



May 8, 2015

Via Electronic Mail

Office of the Executive Secretariat and Regulatory Affairs
U.S. Department of the Interior
1849 C Street, NW
Washington, DC 20240

**COMPLAINT OF VIOLATIONS OF THE U.S. DEPARTMENT OF THE INTERIOR'S
POLICY ON THE INTEGRITY OF SCIENTIFIC AND SCHOLARLY ACTIVITIES**

This Complaint¹ concerns violations of the U.S. Department of the Interior's Integrity of Scientific and Scholarly Activities Policy.² The violations are contained in two *Science Notes* articles³ published by the Bureau of Ocean Energy Management and written by the Bureau's Chief Environmental Officer, Dr. William Yancy Brown. These articles violate the Department's Policy by (1) not communicating the results of scientific activities clearly, honestly, objectively, thoroughly, and accurately, (2) not clearly differentiating among facts, personal opinions, assumptions, hypotheses, and professional judgment, and (3) not fully disclosing the scientific methodology used, all relevant data and information, and the procedures for identifying and

¹ Oceana and Ocean Conservation Research file this Complaint within sixty days of the publication of the March 9, 2015, *Science Notes* article, which republished and expanded on the August 22, 2014, *Science Notes* article.

² Department of the Interior, Department Manual Part 305: Department of Science Efforts, ch. 3 [hereinafter Department's Policy].

³ William Y. Brown, *A Follow Up to our August 2014 Note: More on the Science Behind the Atlantic G&G Decision*, BOEM Science Notes, Mar. 9, 2015, <http://www.boem.gov/BOEM-Science-Note-March-2015> (attached as Exhibit 1) [hereinafter *Science Notes 2*]; William Y. Brown, *The Science Behind the Decision: Answers to Frequently Asked Questions about the Atlantic Geological and Geophysical Activities Programmatic Environmental Impact Statement (PEIS)*, BOEM Science Notes, Aug. 22, 2014, <http://www.boem.gov/BOEM-Science-Note-August-2014> (attached as Exhibit 2) [hereinafter *Science Notes 1*].

excluding faulty data. Both articles commit these violations, in part, by purporting to dismiss concerns about harm from seismic exploration activities without objectively and accurately describing what those concerns are and without objectively discussing the way in which the articles statements do, or do not, address those concerns. For example, the first *Science Notes* article on August 22, 2014, states, that “To date, there has been no documented scientific evidence of noise from air guns used in geologic and geophysical (G&G) seismic activities adversely affecting marine animal populations,”⁴ without explaining the lack of relevant scientific studies of any sort on this precise question. On March 5, 2015, in a letter to the Bureau, seventy-five scientists state, “Opening the U.S. east coast to seismic airgun exploration poses an unacceptable risk of serious harm to marine life *at the species and population levels*, the full extent of which will not be understood until long after the harm occurs.”⁵ Ignoring the statements from the scientists’ letter, the second March 9, 2015, *Science Notes* article reiterates the arguments from the August 22, 2014, *Science Notes* article.⁶ The *Science Notes* articles have been quoted and misquoted by industry to communicate that seismic airguns have no adverse impacts on marine life, a point the articles appear to support, although that point is not supported by scientific evidence.⁷ Oceana, Inc., and Ocean Conservation Research file this Complaint to seek withdrawal of the articles and other appropriate remedies to correct the misimpressions created by the articles.

SUMMARY

The Science Notes articles both violate the Department’s Policy in a number of ways, which is particularly troubling because (1) both articles are *Science Notes*, (2) the author self-identifies as a *scientist*, and (3) the articles emphasize the “benefits by getting the *facts* right.”⁸ Because of the articles’ emphasis on *science*, it is important that the articles strictly adhere to Department’s Policy. The Department’s Policy requires employees, scientists, scholars, and decision-makers to (1) “communicate the results of scientific activities clearly, honestly, objectively, thoroughly, [and] accurately”; (2) “clearly differentiate among facts, personal opinions, assumptions, hypotheses, and professional judgment in reporting the results of scientific activities and characterizing associated definable uncertainties, in using those results for decision making and in carrying out public information activities”; and (3) “fully disclose the scientific methodology

⁴ *Science Notes* 1, *supra* note 3.

⁵ Letter from Christopher Clark et al. to President Barack Obama (Mar. 15, 2015), *available at* http://docs.nrdc.org/wildlife/files/wil_15030401a.pdf (emphasis added) (attached as Exhibit 3) [hereinafter Scientists’ Letter].

⁶ *Science Note* 2, *supra* note 3.

⁷ *See infra* pages 15–22.

⁸ *See, e.g., Science Notes* 1, *supra* note 3 (emphasis added).

used, all relevant data and information, and the procedures for identifying and excluding faulty data except where protected by law.”⁹

Rather than stating the *facts*, the articles engage in advocacy, which in key places is artful and misleading. In its Programmatic Environmental Impact Statement for Atlantic Geological and Geophysical Surveying (“PEIS”), the Bureau estimates the annual take of marine mammals caused by acoustic impacts using two different models.¹⁰ The Bureau did not choose between the models. Because the affected species are protected under the Endangered Species Act and the Marine Mammal Protection Act, and the agency must give the “benefit of the doubt”¹¹ to protected species, it is appropriate to rely on the more protective model, which estimates that, without mitigation,¹² seismic surveying could cause up to 138,000 injuries to marine mammals and up to 13.5 million behavioral disturbances to marine mammals.¹³ These estimates include only acoustic harm from seismic surveying and do not include injuries, behavioral disturbances, or deaths from other non-acoustic sources.¹⁴ However, in the PEIS, the Bureau concedes that the proposed seismic surveying activities could cause marine mammal deaths, particularly from ship strikes.¹⁵

⁹ Department's Policy, *supra* note 2, at 9–10.

¹⁰ BOEM, *Atlantic OCS Proposed Geological and Geophysical Activities Mid-Atlantic and South Atlantic Planning Areas Final Programmatic Environmental Impact Statement, Acoustic Modeling and Marine Mammal Incidental Take Supplemental Tables* tbls. 42, 44 (2014) (attached as Exhibit 4). Unfortunately the PEIS does not present cumulative take figures, but rather fragments its take analyses in a way that conceals from the public the true anticipated impact of sound from the proposed seismic activity. Oceana input the data from the PEIS into a spreadsheet and summed up the total anticipated takes caused by sound from seismic surveying (attached as Exhibit 5).

¹¹ *See, e.g., Miccosukee Tribe of Indians of Fla. v. United States*, 566 F.3d 1257, 1267 (11th Cir. 2009).

¹² For a discussion of the inadequacy of the Programmatic Environmental Impact Statement's mitigation measures, see Comment from Michael Jasny et al., to Gary D. Goeke, BOEM (July 2, 2012) (attached as Exhibit 6) & Comment from Eric A. Bilsky et al., to Gary D. Goeke, BOEM (May 7, 2014) (attached as Exhibit 7).

¹³ BOEM, *supra* note 10, at tbls. 42, 44; *see also* note 10.

¹⁴ BOEM, *Appendix E in BOEM, Atlantic OCS Proposed Geological and Geophysical Activities Mid-Atlantic and South Atlantic Planning Areas Final Programmatic Environmental Impact Statement, Vol. 3* 222, E-1 to E-3 (2014), available at <http://www.boem.gov/BOEM-2014-001-v3>.

¹⁵ BOEM, *Atlantic OCS Proposed Geological and Geophysical Activities Mid-Atlantic and South Atlantic Planning Areas Final Programmatic Environmental Impact Statement, Vol. 1* 2-40 (2014) (“There is a potential risk that survey vessels could strike and injure or kill marine mammals.”).

Instead of relying on the only analysis that the Bureau has completed evaluating the effects of seismic surveying on marine mammals, the *Science Notes* articles state, "To date, there has been no documented scientific evidence of noise from air guns used in geological and geophysical (G&G) seismic activities adversely affecting animal populations."¹⁶ This statement is incomplete and misleading in a number of ways:

- The statement omits the fact that there are no scientific studies evaluating population-level effects from sound impacts of seismic surveying on marine mammals.
- The statement omits the fact that no scientific studies show a *lack* of population-level effects from sound impacts of seismic surveying on marine mammals.
- The statement ignores the Bureau's own estimates that large numbers of marine mammals could be affected, including up to 138,000 marine mammals that could be injured and up to 13.5 million marine mammals that could experience behavioral disturbances.¹⁷
- The statement ignores the facts that (1) the death of *even one* North Atlantic right whale could jeopardize the survivability of the population,¹⁸ (2) the Bureau concedes that

Similarly, the Biological Opinion for Programmatic Geological and Geophysical Activities in the Mid- and South Atlantic Planning Areas from 2013 to 2020 recognizes that Atlantic seismic surveying activities could cause injuries and deaths of marine mammals, including critically endangered right whales, through ship strikes. NMFS, *Programmatic Geological and Geophysical Activities in the Mid- and South Atlantic Planning Areas from 2013 to 2020* at 158, 188 (2013), available at <http://www.boem.gov/Final-Biological-Opinion-19-July-2013>. However, the Programmatic Biological Opinion does not estimate the number of whales that "might be exposed to vessel traffic independent of the number of individuals that might be exposed to seismic and HRG surveys." See, e.g., *id.* at 272 ("We did not estimate the number of blue whales that might be exposed to vessel traffic independent of the number of individuals that might be exposed to seismic and HRG surveys because the data we would have needed to support those analyses were not available."); *id.* at 275 (same for fin whales); *id.* at 277 (same for humpback whales); *id.* at 280 (same for North Atlantic right whales); *id.* at 283 (same for sei whales).

¹⁶ *Science Notes* 1, *supra* note 3; *Science Notes* 2, *supra* note 3.

¹⁷ BOEM, *supra* note 10, at tbls. 42, 44; see also note 10.

¹⁸ NMFS, *Marine Mammal Stock Assessment Reports (SARs)* 10 (2013), available at http://www.nmfs.noaa.gov/pr/sars/2013/ao2013_rightwhale-west-atl.pdf [hereinafter NMFS, *2013 Stock Assessment*]; NMFS, *Draft Marine Mammal Stock Assessment Reports (SARs)* 8 (2015), available at <http://www.nmfs.noaa.gov/pr/sars/draft.htm> [hereinafter NMFS, *Draft 2015 Stock Assessment*].

seismic surveying activities could cause marine mammal deaths from ship strikes,¹⁹ and (3) right whales are particularly prone to being struck by vessels.²⁰

Further, the March 9, 2015, *Science Notes* article is misleading because it omits relevant data and information:

- The article completely ignores the North Atlantic right whale, even though the public has repeatedly expressed concern about right whales because the species is extremely vulnerable.²¹ Instead, the article discusses one of the most abundant marine mammals in the Atlantic Ocean.²²
- The article completely omits arguments from seventy-five scientists who state seismic surveying would likely have “significant, long-lasting and widespread impacts on the reproduction and survival of fish and marine mammal *populations* in the region.”²³ In their letter, the scientists maintain, “Opening the U.S. east coast to seismic airgun exploration poses an unacceptable risk of serious harm to marine life *at the species and population levels*, the full extent of which will not be understood until long after the harm occurs.”²⁴

REQUESTED RELIEF

We request that the Bureau

1. Withdraw the March 9, 2015, and August 22, 2014, *Science Notes* articles;
2. Inform states reviewing geological and geophysical permit applications under the Coastal Zone Management Act that the agency is withdrawing the *Science Notes* articles and provide the reasons that the agency is withdrawing the articles;

¹⁹ BOEM, *supra* note 15, at 2-40 (“There is a potential risk that survey vessels could strike and injure or kill marine mammals.”).

²⁰ NMFS, *Recovery Plan for the North Atlantic Right Whale Revision IG-1*, available at http://www.nmfs.noaa.gov/pr/pdfs/recovery/whale_right_northatlantic.pdf (August 2004).

