearing specialists and NMFS expects that these values may be more likely to significantly change than other groups.

NMFS has conducted some simple calculations, with underlying assumptions (e.g., spherical spreading, airgun shot lasts 100 ms, accumulate 20 shots, animal not avoid source). If thes revised thresholds were adopted in this form, it is likely that the distances from the source within which we would expect animals to potentially be exposed to injurious levels (e.g., within these cSEL thresholds) would primarily fall within the distances to the current 180-dB SPL rms threshold for cetaceans. However, for phocids, the distances within which received levels may exceed the new thresholds could be somewhat larger than the distances to the current 190-dB threshold. However, as noted, these calculations do not take into account the likely avoidance of higher sound levels by some portion of marine mammals or the potential success of mitigation measures in avoiding exposures to those animals that approach more closely. This Supplemental DEIS analysis currently suggests that while marine mammal injury resulting from airgun exposure is unlikely, it cannot be ruled out – and that analysis is anticipated to remain accurate in consideration of revised acoustic thresholds.

Tables 4.2-5, 4.2-6, and 4.2-7 contain a representative summary of takes that were predicted to occur in the Beaufort and Chukchi seas based on previously issued IHAs for the different types of activities analyzed in this EIS.

Table 4.2-5 Examples of estimated takes for different types of oil and gas exploration activities in the Beaufort Sea using the current acoustic criteria, followed by estimated takes if those examples are used to total maximum activity levels for each alternative.

BEAUFORT	Bowhead Whale	Beluga Whale	Gray Whale	Minke Whale	Humpback Whale	Harbor Porpoise	Ringed Seal	Bearded Seal	Spotted Seal	Ribbon Seal
OBC Seismic Survey using an 880 in^3 array	20	15	0	0	0	0	225	30	15	0
3D Seismic Survey using a 3147 in^3 array	400	210	250	0	0	0	7300	375	20	0
Site Clearance and High Resolution Shallow Hazards Survey using a 40 in^3 airgun	300	10	5	0	0	0	140	10	5	0
On-ice Seismic Survey	0	0	0	0	0	0	500	5	0	0
In-ice 2D Seismic Survey	240	4900	20	18	18	18	39,200	70	17	17
Exploratory Drilling Program with a drillship	1500	20	10	0	0	15	440	22	5	2
ALTERNATIVE 2 Total - Maximum levels of all Beaufort activities combined	**3460**	**5385**	**545**	**18**	**18**	**33**	**55385**	**907**	**92**	**19**
ALTERNATIVE 3 Total - Maximum levels of all Beaufort activities combined	**5980**	**5650**	**815**	**18**	**18**	**48**	**63630**	**1354**	**142**	**21**
ALTERNATIVE 4 Total - Maximum levels of all Beaufort activities combined	**8980**	**5690**	**835**	**18**	**18**	**78**	**64510**	**1398**	**152**	**25**

Table 4.2-6 Examples of estimated takes for different types of oil and gas exploration activities in the Chukchi Sea using the current acoustic criteria, followed by estimated takes if those examples are used to total maximum activity levels for each alternative.

CHUKCHI	Bowhead Whale	Beluga Whale	Gray Whale	Minke Whale	Humpback Whale	Fin Whale	Killer Whale	Harbor Porpoise	Ringed Seal	Bearded Seal	Spotted Seal	Ribbon Seal
3D Seismic Survey using a 3000 in^3 array	150	190	145	5	5	5	5	20	6,500	215	130	10
Site Clearance and High Resolution Shallow Hazards Survey using a 40 in^3 array	5	10	20	2	2	2	5	7	700	30	7	2
In-ice 2D Seismic Survey	40	50	5	5	5	0	0	5	21,300	20	5	5
Exploratory Drilling Program with a drillship	80	15	50	15	15	15	15	15	815	35	20	15
Exploratory Drilling Program with a jack-up rig	70	10	35	5	5	5	20	10	340	160	160	15
ALTERNATIVE 2 Total - Maximum levels of all Chukchi activities combined	**435**	**475**	**405**	**36**	**36**	**31**	**40**	**81**	**37215**	**575**	**306**	**46**
ALTERNATIVE 3 Total - Maximum levels of all Chukchi activities combined	**825**	**890**	**785**	**65**	**65**	**60**	**75**	**150**	**52430**	**1100**	**600**	**85**
ALTERNATIVE 4 Total - Maximum levels of all Chukchi activities combined	**985**	**920**	**885**	**95**	**95**	**90**	**105**	**180**	**54060**	**1170**	**640**	**115**

Table 4.2-7 Using the examples provided above, estimated takes for total maximum activity levels in both the Beaufort and Chukchi seas combined for each alternative.

BEAUFORT/CHUKCHI COMBINED	Bowhead Whale	Beluga Whale	Gray Whale	Minke Whale	Humpback Whale	Fin Whale	Killer Whale	Harbor Porpoise	Ringed Seal	Bearded Seal	Spotted Seal	Ribbon Seal
ALTERNATIVE 2 Total - Maximum levels of all activities combined	3895	5860	950	54	54	31	40	81	92,600	1,482	398	65
ALTERNATIVE 3 Total - Maximum levels of all activities combined	6805	6540	1600	83	83	60	75	150	116,060	2,454	742	106
ALTERNATIVE 4 Total - Maximum levels of all activities combined	9965	6610	1720	113	113	90	105	180	118,570	2,568	792	140