²¹ *See, e.g.*, Comment from Dr. Timothy J. Ragen, Executive Director of the Marine Mammal Commission, to Gary D. Goeke, BOEM, July 2, 2012 (attached as Exhibit 8); Comment from Michael Stocker, Director of Ocean Conservation Research, to Gary D. Goeke, BOEM, June 14, 2012 (attached as Exhibit 9); Comment from Michael Jasny et al., to Gary D. Goeke, BOEM (July 2, 2012); Comment from Eric A. Bilsky et al., to Gary D. Goeke, BOEM (May 7, 2014).

²² *Science Notes 2*, *supra* note 3.

²³ Scientists’ Letter, *supra* note 5 (emphasis added).

²⁴ *Id.* (emphasis added).

3. Inform the applicants for seismic exploration permits that the Bureau is withdrawing the *Science Notes* articles and instruct them not to quote information from the *Science Notes* in any applications, public materials, or documents produced;
4. Transmit to Oceana and Ocean Conservation Research copies of the letters informing the states and the seismic exploration applicants; and
5. Take any other necessary steps to correct the misimpressions created by the *Science Notes* articles.

LEGAL BACKGROUND

In his Presidential Memorandum on Scientific Integrity intended to address the abuses of science that took place in the prior Administration, President Barack Obama directed federal agencies to “ensur[e] the highest level of integrity in all aspects of the executive branch’s involvement with scientific and technological processes.”²⁵ To comply with the President’s policy, the Department of the Interior created a department-wide Scientific and Scholarly Integrity Policy.²⁶ The Department’s Policy provides a code of conduct for employees, scientists, scholars, and decision-makers at the Department, including the following standards:

- “communicate the results of scientific activities clearly, honestly, objectively, thoroughly, accurately, and in a timely manner”;²⁷
- “clearly differentiate among facts, personal opinions, assumptions, hypotheses, and professional judgment in reporting the results of scientific activities and characterizing associated definable uncertainties, in using those results for decision making and in carrying out public information activities”;²⁸ and
- “fully disclose the scientific methodology used, all relevant data and information, and the procedures for identifying and excluding faulty data except where protected by law.”²⁹

²⁵ Memorandum from President Barack Obama to the Heads of Executive Departments and Agencies, Mar. 9, 2009, *available at* <http://www.doi.gov/scientificintegrity/upload/Presidential-Memorandum-for-the-Heads-of-Executive-Departments-and-Agencies-3-9-09.pdf>.

²⁶ Department’s Policy, *supra* note 2.

²⁷ *Id.* at 9.

²⁸ *Id.* at 10.

²⁹ *Id.* at 11.

The Department's Policy provides a mechanism for the public to seek enforcement of these codes of conduct.³⁰ The public must file a complaint within sixty days of learning about a potential violation.³¹

PROCEDURAL HISTORY

On March 7, 2014, the Bureau released its PEIS, which includes estimates of annual takes of marine mammals caused by acoustic impacts using two different models.³² However, the Bureau did not choose between the models. Because the affected species are protected under the Endangered Species Act and the Marine Mammal Protection Act, and the agency must give the "benefit of the doubt"³³ to protected species, it is appropriate to rely on the more protective model, which estimates that, without mitigation, seismic surveying could cause up to 138,000 injuries to marine mammals and up to 13.5 million behavioral disturbances to marine mammals.³⁴ The PEIS's estimates include injuries and behavioral disturbances only from acoustic harm from seismic surveying and do not include injuries, behavioral disturbances, or deaths caused by other non-acoustic sources.³⁵ However, in the PEIS, the Bureau concedes that the proposed seismic surveying activities could cause marine mammal mortalities, particularly from ship strikes.³⁶ On July 23, 2014, the Bureau published its Record of Decision ("ROD") on the PEIS.³⁷

Prior to the release of the PEIS and ROD, the National Marine Fisheries Service issued its Biological Opinion on the Programmatic Geological and Geophysical Activities in the Mid- and South Atlantic Planning Area ("Programmatic Biological Opinion").³⁸ The Programmatic Biological Opinion also recognizes that the Atlantic seismic surveying activities could cause injuries and mortalities to marine mammals, including critically endangered North Atlantic right whales, through non-acoustic sources, such as ship strikes.³⁹ The Programmatic Biological Opinion states, "When the vulnerability of right whales to ship strikes is combined with the

³⁰ *Id.* at 6.

³¹ *Id.* at 7.

³² BOEM, *supra* note 10, at tbls. 42, 44; *see also* note 10.

³³ *See, e.g., Miccosukee Tribe of Indians of Fla.*, 566 F.3d at 1267.

³⁴ BOEM, *supra* note 10, at tbls. 42, 44; *see also* note 10.

³⁵ BOEM, *supra* note 14, at E-1 to E-3.

³⁶ BOEM, *supra* note 15, at 2-40 ("There is a potential risk that survey vessels could strike and injure or kill marine mammals.").

³⁷ BOEM, *Record of Decision: Atlantic OCS Proposed Geological and Geophysical Activities Mid-Atlantic and South Atlantic Planning Areas, Final Programmatic Environmental Impact Statement (EIS)* 3 (2014); 80 Fed. Reg. 42,815, 42,815.

³⁸ NMFS, *supra* note 15.

³⁹ *Id.* at 158, 188.

density of ship traffic within the distribution of right whales, ship strikes seem almost inevitable.”⁴⁰ But the Programmatic Biological Opinion does not estimate the number of whales that “might be exposed to vessel traffic independent of the number of individuals that might be exposed to seismic and HRG surveys.”⁴¹

On August 22, 2014, the Bureau published a *Science Notes* article written by Dr. Brown, purportedly to address public concerns about the effects of seismic airgun surveying in the Atlantic Ocean. Rather than honestly and objectively addressing these concerns, including concerns about the effects of seismic surveying on critically endangered North Atlantic right whales, the article focuses on the lack of conclusive evidence of population-level effects. And the article disavows the estimates from the PEIS, stating, “We expect survey operators to comply with our requirements and, if they do, seismic surveys should not cause any deaths or injuries to the hearing of marine mammal or sea turtles.”⁴² Thus, the article undermines the Bureau's and the Fisheries Service's anticipation that survey vessels could strike and kill marine mammals. The article also undermines the Bureau's own estimates that, without mitigation, sound from seismic surveying could result in a large number of takes of marine mammals, comprised of up to 138,000 injuries to marine mammals, including up to nine injuries to right whales, and up to 13.5 million behavioral disturbances to marine mammals, including up to 950 behavioral disturbances to right whales.⁴³

The article does not state any scientific basis for the claim that the mitigation measures would completely eliminate mortalities and injuries. Indeed, the article fails to cite any scientific study of the impacts of the mitigation measures. In contrast, comments from the public identified serious deficiencies in the mitigation measures which might keep them from being effective.⁴⁴ The article does not acknowledge these concerns.

⁴⁰ *Id.* at 158.

⁴¹ *See, e.g., id.* at 272 (“We did not estimate the number of blue whales that might be exposed to vessel traffic independent of the number of individuals that might be exposed to seismic and HRG surveys because the data we would have needed to support those analyses were not available.”); *id.* at 275 (same for fin whales); *id.* at 277 (same for humpback whales); *id.* at 280 (same for North Atlantic right whales); *id.* at 283 (same for sei whales).

⁴² *Science Notes* 1, *supra* note 3.

⁴³ BOEM, *supra* note 10, at tbls. 42, 44; *see also* note 10.

⁴⁴ *See, e.g.,* Comment from Dr. Timothy J. Ragen, Executive Director of the Marine Mammal Commission, to Gary D. Goeke, BOEM, July 2, 2012; Comment from Michael Stocker, Director of Ocean Conservation Research, to Gary D. Goeke, BOEM, June 14, 2012; Comment from Michael Jasny et al., to Gary D. Goeke, BOEM (July 2, 2012); Comment from Eric A. Bilsky et al., to Gary D. Goeke, BOEM (May 7, 2014).

On September 25, 2014, Oceana staff met with Bureau officials, including Dr. Brown, to discuss the pending seismic exploration applications for surveying in the Atlantic Ocean. At this meeting, Oceana voiced its concerns about the *Science Notes* article and asked the Bureau to remove the article from its website.

On March 5, 2015, seventy-five leading marine scientists, including Dr. Andy J. Read, Stephen Toth Professor of Marine Biology for Duke University, and Dr. Chris Clark, Senior Scientist for Cornell University's Bioacoustic Research Program, submitted a letter expressing concern that Atlantic seismic surveys could compromise the health and habitat of marine mammals, fish, and marine invertebrates.⁴⁵ The scientists wrote that seismic surveying is likely to have "significant, long-lasting and widespread impacts on the reproduction and survival of fish and marine mammal *populations* in the region."⁴⁶ In their letter, the scientists maintain, "Opening the U.S. east coast to seismic airgun exploration poses an unacceptable risk of serious harm to marine life *at the species and population levels*, the full extent of which will not be understood until long after the harm occurs."⁴⁷

On March 9, 2015, the Bureau released an updated *Science Notes* article written by Dr. Brown, again purporting to address public concern over the effects of seismic surveying on marine mammals. Again, the article focuses on the lack of conclusive evidence of population-level effects. The article again undermines the Bureau's anticipation that surveying vessels could strike and kill marine mammals⁴⁸ and undermines the estimates in its PEIS of large numbers of injuries and behavioral disturbances, stating, "It is also important to understand that BOEM does not expect that 138,000 individual marine mammals, or anything close to that number, will have their hearing injured by air guns if seismic surveys are permitted on the Atlantic Outer Continental Shelf."⁴⁹ The article does not mention the scientists' letter which states that seismic surveying is likely to affect the reproduction and survival of marine mammal populations. Instead, the updated version incorporates and quotes the previous *Science Notes* article, stating, "To date, there has been no documented scientific evidence of noise from air guns used in geological and geophysical (G&G) seismic activities adversely affecting animal populations."⁵⁰

⁴⁴ NMFS, *North Atlantic Right Whale: Western Atlantic Stock* (Dec. 2012), available at <http://www.nmfs.noaa.gov/pr/pdfs/sars/ao2012whnr-w.pdf>.

⁴⁵ Scientists' letter, *supra* note 5.

⁴⁶ *Id.* (emphasis added).

⁴⁷ *Id.* (emphasis added).

⁴⁸ BOEM, *supra* note 15, at 2-40 ("There is a potential risk that survey vessels could strike and injure or kill marine mammals.").

⁴⁹ *Science Notes 2*, *supra* note 3.

⁵⁰ *Id.*

One day later, Oceana staff again met with Bureau officials, including Dr. Brown, to discuss the pending seismic permit applications for the Atlantic Ocean, as well as the scientists' letter and the most recent version of the *Science Notes*. At this meeting, Oceana again voiced its concern about the *Science Notes* articles and requested that the agency withdraw the articles.

Meanwhile, seismic survey applicants and other supporters of offshore oil and natural gas exploration used the reasoning in the *Science Notes* articles to bolster their position. For example, Spectrum Geo, Inc.'s, application for federal consistency review in South Carolina stated, "[N]o mortalities or injuries of marine mammals or sea turtles are expected."⁵¹ GX Technology, Co.'s, application for federal consistency review in South Carolina similarly concluded, "GXT personnel have observed no negative effects to marine mammals, sea turtles, or fishes."⁵² CGG's application for federal consistency review in South Carolina stated there would be "minimal effects on marine mammals and sea turtles."⁵³ In TGS's application for federal consistency review in Georgia, the company concluded that there would only be minimal impacts through the duration of seismic surveys.⁵⁴ Perhaps the most egregious statement came from Ken Wells, the President of the International Association of Geophysical Contractors, at a North Carolina Department of Environment and Natural Resources meeting, where he said there would be "zero Level A takes for seismic surveys."⁵⁵

DETAILED DISCUSSION OF VIOLATIONS

Oceana and Ocean Conservation Research submit this Complaint alleging violations of the Department's Policy in two *Science Notes* articles published by the Bureau and written by Dr. Brown. The articles violate these standards in a number of ways, including the following:

1. The March 9, 2015, *Science Notes* article is misleading, incomplete, and inaccurate because when discussing the take estimates from the PEIS, it fails to disclose all relevant information and fails to clearly differentiate facts from personal opinions and professional judgment.

⁵¹ Spectrum Geo Inc., *Consistency Certification for Spectrum Geo Inc. Atlantic 2D Geophysical Survey to South Carolina Department of Natural Resources* (Jan. 2015).

⁵² GXT, *Coastal Zone Management Act Consistency Certification Necessary Data and Information* (Feb. 2015).

⁵³ CGG Services, Inc., *Certification of Consistency with the State of South Carolina Coastal Management Program 3* (Feb. 3015).

⁵⁴ TGS, *TGS Consistency Certification and Supporting Information; Georgia OCM1*, 7, 9, 18, 20, 30 (Feb. 2015).

⁵⁵ NC DENR Meeting with BOEM, February 4, 2015. Compare this statement with the PEIS, which estimates that there could be up to 138,000 Level A takes. BOEM, *supra* note 10, at tbls. 42, 44; *see also* note 10.

2. The March 9, 2015, *Science Notes* article is misleading when analyzing impacts because it emphasizes take estimates for an abundant species, the bottlenose dolphin, but fails to consider effects on vulnerable species, such as the North Atlantic right whale.
3. The March 9, 2015, *Science Notes* article is misleading because it ignores the scientists' letter, failing to disclose all relevant data and information.
4. Both *Science Notes* articles are misleading when arguing that there is no documented conclusive scientific evidence of noise from seismic activities adversely affecting animal populations.

A. The March 9, 2015, *Science Notes* Article Violates the Department's Policy by Inaccurately Discussing the Findings of the PEIS.

The March 9, 2015, *Science Notes* article violates the Department's Policy through its misleading, inaccurate, and incomplete discussion of the take estimates from the PEIS, failing to disclose all relevant information and failing to clearly differentiate facts from personal opinions and professional judgment. The Department's Policy requires clear, honest, objective, thorough, and accurate communications of the results of scientific activities; requires differentiation among facts, personal opinions, hypotheses, and professional judgment; and requires the full disclosure of the scientific methodology used, all relevant data and information, and the procedures for identifying and excluding faulty data except where protected by law.⁵⁶ Here, the article violates these policies by undermining the models presented in the PEIS. The PEIS uses two models to estimate takes, but the Bureau did not choose between the models. Because the species affected are protected under the Endangered Species Act and the Marine Mammal Protection Act, and the agency must give the "benefit of the doubt"⁵⁷ to protected species, it is appropriate to rely on the more protective model, which estimates that, without mitigation, seismic activity could result in up to 138,000 marine mammal injuries and up to 13.5 million behavioral disturbances to marine mammals.⁵⁸ Rather than relying on the only analysis that the Bureau has conducted to evaluate marine mammal takes, the March 9, 2015, article states, "It is also important to understand that [the Bureau] *does not expect* that 138,000 individual marine mammals, *or anything close to that number*, will have their hearing injured by air guns if seismic surveys are permitted on the Atlantic Outer Continental Shelf."⁵⁹ The analysis in the PEIS is the only study that the Bureau has conducted to evaluate the effects of sound from seismic surveying on threatened and

⁵⁶ Department's Policy, *supra* note 2, at 11.

⁵⁷ See, e.g., *Miccosukee Tribe of Indians of Fla.*, 566 F.3d at 1267.

⁵⁸ See BOEM, *supra* note 10, at tbls. 42, 44; see also note 10.

⁵⁹ *Science Notes 2*, *supra* note 3 (emphasis added).

endangered species, including marine mammals. The Bureau failed to conduct any studies estimating the degree to which mitigation measures would reduce the takes estimated by the PEIS models. The PEIS includes the only estimates that the public and the Bureau can rely upon to make conclusions about the effects airguns would have on marine mammals. Therefore, the March 9, 2015, *Science Notes* article violates the Department's Policy because it is misleading, inaccurately and incompletely discussing the results of the PEIS, not clearly differentiating among facts, personal opinions, assumptions, and professional judgment, and not fully disclosing all relevant data and information.

B. The March 9, 2015, *Science Notes* Article Violates the Department's Policy by Focusing on Impacts to Abundant Bottlenose Dolphins, Ignoring Impacts to Vulnerable Species.

The March 9, 2015, *Science Notes* article violates the Department's Policy through its misleading, inaccurate, and incomplete analysis of impacts due to its emphasis on takes of an abundant species, the bottlenose dolphin, and its failure to address relevant data and information about effects on vulnerable species, such as the North Atlantic right whale. The Department's Policy requires clear, honest, objective, thorough, and accurate communications of the results of scientific activities and requires the full disclosure of relevant data and information.⁶⁰ Here, the March 9, 2015, article fails to comply with both of these requirements.

Marine mammals with depleted populations are in particular danger of suffering population-level effects from seismic airguns. The North Atlantic right whale (*Eubalaena glacialis*) has a minimum population estimate of 455 individuals remaining.⁶¹ There are only about 100–150 breeding-age females left.⁶² As the Fisheries Service has repeatedly stated, “the loss of even a single individual [North Atlantic right whale] may contribute to the extinction of the species.”⁶³ The Fisheries Service's 2013 and draft 2015 stock assessments for North Atlantic right whales provide a Potential Biological Removal rate of 0.9.⁶⁴ Potential Biological Removal is “the *maximum number* of animals, not including natural mortalities, *that may be removed* from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable

⁶⁰ Department Policy, *supra* note 2, at 9–10.

⁶¹ NMFS, *supra* note 44.

⁶² *Id.*

⁶³ See 69 Fed. Reg. 30,857, 30,858 (June 1, 2004); see also 73 Fed. Reg. 60,173, 60,173 (Oct. 10, 2008); 72 Fed. Reg. 34,632, 34,632 (June 25, 2007); 66 Fed. Reg. 50,390, 50,392 (Oct. 3, 2001).

⁶⁴ NMFS, 2013 Stock Assessment, *supra* note 18, at 10; NMFS, Draft 2015 Stock Assessment, *supra* note 18, at 8.

population.”⁶⁵ In other words, *even one* North Atlantic right whale death caused by humans would have adverse population-level effects and jeopardize the survivability of the entire population. Current activities kill a minimum of 4.75 right whales each year, including 3.85 deaths from fishery entanglement and 0.9 deaths from ship strikes.⁶⁶ In the face of this evidence, the Bureau estimates that, without mitigation, sound from seismic activity could cause *up to nine* injuries to critically endangered North Atlantic right whales.⁶⁷ And as noted above,⁶⁸ this estimate does not include injuries or deaths from non-acoustic sources, even though the Bureau anticipates marine mammal deaths from ship strikes.⁶⁹ This anticipation is troubling because right whales are particularly susceptible to being struck by vessels.⁷⁰ As the Fisheries Service explains in its Programmatic Biological Opinion, “When the vulnerability of right whales to ship strikes is combined with the density of ship traffic within the distribution of right whales, ship strikes seem almost inevitable.”⁷¹ Thus, based on the information from the PEIS and the Programmatic Biological Opinion, it is reasonable to predict that seismic surveying vessels could strike and injure or kill at least one right whale. The PEIS also anticipates up to 950 behavioral disturbances—a number of disturbances more than twice the number of individuals in the population.⁷² As discussed below⁷³ and in the scientists’ letter,⁷⁴ behavioral disturbances can have significant effects on marine mammal species and populations.

Instead of addressing the troubling risk to vulnerable species, such as the right whale, the March 9, 2015, *Science Notes* article focuses on effects of sound from seismic surveying on an abundant species, stating, “[T]he highest numbers estimated for a particular species are those for the bottlenose dolphin, as noted above, and in its case the PEIS estimated potential for Level A takings of up to 11,748 individual bottlenose dolphins a year from air gun surveys and potential for up to 1,151,442 Level B takings.”⁷⁵ The article completely ignores the most dangerous implications of airgun use in the Atlantic Ocean, the potential effects on vulnerable marine

⁶⁵ NMFS, *Protected Resources Glossary*, available at <http://www.nmfs.noaa.gov/pr/glossary.htm#p> (last visited Apr. 14, 2015) (emphasis added).

⁶⁶ Waring et al., *Draft Marine Mammal Stock Assessment Reports* (2014), available at http://www.nmfs.noaa.gov/pr/sars/pdf/atl2014_draft.pdf.

⁶⁷ BOEM, *supra* note 10, at tbls. 42, 44; *see also* note 10.

⁶⁸ *See supra* page 3.

⁶⁹ BOEM, *supra* note 15, at 2-40 (“There is a potential risk that survey vessels could strike and injure or kill marine mammals.”).

⁷⁰ NMFS, *Recovery Plan for the North Atlantic Right Whale IG-1* (August 2004).

⁷¹ NMFS, *supra* note 15, at 158.

⁷² BOEM, *supra* note 10, at tbls. 42, 44; *see also* note 10.

⁷³ *See infra* pages 16–19.

⁷⁴ Scientists’ Letter, *supra* note 5.

⁷⁵ *Science Notes 2*, *supra* note 3.

mammal populations, such as the North Atlantic right whale, which has been the subject of public comments.⁷⁶ Rather than discussing this relevant information, the article draws the public's attention away from the species with the most serious threat of population-level effects, instead focusing on a more abundant species.

Thus, by neglecting to discuss vulnerable species, such as the right whale, the March 9, 2015, *Science Notes* article is misleading, fails to honestly, objectively, thoroughly, and accurately discuss the effects of seismic surveying, and fails to disclose relevant data and information.

C. The March 9, 2015, *Science Notes* Article Violates the Department's Policy by Ignoring the Scientists' Letter.

The March 9, 2015, *Science Notes* article violates the Department's Policy by deceptively ignoring the letter from seventy-five leading scientists that expressed concern that Atlantic seismic surveys could compromise the health and habitat of marine mammal, fish, and marine invertebrate populations.⁷⁷ The Department's Policy requires clear, honest, objective, thorough, and accurate communications of the results of scientific activities; and requires the full disclosure of all relevant data and information.⁷⁸ The scientists' letter argues that seismic surveying would likely have "significant, long-lasting and widespread impacts on the reproduction and survival of fish and marine mammal *populations* in the region."⁷⁹ The scientists explain that the Bureau's conclusion that seismic surveying would have negligible effects on marine species populations "is not supported by the best available science."⁸⁰ In their letter, the scientists maintain, "Opening the U.S. east coast to seismic airgun exploration poses an unacceptable risk of serious harm to marine life *at the species and population levels*, the full extent of which will not be understood until long after the harm occurs."⁸¹ But, the article neither mentions nor addresses the arguments from the scientists' letter. The article simply states, "To date, there has been no documented scientific evidence of noise from air guns used in geological and geophysical (G&G) seismic activities adversely affecting animal populations."⁸² It is misleading that the

⁷⁶ See, e.g., Comment from Dr. Timothy J. Ragen, Executive Director of the Marine Mammal Commission, to Gary D. Goeke, BOEM, July 2, 2012; Comment from Michael Stocker, Director of Ocean Conservation Research, to Gary D. Goeke, BOEM, June 14, 2012; Comment from Michael Jasny et al., to Gary D. Goeke, BOEM, July 2, 2012; Comment from Eric A. Bilsky et al., to Gary D. Goeke, BOEM, May 7, 2014.

⁷⁷ Scientists' Letter, *supra* note 5.

⁷⁸ Department's Policy, *supra* note 2, at 11.

⁷⁹ Scientists' Letter, *supra* note 5 (emphasis added).

⁸⁰ *Id.*

⁸¹ *Id.* (emphasis added).

⁸² *Id.*

article provides this conclusion without addressing seventy-five scientists' statement that seismic surveying would likely affect fish and marine mammal populations. Therefore, the March 9, 2015, *Science Notes* article violates the Department's Policy through its misleading omission of relevant information and its inaccurate and incomplete communication of the results of scientific activities.

D. Both *Science Notes* Articles Violate the Department's Policy When Arguing that There Is No Conclusive Scientific Evidence of Noise from Seismic Activities Adversely Affecting Animal Populations.

Both *Science Notes* articles violate the Department's Policy through their misleading and incomplete argument that "[t]o date, there has been no documented scientific evidence of noise from air guns used in geologic and geophysical (G&G) seismic activities adversely affecting animal populations."⁸³ The Department's Policy requires clear, honest, objective, thorough, and accurate communications of the results of scientific activities; and requires the full disclosure of the scientific methodology used, all relevant data and information, and the procedures for identifying and excluding faulty data except where protected by law.⁸⁴ The articles violate these requirements in a number of ways. First, the *Science Notes* articles do not disclose that there are no population-level studies of seismic surveying airguns on marine mammals. Second, both articles inaccurately focus on population-level effects caused by marine mammal injuries and deaths, rather than the population-level effects resulting from behavioral disturbances. Third, the *Science Notes* articles do not explain that there has been no analysis of cumulative effects of seismic surveying on populations. Finally, both articles ignore evidence, including the vulnerability of certain marine mammal populations like the North Atlantic right whale, that suggests there would be population-level effects on marine mammals. Thus, the *Science Notes* articles violate the Department's Policy by failing to honestly, objectively, thoroughly, and accurately communicate the results of scientific activities and failing to disclose relevant data and information.

First, the *Science Notes* articles violate the Department's Policy by failing to mention the lack of scientific studies analyzing the population-level effects of seismic surveys on marine mammals. The articles' main argument is that there is no conclusive scientific evidence of effects from seismic surveying on animal populations. However, the articles do not explain that no population-level studies⁸⁵ analyzing the effects of seismic surveying on marine mammal

⁸³ *Science Notes* 1, *supra* note 3; *Science Notes* 2, *supra* note 3.

⁸⁴ Department's Policy, *supra* note 2, at 9–11.

⁸⁵ The March 9, 2015, article argues that the Bureau "has invested over \$50 million on protected species and noise-related research including marine mammals." *Science Notes* 2, *supra* note 3. This statement implies that there has been intensive study of the effects of underwater noise on

populations exist. Given the absence of population-level studies, one would not expect to find scientific evidence of population-level effects from seismic surveying. The author surely recognized this fact, but did not acknowledge it in the articles. Further, the articles do not explain that no studies find no population-level effects from the sound impacts of seismic surveying. In failing to disclose these facts, while also concluding that the Bureau does not expect population-level effects from airguns, the articles are misleading and fail to fully discuss all relevant data and information.

Second, both articles focus on the population-level effects caused by individual injuries and deaths, ignoring the potential population-level effects caused by the massive number of anticipated behavioral disturbances to marine mammals. As the scientists' letter explains, "[T]he magnitude of the proposed seismic activity is likely to have significant, long-lasting, and widespread impacts on the reproduction and survival of fish and marine mammal *populations* in the region, including the critically endangered North Atlantic right whale."⁸⁶ The PEIS anticipates up to 13.5 million behavioral disturbances to marine mammals.⁸⁷ And, in their letter, the scientists state that "there are good reasons to consider this number a significant underestimate."⁸⁸ The PEIS also anticipates up to 950 behavioral disturbances to right whales—a number of disturbances more than twice the number of individuals in the population.⁸⁹ Simply looking at the considerable number of predicted behavioral disturbances, it is reasonable to conclude that the disturbances could cause population-level effects.

One significant effect of sound from seismic surveys is "masking"—that is, where one sound affects the perception of another sound. Even though the March 9, 2015, article concedes, "We know from studies by BOEM and others that marine mammals can react to sound, sometimes moving away and sometimes changing their vocalizations. One prominent concern is whether anthropogenic sounds may 'mask' communications between some marine mammals,"⁹⁰ this statement does not convey the potentially life-threatening implications of masking. Collective noise pollution from many sources interferes with marine mammals' ability to recognize or detect important sounds, a trait necessary for foraging, avoiding predators, and communication. For highly social and vocal creatures, such as marine mammals, communication between

marine mammals. However, the Bureau spent this money over an eighteen-year period. And, the article does not describe any of the studies that the Bureau funded. Thus, this statement misleads the public into believing that relevant studies exist that found no effects from sound from seismic surveying on marine mammal populations.

⁸⁶ Scientists' Letter, *supra* note 5.

⁸⁷ BOEM, *supra* note 10, at tbls. 42, 44; *see also* note 10.

⁸⁸ Scientists' Letter, *supra* note 5.

⁸⁹ BOEM, *supra* note 10, at tbls. 42, 44; *see also* note 10.

⁹⁰ *Science Notes 2*, *supra* note 3.

individuals is necessary for survival. Baleen whales' hearing and vocalizations occur at low frequencies, and in the presence of both continuous and non-continuous low frequency noise pollution, their communication signals are more susceptible to acoustic masking.⁹¹ One study analyzing how sound from airguns influence marine mammal masking demonstrated that "airgun sounds can lead to a significant loss in communication range for blue and fin whales."⁹² Another study found, "Acoustic masking from anthropogenic sound sources is recognized as a threat to marine mammals, particularly low-frequency specialists such as the baleen whales, . . . [and] rais[es] concerns that noise chronically influences the life histories of individuals and populations."⁹³ These studies highlight some of the many consequences that interferences with marine mammal communications can have on species and populations. The *Science Notes* articles ignore these studies, generating a misleading, inaccurate, and incomplete discussion of the effects of masking from seismic surveying on marine mammal individuals and populations.

Further, the article omits any discussion of how seismic surveying could disrupt other significant behaviors, including foraging, feeding, conspecific bonding, and migration. Even what the Marine Mammal Protection Act classifies as Level B Harassment, or behavioral disturbance,⁹⁴ can have significant effects on marine mammals, sometimes causing death.⁹⁵ For example, a

⁹¹ C.W. Clark et al., *Acoustic Masking in Marine Ecosystems: Intuitions, Analysis, and Implication*, 395 *Marine Ecology Progress Series* 201, 201–222 (2009).

⁹² Ursula Siebert et al., *Assessment of Potential for Masking in Marine Mammals of the Antarctic Exposed to Underwater Sound from Airguns* (2014).

⁹³ C.W. Clark et al., *Acoustic Masking in Marine Ecosystems as a Function of Anthropogenic Sound Sources* (2009).

⁹⁴ The Marine Mammal Protection Act defines Level B Harassment as 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 but which does not have the potential to injure a marine mammal or marine mammal stock in the wild." 16 U.S.C. § 1362; see 50 C.F.R. § 216.3.

⁹⁵ For example, a 2008 stranding of approximately one hundred melon-headed whales (*Peponocephala electra*) in the Loza Lagoon system off of Madagascar resulted in at least seventy-five mortalities. Brandon Southall et. al, *Final Report of the Independent Scientific Review Panel Investigating the Potential Contributing Factors to a 2008 Mass Stranding of Melon-headed Whales (Peponocephala electra) in Antsohihy, Madagascar* (2013), available at <https://iwc.int/private/downloads/4b0mkc030sg0gogkg8kog4o4w/Madagascar%20ISRP%20FINAL%20REPORT.pdf>. One behavioral disturbance, the whales' relocation to avoid the sound, caused the mass stranding and mass deaths. *Id.* The "[m]ost plausible and likely initial behavioral trigger for animals stranding and entering lagoon system" was an intense acoustic event caused by sound from another technology for oil and gas exploration, a multibeam echosounder system. *Id.* at 51. This example shows that even one behavioral disturbance can have significant, and sometimes deadly, effects.

number of studies found serious effects from behavioral disturbances which, depending on other impacts and the vulnerability of the particular population, should be taken seriously, but were not addressed in any way in the *Science Notes* articles:

- One study indicated that seismic surveys taking place for only eleven days in the Mediterranean Sea caused behavioral modifications for fin whales (*Balaenoptera physalus*).⁹⁶ During the seismic surveys, scientists found a sharp decline in the number of detected and received fin whale song notes, which demonstrates that fin whale singers moved away from the seismic airgun source and were rarely detected again until fourteen days after the end of the seismic survey.⁹⁷ The study's results reveal that fin whale songs changed to compensate for the masking effects of increased background noise from airguns, which cost the animals energy.⁹⁸ Relocating and potential decreased reproductive and foraging opportunities also cost the animals energy.⁹⁹ The studied seismic survey consisted of one relatively small array with only nine airguns, a total capacity of 1395 cubic inches at 120 μ Bar, that lasted only eleven days.¹⁰⁰ Given that the proposed surveys in the Atlantic Ocean will be much larger¹⁰¹ and running concurrently with other surveys, it stands to reason that the Atlantic survey plans could create significant acoustic obstacles for North Atlantic right whales and any other baleen whales that would be feeding, migrating, or otherwise inhabiting the surveying area.
- Another study analyzing effects of seismic activities on humpback whales off the coast of Angola found potentially damaging effects on the whales.¹⁰² As the level of seismic survey pulses increased, the number of humpback whale singers significantly decreased, which is particularly troubling because humpback whales use songs for breeding displays, and the songs play a very important role in breeding strategy.¹⁰³ The study suggested that a disruption of this breeding display or displacement of breeding males

⁹⁶ M. Castellote et al., *Acoustic and Behavioural Changes in Fin Whales (Balaenoptera physalus) in Response to Shipping and Airgun Noise*, 147 *Biological Conservation* 115, 115–22 (2012).

⁹⁷ *Id.*

⁹⁸ *Id.*

⁹⁹ *Id.*

¹⁰⁰ *Id.*

¹⁰¹ *E.g.*, TGS with 4,808 cubic inches main array of 40 airguns and a 1202 cubic inches array of 4 airguns operating at 2,000 psi; ION GeoVentures with 6,420 cubic inches main array of 36 airguns and a 1605 cubic inches subarray of 4 airguns operating at 2,000 psi; Spectrum Geo with 4,920 cubic inches main array of 32 airguns operating at 2,000 psi.

¹⁰² S. Cerchio et al., *Seismic Surveys Negatively Affect Humpback Whale Singing Activity off Northern Angola*, 9 *PLoS ONE* e86464 (2014).

¹⁰³ *Id.*

could have significant adverse impacts on individual males by adversely affecting their chances to breed.¹⁰⁴ The study found that ultimately “this could translate into adverse impacts at the population level.”¹⁰⁵

Given these studies, the *Science Notes* articles' characterization of marine mammal effects from sound is misleading, incomplete, and inaccurate because there is good reason to believe that behavioral disturbances from seismic surveying would have population-level effects on marine mammals.

Third, the *Science Notes* articles do not fully disclose all relevant data and information because they do not explain that the PEIS only analyzed effects from individual seismic surveys, without consideration of other concurrent anthropogenic sound sources that are major marine noise sources, including shipping, concurrent geophysical and geological seismic surveys in overlapping areas, seismic surveys conducted for scientific research purposes, and various military activities.¹⁰⁶ Each sound source can have unique and profound impacts and, when analyzed cumulatively, pose serious harm to marine life and habitat. For example, vessel traffic is the predominant source of human-generated noise in the coastal waters of the eastern United States, creating loud and far-reaching sounds that can harm a variety of marine species.¹⁰⁷ Several species of marine mammals demonstrate behavioral and physiological changes due to increased background noise.¹⁰⁸

Further, the Bureau's proposed seismic surveying activity would not be the only seismic survey occurring in the Mid- and South Atlantic region. For instance, the U.S. Geological Survey conducted seismic surveys from August to September 2014, and will perform surveys April to

¹⁰⁴ *Id.*

¹⁰⁵ *Id.* at 9.

¹⁰⁶ M.P. Simmonds et al., *Marine Noise Pollution—Increasing Recognition but Need for More Practical Action*, 9 J. Ocean Technology 71, 71–90 (2014).

¹⁰⁷ L. Hatch et al., *Characterizing the Relative Contributions of Large Vessels to Total Ocean Noise Fields: A Case Study using the Gerry E. Studds Stellwagen Bank National Marine Sanctuary*, 42 *Envtl. Mgmt.* 735, 735–52 (2008).

¹⁰⁸ See, e.g., S.E. Parks et al., *Short- and Long-term Changes in Right Whale Calling Behavior: The Potential Effects of Noise on Acoustic Communication* (2007); R.M. Rolland et al., *Evidence that Ship Noise Increases Stress in Right Whales*, 279 *Proceedings of the Royal Society Biological Sciences* 2363, 2363–68 (2012); C.W. Clark et al., *Acoustic Masking in Marine Ecosystems: Intuitions, Analysis, and Implication*, 395 *Marine Ecology Progress Series* 201, 201–22 (2009); R.M. Rolland et al., *Evidence that Ship Noise Increases Stress in Right Whales*, 279 *Proceedings of the Royal Society Biological Sciences* 2363, 2363–68 (2012).

August 2015.¹⁰⁹ The Fisheries Service estimated that these activities could cause up to 19,428 disruptions of marine mammal behavior, “including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering.”¹¹⁰

Naval sonar activities in the Atlantic Ocean may also cause significant harm to marine life.¹¹¹ There are multiple naval sonar activities in the Atlantic Ocean. For example, the U.S. Navy conducts training activities off the East Coast that could lead to “sonar, underwater detonations, and ship strike[s]” which “are the stressors most likely to result in impacts on marine mammals.”¹¹² The Fisheries Service estimates that this Navy sonar activity could cause up to eleven mortalities of small *Odontoceti*, up to 375 marine mammal injuries, and up to 2.4 million marine mammal behavioral disturbances.¹¹³ The U.S. Marine Corps also operates training exercises at the Marine Corps Air Station Cherry Point Range Complex located within Pamlico Sound, North Carolina, which could cause behavioral disturbances for 1,615 and injure 165 Atlantic bottlenose dolphins.¹¹⁴

¹⁰⁹ NMFS, Takes of Marine Mammals Incidental to Specified Activities; Taking Marine Mammals Incidental to a Marine Geophysical Survey in the Atlantic Ocean Off the Eastern Seaboard, August to September 2014 and April to August 2015, 79 Fed. Reg. 52,122 (Sept. 2, 2014).

¹¹⁰ *Id.* at 52,157, 52,159–60 (Sept. 2, 2014). The Incidental Harassment Authorization for the U.S. Geological Survey's seismic activities unfortunately does not provide a cumulative number of marine mammal harassments. Oceana computed the total number by imputing the data from the Authorization into an Excel spreadsheet and summing the numbers. *See* attached Exhibit 10.

¹¹¹ *See, e.g.*, E.C.M. Parsons et al., *Navy Sonar and Cetaceans: Just How Much Does the Gun Need to Smoke Before We Act?*, 56 *Marine Pollution Bulletin* 1248, 1248–57 (2008); M.P. Simmonds & L.F. Lopez-Jurado, *Whales and the Military*, 351 *Nature* 448 (1991); P. Van Bree & I. Kristensen, *On the Intriguing Stranding of Four Cuvier's Beaked Whales*, *Ziphius cavirostris* G. Cuvier, 1823, *on the Lesser Antillean Island of Bonaire*, 44 *Bijdragen tot de Dierkunde* 235, 235–38 (1974); A. Frantzis, *Does Acoustic Testing Strand Whales?*, 392 *Nature* 29, 29 (1998); K.C. Balcomb III & D.E. Claridge, *A Mass Stranding of Cetaceans Caused by Naval Sonar in the Bahamas*, 8 *Bahamas J. Science* 2, 2–12 (2001); A. Fernández et al., *Whales: No Mass Strandings Since Sonar Ban*, 497 *Nature* 317, 317 (2013); International Whaling Commission, *Report of the Scientific Committee*, 6 *J. Cetacean Res. Manage.*(Suppl.) 1, 1–60 (2004); International Whaling Commission, *Report of the Scientific Committee* (2014).

¹¹² NMFS, Takes of Marine Mammals Incidental to Specified Activities; U.S. Navy Training and Testing Activities in the Atlantic Fleet Training and Testing Study Area, 78 Fed. Reg. 73,009, 73,011 (Dec. 4, 2013), *available at* <https://www.federalregister.gov/articles/2013/12/04/2013-27846/takes-of-marine-mammals-incident-to-specified-activities-us-navy-training-and-testing-activities>.

¹¹³ *Id.* at 73,052.

¹¹⁴ NMFS, *Letter of Authorization Taking Marine Mammals Incidental to U.S. Marine Corps Training Exercises at Brant Island Bombing Target and Piney Island Bombing Range, USMC*

The *Science Notes* articles do not account for these sound sources and their ability to create additional cumulative effects, which could lead to additional pressures on marine mammal species and populations. The Bureau's PEIS does not include a sufficient analysis of cumulative impacts, which renders its analysis incomplete and inaccurate. The discussion in the *Science Note* articles lacks sufficient analysis of the array of acoustic activities that can harm marine life, specifically marine mammals, and thus fails to fully disclose all relevant data and information.

Finally, both articles ignore the extreme vulnerability of certain marine mammal populations, particularly the North Atlantic right whale. As explained above, the North Atlantic right whale is critically endangered, and the death of *one* right whale from human activity could put the population at risk.¹¹⁵ However, current activities kill a minimum of 4.75 right whales each year, including 3.85 deaths from fishery entanglement and 0.9 deaths from ship strikes.¹¹⁶ The Programmatic Biological Opinion concedes, "When the vulnerability of right whales to ship strikes is combined with the density of ship traffic within the distribution of right whales, ship strikes seem almost *inevitable*."¹¹⁷ As noted above,¹¹⁸ in the PEIS, the Bureau anticipates marine mammal deaths from ship strikes,¹¹⁹ but provides take estimates only for injuries and behavioral disturbances caused by sound from seismic surveying.¹²⁰ The Bureau estimates that, without mitigation, sound from seismic activity could cause *up to nine* injuries to critically endangered North Atlantic right whales.¹²¹ Moreover, the PEIS anticipates *up to 950* behavioral disturbances caused by sound from seismic surveying—a number of disturbances more than twice the number of individuals in the population.¹²² As explained above,¹²³ behavioral disturbances can cause significant harm to marine mammals. Because of the extreme vulnerability of the right whale population, if seismic surveying activities cause even one right whale death, then the entire population could be jeopardized.

Cherry Point Range Complex, North Carolina (March 2015), available at http://www.nmfs.noaa.gov/pr/permits/incidental/military/usmc_pamlico_loa_signed.pdf.

¹¹⁵ NMFS, *supra* note 44.

¹¹⁶ Waring et al., *supra* note 66.

¹¹⁷ NMFS, *supra* note 15, at 158 (emphasis added).

¹¹⁸ *See supra* pages 3.

¹¹⁹ BOEM, *supra* note 15, at 2-40 ("There is a potential risk that survey vessels could strike and injure or kill marine mammals.").

¹²⁰ BOEM, *supra* note 14.

¹²¹ *See* BOEM, *supra* note 10, at tbls. 42, 44; *see also* note 10.

¹²² BOEM, *supra* note 10, at tbls. 42, 44; *see also* note 10.

¹²³ *See supra* pages 16–19.

Therefore, the *Science Notes* articles violate the Department's Policy by failing to honestly, objectively, thoroughly, and accurately communicate the results of scientific activities and by failing to disclose all relevant data and information.

CONCLUSION

The March 9, 2015, and the August 22, 2014, *Science Notes* articles violate three major pillars of the Department's Policy through their misleading, incomplete, and inaccurate communications about scientific activities, through their failure to differentiate among facts, assumptions, opinions, and professional judgments, and through their omission of relevant data and information. In particular, the *Science Notes* articles violate these standards in the following ways:

1. The March 9, 2015, *Science Notes* article is misleading, incomplete, and inaccurate because when discussing the take estimates from the PEIS, it fails to disclose all relevant information and fails to clearly differentiate facts from personal opinions and professional judgment.
2. The March 9, 2015, *Science Notes* article is misleading when analyzing impacts because it emphasizes take estimates for an abundant species, the bottlenose dolphin, but fails to consider effects on vulnerable species, such as the North Atlantic right whale.
3. The March 9, 2015, *Science Notes* article is misleading because it ignores the scientists' letter, failing to disclose all relevant data and information.
4. Both *Science Notes* articles are misleading when arguing that there is no documented conclusive scientific evidence of noise from seismic activities adversely affecting animal populations.

To comply with the Department's Policy, the Bureau must withdraw the August 22, 2014, and March 9, 2015, *Science Notes* articles and issue a statement explaining its rationale. The Bureau must inform states reviewing geological and geophysical permit applications under the Coastal Zone Management Act that the agency is withdrawing the *Science Notes* articles and provide the reasons that the agency is withdrawing the articles. The agency must inform applicants for

Complaint of Violations of the U.S. Department of the Interior's Policy on the Integrity of
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seismic exploration permits that the Bureau is withdrawing the *Science Notes* articles and instruct them not to quote information from the articles in any applications, public materials, or documents produced. The Bureau must transmit to Oceana and Ocean Conservation Research copies of the letters informing the states and the seismic exploration applicants. And the agency must take any other necessary steps to correct the misimpressions created by the *Science Notes* articles.

Respectfully submitted,

Claire Douglass
Campaign Director: Climate and Energy
Oceana, Inc.

Michael Stocker
Director
Ocean Conservation Research

EXHIBIT 1



Applied science for informed decision making

March 9, 2015

Dear Reader:

In August 2014, BOEM published a *Science Note* addressing a few fundamentals about impacts of seismic air gun surveys on marine mammal populations. The surveys are used to characterize sub-seabed geology, including oil and gas resources but are also used for our marine minerals program and renewable energy. One sentence in the *Science Note* has generated some dialogue: "To date, there has been no documented scientific evidence of noise from air guns used in geological and geophysical (G&G) seismic activities adversely affecting animal populations."

BOEM's conclusion regarding the impact of these surveys is in stark contrast with public statements citing BOEM research and asserting that many thousands of marine mammals will be killed or injured through these surveys. For example, one web posting states that "Seismic air gun testing currently being proposed in the Atlantic will injure 138,000 whales and dolphins and disturb millions more, according to government estimates." This characterization of our conclusion, however, is not accurate; that is actually not what we estimate. I hope that providing background and discussion on BOEM's conclusion and the numbers may help those who follow this issue to understand our position. I'll begin with an overview of a few key legal terms.

Terms of the Marine Mammal Protection Act (MMPA)

Three MMPA terms are key to this conversation. First, a "take" of a marine mammal under the MMPA is defined as follows: "to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal." The MMPA defines the term "harassment" to mean

"[A]ny act of pursuit, torment, or annoyance which - (i) has the potential to injure a marine mammal or marine mammal stock in the wild [referred to in the MMPA as 'Level A harassment']; or (ii) has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering [referred to in the MMPA as 'Level B harassment']." MMPA Sec. 3 (18).

In other words, a "take" can mean an act that kills or injures a marine mammal, but it can also mean an act that does no more than have the potential to disturb a marine mammal.

Second, it is important to recognize that the MMPA prohibits the take of marine mammals as a result of permitted activities - referred to in the statute as "incidental take" -- unless that take will have no more than "negligible impact." In particular, section 101 (5) of the MMPA prohibits incidental "taking" of a marine mammal, including Level A and Level B harassment, unless the Secretary of Commerce, acting through the National Oceanic and Atmospheric Administration (NOAA), determines that the taking will have no more than "negligible impact" on the species or stocks affected. NOAA regulations define negligible impact to mean "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." By definition, then, the impact analysis is measured on the "species or stock," not on an individual animal.

Our bureau has stated publicly that it will not consider issuing any air gun seismic survey permits in the Atlantic unless applicants have first obtained an MMPA authorization from NOAA, including the required finding of no adverse effect on marine mammal species or stocks.

"Optimum sustainable population" or OSP is a third key MMPA concept. Obtaining optimum sustainable populations is a stated goal of the MMPA, and OSP is defined by the statute to mean, "with respect to any population stock, the number of animals which will result in the maximum productivity of the population or the species, keeping in mind the carrying capacity of the habitat and the health of the ecosystem of which they form a constituent element." OSP is about populations, not individuals.

No Documented Scientific Evidence of Adverse Effects on Population Sustainability



With these three terms in mind, it is critically important to understand that BOEM's conclusion in our August 2014 *Science Note*, and its *Programmatic Environmental Impact Statement (PEIS)*, refers to effects on population sustainability, rather than effects on individual animals. We know from studies by BOEM and others that marine mammals can react to sound, sometimes moving away and sometimes changing their vocalizations. One prominent concern is whether anthropogenic sounds may "mask" communications between some marine mammals. However, as BOEM concluded in the PEIS, and reiterated in the 2014 *Science Note*, potential links between these effects and the sustainability of species or stocks have not been demonstrated. For example, because of its abundance, the bottlenose dolphin heads the class in number of potential exposures to air gun sound levels with potential effects on behavior. Yet Federal stock assessments for the dolphin do not identify air gun seismic

surveys as adversely impacting stock sustainability in the Gulf of Mexico, where air gun surveys are routine.

It is also important to understand that BOEM does not expect that 138,000 individual marine mammals, or anything close to that number, will have their hearing injured by air guns if seismic surveys are permitted on the Atlantic Outer Continental Shelf. BOEM published numbers for potential air gun survey "takings" of marine mammals in its PEIS. The highest numbers estimated for a particular species are for the bottlenose dolphin, as noted above, and in its case the PEIS estimated potential for Level A takings of up to 11,748 individual bottlenose dolphins a year from air gun surveys and potential for up to 1,151,442 Level B takings. But the number of modeled "takes" in the PEIS is by design highly over-estimated to err on the side of protection, and it does not consider key mitigation measures that will be required to prevent "taking." One such requirement, for example, is that seismic survey vessels maintain "exclusion zones" around vessels whose boundaries are set to avoid any injury to marine mammal hearing. If a marine mammal enters the zone, or appears on a course to enter, trained observers call for immediate shut down of the air guns until the animals are clear of the area. Therefore, even those numbers included in the PEIS are far in excess of those takes we anticipate, given the mitigation measures that will be employed.

Need for More Research

A final point warrants mention. BOEM does not and should not assume that lack of evidence for adverse population-level effects of air gun surveys means that those effects may not occur. What we know is a function of the effort and intelligence put into evaluating effects as well as what is actually happening in nature. Since 1998, BOEM has invested over \$50 million on protected species and noise-related research, including marine mammals. We have also convened workshops for acoustic experts to help us identify questions for future research. But BOEM needs to keep looking -- hard and well -- for adverse effects of offshore oil and gas activities on the environment, including sound. And we have asked our environmental studies program to make this a priority.

I'll conclude by noting that BOEM's 2014 *Science Note* has been cited publicly by both industry and environmental NGOs alike in presenting their respective positions on seismic surveys. BOEM is responsible for providing environmental safeguards in development of offshore resources, and our *Science Note* was intended to help the public understand our thinking on that task. I hope this follow-on *Science Note* is a helpful explanation.

As always, your feedback is important to us, so please feel free to contact us.

Sincerely,

William Y. Brown

Chief Environmental Officer, Bureau of Ocean Energy Management

The Bureau of Ocean Energy Management (BOEM) promotes energy independence, environmental protection and economic development through responsible, science-based management of offshore conventional and renewable energy resources.

EXHIBIT 2



SCIENCE NOTES

Applied science for informed decision making

August 22, 2014

Dear Reader:

It has been just over a month since BOEM released a [Record of Decision](#) -- or ROD -- on the Mid- and South Atlantic Geological and Geophysical (G&G) Activities Programmatic Environmental Impact Statement, or PEIS for short. And there's been a lot of attention on both sides of this complex issue. I wanted to take some time to clear up a few misperceptions about the bureau's decision and what it means.

As a scientist who has spent a good part of my career working in non-governmental environmental organizations and in industry, I understand and appreciate advocacy. At the same time, I believe that everyone benefits by getting the facts right.

BOEM has the legal responsibility to protect marine species and ecosystems from harm by the energy exploration and development which we regulate, and that is a responsibility which I embrace without reservation. Since 1998, BOEM has partnered with academia and other experts to invest more than \$50 million on protected species and noise-related research. The bureau has provided critical studies on marine mammals, such as researching seismic survey impacts on sperm whales, and BOEM has conducted many expert stakeholder workshops to discuss and identify information needs on acoustic impacts in the ocean.

As noted below, the bureau's decision requires a set of protective measures that will be used in site-specific permits for any future G&G activities in the Atlantic. BOEM will conduct site-specific environmental reviews for any permit applications. These reviews will include coordination and consultation with federal, state and tribal authorities under a variety of additional statutory requirements. In particular, any "taking" of a marine mammal requires authorization from the National Oceanic and Atmospheric Administration, or NOAA, separately from BOEM, and that authorization requires NOAA to find that there is no more than "negligible impact" and no adverse effects on marine mammal species or stocks.

Below, please find our latest edition of *Science Notes* that I hope will help to clarify the facts on BOEM's recent decision and the science behind it. As always, your feedback is important to us, so please feel free to contact us at boempublicaffairs@boem.gov.

Sincerely,

William Y. Brown

Chief Environmental Officer, Bureau of Ocean Energy Management

The Science Behind the Decision

Answers to Frequently Asked Questions about the Atlantic Geological and Geophysical Activities Programmatic Environmental Impact Statement (PEIS)

Will air guns used in seismic surveys kill dolphins, whales and sea turtles and ruin coastal communities?

To date, there has been no documented scientific evidence of noise from air guns used in geological and geophysical (G&G) seismic activities adversely affecting marine animal populations or coastal communities. This technology has been used for more than 30 years around the world. It is still used in U.S. waters off of the Gulf of Mexico with no known detrimental impact to marine animal populations or to commercial fishing.



Bottlenose dolphin from the Atlantic AMAPPS study.

While there is no documented case of a marine mammal or sea turtle being killed by the sound from an air gun, it is possible that at some point where an air gun has been used, an animal could have been injured by getting too close. Make no mistake, airguns are powerful, and protections need to be in place to prevent harm. That is why mitigation measures -- like required distance between surveys and marine mammals and time and area closures for certain species -- are so critical.

Is it true that the air guns are 100,000 times louder than a jet, and if so, won't they kill or deafen marine life?

A large air gun is loud, although it is not 100,000 times louder than a jet. Measured comparably in decibels, an air gun is about as loud as one jet taking off. Scientists who specialize in acoustics confirm that sounds in water and sounds in air that have the same pressures have very different intensities (which is a measure of energy produced by the source) because the density of water is much greater than the density of air, and because the speed of sound in water is much greater than the speed of sound in air. For the same pressure, the higher density and higher speed make sound in water less intense than sound in air.

We do not know what a whale, dolphin, or turtle actually experiences when it hears an air gun. Many marine mammal species -- but not the baleen whales including North Atlantic right whales -- have reduced sensitivity to sound signals that are in the same frequency range as airplanes and air gun arrays. Some whales appear to move away from surveys, indicating that they probably don't like the noise, but bottlenose dolphins have often been observed swimming toward surveying vessels, and ride bow waves along the vessels.

Is it true that the government's own scientists expect 100,000 injuries or deaths of marine life if seismic surveys go forward?

This statement misrepresents the facts. When our scientists began to look at possible impacts of seismic surveys, they first looked at what might happen if no measures were taken to mitigate or avoid possible injury to marine mammals. Next they began to look at what could be

done to avoid harm, such as avoiding migration routes and stopping surveys if vessels get close enough to marine mammals to possibly injure their hearing.

After a thorough, public process, the Department selected a preferred alternative that included the most restrictive mitigation measures that would allow surveys to take place. We expect survey operators to comply with our requirements and, if they do, seismic surveys should not cause any deaths or injuries to the hearing of marine mammal or sea turtles.

Another source of confusion is about what a "take" is. As defined by Federal law, a "take" of a marine mammal, unsurprisingly, includes causing its death. However "take" also includes not only injury to hearing but also any disturbance to an animal that may disrupt its behavior. BOEM has published numbers of potential "takes," and the highest numbers are based on potential for behavioral effects, such as temporarily leaving survey areas. These behavioral effects have not been linked to negative impacts on populations. In fact, the same Federal law defining "take" of a marine mammal prohibits all taking unless the NOAA has determined that the taking will have no more than "negligible impact" and no adverse effects on marine mammal species or stocks.

BOEM cannot authorize air gun surveys which "take" marine mammals unless the surveys are also authorized by NOAA and meet this requirement. BOEM also consulted with both NOAA and the U.S. Fish and Wildlife Service under the Endangered Species Act to develop mitigations that would limit any potential impacts to endangered and threatened species, including baleen whales and sea turtles.

Does this decision mean that the federal government is opening the entire Atlantic coast up for offshore oil and gas drilling?

The decision to authorize G&G activities for all three program areas (oil and gas, renewable energy and marine minerals) does not authorize leasing for oil and gas exploration and development in the Atlantic. Those decisions will be addressed through the development of the next Five Year Program for oil and gas leasing. BOEM is at the beginning of the process to develop that program pursuant to the Outer Continental Shelf Lands Act. The planning process will take two-and-a-half to three years to complete and will offer many opportunities for the public to provide input.

Completion of the PEIS and BOEM's selection of the strongest environmental alternative and its documentation in the decision (ROD) do not themselves authorize any specific activities. Nor does this make any decision about future leasing.

The bureau's decision requires a set of protective measures that will be used in site-specific permits for any future G&G activities in the Atlantic. BOEM will conduct site-specific environmental reviews for any permit applications. These reviews will include coordination and consultation with federal, state and tribal authorities under a variety of additional statutory requirements. In particular, any "taking" of a marine mammal requires authorization from NOAA, separately from BOEM, and that authorization requires NOAA to find that there is no more than "negligible impact" and no adverse effects on marine mammal species or stocks.

[Click here](#) for the fact sheet on Atlantic G&G Surveys Record of Decision.

- BOEM -

The Bureau of Ocean Energy Management (BOEM) promotes energy independence, environmental protection and economic development through responsible, science-based management of offshore conventional and renewable energy resources.

EXHIBIT 3

Dear Mr. President:

We, the undersigned, are marine scientists united in our concern over the introduction of seismic oil and gas exploration along the U.S. mid-Atlantic and south Atlantic coasts. This activity represents a significant threat to marine life throughout the region.

To identify subsea deposits, operators use arrays of high-volume airguns, which fire approximately every 10-12 seconds, often for weeks or months at a time, with sound almost as powerful as that produced by underwater chemical explosives. Already nine survey applications covering the entirety of the region several times over have been submitted within the past six months, including multiple duplicative efforts in the same areas. In all, the activities contemplated by the Interior Department would result in more than 20 million seismic shots.

Airgun surveys have an enormous environmental footprint. For blue and other endangered great whales, for example, such surveys have been shown to disrupt activities essential to foraging and reproduction over vast ocean areas. Additionally, surveys could increase the risk of calves being separated from their mothers, the effects of which can be lethal, and, over time, cause chronic behavioral and physiological stress, suppressing reproduction and increasing mortality and morbidity. The Interior Department itself has estimated that seismic exploration would disrupt vital marine mammal behavior more than 13 million times over the initial six-to-seven years, and there are good reasons to consider this number a significant underestimate.

The impacts of airguns extend beyond marine mammals to all marine life. Many other marine animals respond to sound, and their ability to hear other animals and acoustic cues in their environment are critical to survival. Seismic surveys have been shown to displace commercial species of fish, with the effect in some fisheries of dramatically depressing catch rates. Airguns can also cause mortality in fish eggs and larvae, induce hearing loss and physiological stress, interfere with adult breeding calls, and degrade anti-predator response: raising concerns about potentially massive impacts on fish populations. In some species of invertebrates, such as scallops, airgun shots and other low-frequency noises have been shown to interfere with larval or embryonic development. And threatened and endangered sea turtles, although almost completely unstudied for their vulnerability to noise impacts, have their most sensitive hearing in the same low frequencies in which most airgun energy is concentrated.

The Interior Department's decision to authorize seismic surveys along the Atlantic coast is based on the premise that these activities would have only a negligible impact on marine species and populations. Our expert assessment is that the Department's premise is not supported by the best available science. On the contrary, the magnitude of the proposed seismic activity is likely to have significant, long-lasting, and widespread impacts on the reproduction and survival of fish and marine mammal populations in the region, including the critically endangered North Atlantic right whale, of which only 500 remain.

Opening the U.S. east coast to seismic airgun exploration poses an unacceptable risk of serious harm to marine life at the species and population levels, the full extent of which will not be understood until long after the harm occurs. Mitigating such impacts requires a much better understanding of cumulative effects, which have not properly been assessed, as well as strict, highly precautionary limits on the amounts of annual and concurrent survey activities, which have not been prescribed. To proceed otherwise is simply not sustainable. Accordingly, we respectfully urge you, Mr. President, to reject the Interior Department's analysis and its decision to introduce seismic oil and gas surveys in the Atlantic.

Sincerely,

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EXHIBIT 4

SUPPLEMENT A
SEISMIC TAKE TABLES

EXHIBIT 6

Center for Biological Diversity • Center for Water Advocacy • Clean Ocean Action • Defenders of Wildlife • Earthjustice • Natural Resources Defense Council • Ocean Conservation Research • Oceana • South Carolina Coastal Conservation League • Sierra Club • Southern Environmental Law Center • Surfrider Foundation • The Humane Society of the United States • Whale and Dolphin Conservation Society

By Regular and Electronic Mail

July 2, 2012

Mr. Gary D. Goeke
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Re: Comments on the Draft PEIS for Atlantic G&G Activities

Dear Mr. Goeke:

On behalf of our organizations and our millions of members, we write to submit comments on the Draft Programmatic Environmental Impact Statement (“DPEIS”) for geological and geophysical (“G&G”) activities off the mid-Atlantic and southeast coasts. 77 Fed. Reg. 19321 (Mar. 30, 2012). For the reasons discussed in detail below, we believe that the DPEIS not only fails to meet the environmental review standards prescribed by the National Environmental Policy Act (“NEPA”), but fails to an extent that cannot be remedied through the issuance of a final EIS. Accordingly, if BOEM intends to allow oil and gas exploration in the Atlantic, we believe that the document must be thoroughly revised and reissued as a draft for further public review and comment.

We are profoundly concerned about BOEM’s intention to permit high-intensity seismic surveys in the Atlantic region, not only because of the potentially catastrophic impacts of OCS drilling, but because of the significant environmental harm represented by airgun exploration itself.

It is undisputed that sound is a fundamental element of the marine environment. Whales, fish, and other wildlife depend on it for breeding, feeding, navigating, and avoiding predators – in short, for their survival and reproduction – and it is no exaggeration to say that BOEM’s proposed action would dramatically degrade the acoustic environment along most of the east coast. To prospect for oil and gas, the industry typically tows arrays of high-volume airguns

behind ships, firing intense impulses of compressed air – often as loud as explosives – about every 12 seconds, 24 hours per day, for days, weeks, or months on end. Increasingly, the available science demonstrates that these blasts disrupt baleen whale behavior and impair their communication on a vast scale; that they harm a diverse range of other marine mammals; and that they can significantly impact fish and fisheries, with unknown but potentially substantial effects on coastal communities. Given the scales involved, surveys taking place off the coast of Virginia could well affect endangered species off southern New England down through the Carolinas, impacting the endangered right whale’s entire migratory range. And the degree of activity contemplated under this EIS is enormous, with BOEM having already received permit applications to run hundreds of thousands of miles of survey lines during the pre-leasing phase alone.

Even according to BOEM’s estimates – which significantly understate the harm – oil and gas activity would injure up to 138,500 marine mammals and disrupt marine mammal feeding, calving, breeding, and other vital activities more than 13.5 million times over the next eight years alone.

NEPA dictates that, before opening the floodgates to this action, BOEM must employ rigorous standards of environmental review, including a fair and objective description of potential impacts, a comprehensive analysis of all reasonable alternatives, and a thorough delineation of measures to mitigate harm. Unfortunately, the DPEIS falls far short of these standards. Instead, it provides an analysis that on almost every crucial point is disconnected from the relevant science, in a way that consistently tends to understate impacts and, consequently, to rationalize BOEM’s proposed action. To cite just a few examples:

- BOEM relies on a 13-year-old, cookie-cutter threshold for harm that was recently castigated by some of the world’s leading experts in this field as “overly simplified, scientifically outdated, and artificially rigid” – leading to a serious misconception of the scale of the impact area and a massive underestimate of marine mammal take.
- It fails to assess the far-reaching cumulative impacts of airgun blasting on marine mammal communication, despite the availability of Cornell and NOAA models, simply stating without any discernible support (and contrary to the literature) that masking effects on marine mammals would be “minor.”
- It fails to incorporate new studies, accepted by the Navy and other state and federal agencies and incorporated into their recent impact statements, demonstrating that marine mammals are more susceptible to hearing loss than previously believed.
- In lieu of a serious analysis of cumulative impacts, it strings together a few unsupported and indeed baseless statements, ignoring not only its own marine mammal take numbers but also failing to consider such patently foreseeable impacts as the Navy’s substantial takes of the same populations over the same period (just analyzed in the Navy’s Draft EIS for the Atlantic Fleet).

- Despite acknowledging that airguns can cause wide-scale displacement of fish species – disrupting spawning and reproduction, altering migration routes, and impairing feeding, and dramatically reducing catch rates – it assumes without support that effects on both fish and fisheries would be localized and “minor.”

Nor is BOEM’s analysis of alternatives any more credible. **The fundamental problem is that the agency simply does not take the problem of cumulative, sublethal impacts seriously; and misprising the scale and potential significance of the impacts, it fails to consider alternatives and mitigation adequate to address it.** It does not even attempt to identify biologically important areas within the enormous activity area, aside from critical habitat for the right whale and loggerhead sea turtles. It does not attempt to reduce the extraordinary amount of activity by restricting exploration from areas that are unlikely to be leased, beginning with important Navy training areas, or to reduce the environmental footprint of the activity that does occur. It fails even to devise a long-term monitoring plan, which is a staple of Navy mitigation and essential to any meaningful adaptive management program. Instead, other than an insufficiently small time-area closure for the critically endangered right whale, BOEM’s preferred alternative relies on mitigation that the Courts have rightly described in other contexts as “woefully inadequate and ineffectual.” These faults are all the more serious given BOEM’s decision to avoid programmatic review under the Marine Mammal Protection Act.

Our organizations strongly support Alternative C, which would bar oil and gas exploration activity from the region, but allow G&G activity for renewable energy development and minerals exploration on a case-by-case basis, preserving the status quo. It makes no sense on either economic or ecological grounds to open the greater portion of the east coast to oil and gas development. If, however, BOEM proceeds with this poorly conceived policy, it must correct the fundamental errors in the present DPEIS. Merely revising the draft into a final EIS is not sufficient, because its pervasive flaws and omissions have effectively deprived federal and state agencies, the scientific community, and the general public of their statutory right to an objective description of the activity and a meaningful opportunity to comment.

These comments (1) provide background on NEPA and the science of ocean noise; (2) assess BOEM’s scant alternatives analysis and recommend additional alternatives and mitigation measures for consideration; (3) critique the document’s analysis of impacts on marine species; and (4) discuss what BOEM must do to satisfy its obligations under other statutes. Our recommendations for BOEM’s alternatives analysis, mitigation, and monitoring are summarized as follows.¹

- (1) BOEM should assess alternatives that place meaningful caps or limits on offshore activities, to reduce disruptions of marine mammal behavior.
- (2) BOEM should eliminate duplication of survey effort by prescribing or incentivizing the use of common surveyors, particularly for the extensive 2-D surveys expected within the first five years of activity.

¹ Except as indicated, these recommendations are intended to apply to seismic airgun activities, rather than to G&G activities more generally.

- (3) BOEM should develop alternatives for the development and implementation of “greener” exploration technology, of which several possibilities are described below.
- (4) BOEM should exclude from G&G exploration areas that are unlikely to be leased in the near future, whether for biological, political, or economic reasons, such as waters within 50 miles of the Virginia shore or waters important to the Navy’s national security mission.
- (5) BOEM should consider establishing buffer zones around all of its time-area closures, to prevent ensonification of important habitat at disruptive levels.
- (6) BOEM should develop time-area closures for marine mammals based on a systematic analysis of their density, distribution, and habitat use within the area of interest. To begin with, it should expand the time-area closure for North Atlantic right whales to fully capture the calving grounds and migration corridor, and put the Cape Hatteras Special Research Area off limits on a year-round basis.
- (7) BOEM should extend the seasonal Brevard County time-area closure for sea turtles to near-coastal areas through North Carolina, and should consult with NMFS to ensure inclusion of all loggerhead critical habitat in any closure provision.
- (8) BOEM should consider alternatives that exclude key fish habitat and fisheries, including submarine canyons in the mid-Atlantic, and Habitat Areas of Particular Concern designated by the Mid-Atlantic and South Atlantic Fishery Management Councils.
- (9) BOEM should exclude airgun surveys within a 145 dB isopleth around established dive sites.
- (10) BOEM should require that airgun survey vessels use the lowest practicable source levels, minimize horizontal propagation of the sound signal, and minimize the density of track lines consistent with the purposes of the survey, and, to this end, should consider establishing an expert panel within the agency to review survey designs with the aim of reducing their wildlife impacts.
- (11) BOEM should require operators to validate *in situ* the assumptions about propagation distances used to establish safety zones and calculate take, as is required in the Arctic.
- (12) BOEM should therefore require that all vessels associated with G&G activities, including support vessels and vessels used in HRG surveys, adhere to a 10 knot speed limit when operating or transiting at all times.
- (13) BOEM should require that vessels avoid important habitat, such as right whale calving grounds, when transiting to G&G activities.
- (14) BOEM should require that all vessels used in oil and gas G&G activities undergo measurement for their underwater noise output per American National Standards Institute/ Acoustical Society of America standards (S12.64); that all such vessels undergo regular maintenance to minimize propeller cavitation; and that all new industry vessels be required to employ the best ship-quieting designs and technologies available for their class of ship.

- (15) BOEM should consider prescribing larger, more conservative separation distances, since marine mammals can experience displacement and other impacts well beyond the 160 dB isopleth, on which the current proposed separation distance is based.
- (16) BOEM should require that operators working close to shore design their tracklines to minimize the potential for embayments and strandings.
- (17) BOEM should reconsider the size of the safety zones it would prescribe as part of its nominal protocol for seismic airgun surveys, taking into account new data on the threshold shift in marine mammals; and should consider establishing larger shutdown zones for certain target species, such as right whales.
- (18) BOEM should improve its real-time monitoring requirements, by reducing the length of time a marine mammal observer can continuously work; requiring that observers used on airgun surveys have meaningful field experience; mandating, or at least presumptively requiring, the use of passive acoustic monitoring; prescribing aerial surveillance on a case-by-case basis; and, for HRG surveys, requiring two trained observers in order to maintain coverage on both sides of the survey vessel.
- (19) BOEM should commit to consider limiting activities in low-visibility conditions on a case-by-case basis, and describe the conditions under which it might be required.
- (20) BOEM should immediately develop a long-term monitoring program, to establish environmental baselines, to determine long-term impacts on populations of target species, and to test whether the biological assumptions underlying the DPEIS are correct.
- (21) BOEM should incorporate an adaptive management plan into its alternatives, and should also set forth a protocol for emergency review or suspension of activities, if serious unanticipated impacts are found to occur.

I. BACKGROUND: ENVIRONMENTAL IMPACTS AND NEPA COMPLIANCE

A. Impacts of Airgun Surveys and Other G&G Activities

For offshore exploration, the oil and gas industry typically relies on arrays of airguns, which are towed behind ships and release intense impulses of compressed air into the water about once every 10-12 seconds.² A large seismic airgun array can produce effective peak pressures of sound higher than those of virtually any other man-made source save explosives;³ and although airguns are vertically oriented within the water column, horizontal propagation is so significant as to make them, even under present use, one of the leading contributors to low-frequency ambient noise thousands of miles from any given survey.⁴ Indeed, the enormous scale of this acoustic footprint has now been confirmed by studies of seismic in numerous regions around the

² Airguns are not used in surveys for renewable energy projects.

³ National Research Council, *Ocean Noise and Marine Mammals* (2003).

⁴ Niekirk, S.L., Stafford, K.M., Mellinger, D.K., Dziak, R.P., and Fox, C.G., Low-frequency whale and seismic airgun sounds recorded in the mid-Atlantic Ocean, *Journal of the Acoustical Society of America* 115: 1832-1843 (2004).

globe, including the Arctic, the northeast Atlantic, Greenland, and Australia (see *infra* at § IV.B.1).

It is well established that the high-intensity pulses produced by airguns can cause a range of impacts on marine mammals, fish, and other marine life, including broad habitat displacement, disruption of vital behaviors essential to foraging and breeding, loss of biological diversity, and, in some circumstances, injuries and mortalities.⁵ Consistent with their acoustic footprint, most of these impacts are felt on an extraordinarily wide geographic scale – especially on endangered baleen whales, whose vocalizations and acoustic sensitivities overlap with the enormous low-frequency energy that airguns put in the water. For example, a single seismic survey has been shown to cause endangered fin and humpback whales to stop vocalizing – a behavior essential to breeding and foraging – over an area at least 100,000 square nautical miles in size, and can cause baleen whales to abandon habitat over the same scale.⁶

Similarly, airgun noise can also mask the calls of vocalizing baleen whales over vast distances, substantially compromising their ability to communicate, feed, find mates, and engage in other vital behavior.⁷ The intermittency of airgun pulses hardly mitigates this effect since their acoustic energy spreads over time and can sound virtually continuous at distances from the array.⁸ According to recent modeling from Cornell and NOAA, the highly endangered North Atlantic right whale is particularly vulnerable to masking effects from airguns and other sources given the acoustic and behavioral characteristics of its calls.⁹ As discussed further below, the exposure levels implicated in all of these studies are lower – indeed orders of magnitude lower on a decibel scale – than the threshold used to evaluate airgun behavioral impacts in the DPEIS. Repeated insult from airgun surveys, over months and seasons, would come on top of already urbanized levels of background noise and, cumulatively and individually, would pose a significant threat to populations of marine mammals.

⁵ See, e.g., Hildebrand, J.A., Impacts of anthropogenic sound, in Reynolds, J.E. III, Perrin, W.F., Reeves, R.R., Montgomery, S., and Ragen, T.J. (eds), *Marine Mammal Research: Conservation beyond Crisis* (2006); Weilgart, L., The impacts of anthropogenic ocean noise on cetaceans and implications for management. *Canadian Journal of Zoology* 85: 1091-1116 (2007).

⁶ Clark, C.W., and Gagnon, G.C., Considering the temporal and spatial scales of noise exposures from seismic surveys on baleen whales (2006) (IWC Sci. Comm. Doc. IWC/SC/58/E9); Clark, C.W., pers. comm. with M. Jasny, NRDC (Apr. 2010); see also MacLeod, K., Simmonds, M.P., and Murray, E., Abundance of fin (*Balaenoptera physalus*) and sei whales (*B. borealis*) amid oil exploration and development off northwest Scotland, *Journal of Cetacean Research and Management* 8: 247-254 (2006).

⁷ Clark, C.W., Ellison, W.T., Southall, B.L., Hatch, L., van Parijs, S., Frankel, A., and Ponirakis, D., Acoustic masking in marine ecosystems as a function of anthropogenic sound sources (2009) (IWC Sci. Comm. Doc. SC/61/E10).

⁸ *Id.*; Weilgart, L. (ed.), Report of the workshop on alternative technologies to seismic airgun surveys for oil and gas exploration and their potential for reducing impacts on marine mammals, 31 Aug. – 1 Sept., 2009, Monterey, Calif. (2010) (available at www.oceanos-stiftung.org/oceanos/download.php?id=19).

⁹ Clark et al., Acoustic masking in marine ecosystems as a function of anthropogenic sound sources; Clark, C.W., Ellison, W.T., Southall, B.L., Hatch, L., Van Parijs, S.M., Frankel, A., and Ponirakis, D., Acoustic masking in marine ecosystems: intuitions, analysis, and implication, *Marine Ecology Progress Series* 395: 201-222 (2009).

Airguns are known to affect a broad range of other marine mammal species beyond the endangered great whales. For example, sperm whale foraging appears to decline significantly on exposure to even moderate levels of airgun noise, with potentially serious long-term consequences;¹⁰ and harbor porpoises have been seen to engage in strong avoidance responses fifty miles from an array.¹¹ Seismic surveys have been implicated in the long-term loss of marine mammal biodiversity off the coast of Brazil.¹² Broader work on other sources of undersea noise, including noise with predominantly low-frequency components, indicates that beaked whale species would be highly sensitive to seismic noise as well.¹³

Airgun surveys also have important consequences for the health of fisheries. For example, airguns have been shown to dramatically depress catch rates of various commercial species (by 40-80%) over thousands of square kilometers around a single array,¹⁴ leading fishermen in some parts of the world to seek industry compensation for their losses. Other impacts on commercially harvested fish include habitat abandonment – one hypothesized explanation for the fallen catch rates – reduced reproductive performance, and hearing loss.¹⁵ Even brief playbacks of predominantly low-frequency noise from speedboats have been shown to significantly impair the ability of some fish species to forage.¹⁶ Recent data suggest that loud, low-frequency sound also disrupts chorusing in black drum fish, a behavior essential to breeding in this commercial

¹⁰ Miller, P.J.O., Johnson, M.P., Madsen, P.T., Biassoni, N., Quero, M., and Tyack, P.L., Using at-sea experiments to study the effects of airguns on the foraging behavior of sperm whales in the Gulf of Mexico, *Deep-Sea Research I* 56: 1168-1181 (2009).

¹¹ Bain, D.E., and Williams, R., Long-range effects of airgun noise on marine mammals: responses as a function of received sound level and distance (2006) (IWC Sci. Comm. Doc. IWC/SC/58/E35).

¹² Parente, C.L., Pauline de Araújo, J., and Elisabeth de Araújo, M., Diversity of cetaceans as tool in monitoring environmental impacts of seismic surveys, *Biota Neotropica* 7(1) (2007).

¹³ Tyack, P.L., Zimmer, W.M.X., Moretti, D., Southall, B.L., Claridge, D.E., Durban, J.W., Clark, C.W., D'Amico, A., DiMarzio, N., Jarvis, S., McCarthy, E., Morrissey, R., Ward, J., and Boyd, I.L. (2011), Beaked whales respond to simulated and actual Navy sonar, *PLoS ONE* 6(3): e17009. Doi:10.1371/journal.pone.0017009; Soto, N.A., Johnson, M., Madsen, P.T., Tyack, P.L., Bocconcelli, A., and Borsani, J.F. (2006), Does intense ship noise disrupt foraging in deep-diving Cuvier's beaked whales (*Ziphius cavirostris*)? *Mar. Mamm. Sci.* 22: 690-699.

¹⁴ Engås, A., Løkkeborg, S., Ona, E., and Soldal, A.V., Effects of seismic shooting on local abundance and catch rates of cod (*Gadus morhua*) and haddock (*Melanogrammus aeglefinus*), *Canadian Journal of Fisheries and Aquatic Sciences* 53: 2238-2249 (1996); see also Skalski, J.R., Pearson, W.H., and Malme, C.I., Effects of sounds from a geophysical survey device on catch-per-unit-effort in a hook-and-line fishery for rockfish (*Sebastes ssp.*), *Canadian Journal of Fisheries and Aquatic Sciences* 49: 1357-1365 (1992).

¹⁵ McCauley, R.D., Fewtrell, J., Duncan, A.J., Jenner, C., Jenner, M.-N., Penrose, J.D., Prince, R.I.T., Adhitya, A., Murdoch, J. and McCabe, K., Marine seismic surveys: analysis and propagation of air-gun signals, and effects of air-gun exposure on humpback whales, sea turtles, fishes, and squid (2000) (report by Curtin U. of Technology); McCauley, R., Fewtrell, J., and Popper, A.N., High intensity anthropogenic sound damages fish ears, *Journal of the Acoustical Society of America* 113: 638-642 (2003); Scholik, A.R., and Yan, H.Y., Effects of boat engine noise on the auditory sensitivity of the fathead minnow, *Pimephales promelas*, *Environmental Biology of Fishes* 63: 203-209 (2002).

¹⁶ Purser, J., and Radford, A.N., Acoustic noise induces attention shifts and reduces foraging performance in three-spined sticklebacks (*Gasterosteus aculeatus*), *PLoS One*, 28 Feb. 2011, DOI: 10.1371/journal.pone.0017478 (2011).

species.¹⁷ Several studies indicate that airgun noise can kill or decrease the viability of fish eggs and larvae.¹⁸

The amount of disruptive activity under consideration in this PEIS is enormous. Since MMS issued its Notice of Intent in 2010, it has received roughly 10 applications for G&G activity in the Atlantic region. 75 Fed. Reg. 16830, 16832. Most of these applications involve extensive airgun surveys in the Mid-Atlantic and South Atlantic planning regions: for example, Spectrum Geo has proposed shooting 112,500 line miles of surveys from Massachusetts down to Florida, Western Geco another 54,900 miles between New Jersey and Georgia, and CGG Veritas more than 42,000 miles running northwards from Florida.¹⁹ As you know, industry will conduct more surveys as areas are opened for leasing, and will send ships back again and again to certain areas of interest to see how geologic features there change over time.

In all, the PEIS estimates more than 617,000 kilometers of 2D surveys, 2500 blocks of 3D/ 4D surveys (each block being about 9 square miles), and 900 blocks of wide-azimuth surveys in the Mid-Atlantic and South Atlantic Planning Areas through 2020, plus hundreds of thousands of additional kilometers of high-resolution surveys, vertical seismic profiling, and electromagnetic exploration, plus disturbance from vessel noise, node and cable installation, and other activities. PEIS at Table 3-3. The 2D surveys alone equate to about 8.8 years of continuous airgun activity, running 24 hours per day, 365 days per year, assuming vessel speeds of 4.5 knots. The 3D surveys, which according to BOEM's assumptions would not even begin until 2016, amount to 4 to 10.8 years of continuous activity assuming (per recent 3D surveys in the Arctic) 7 to 19 miles of trackline for every square mile of lease block. There is no indication that these estimates represent a worst-case scenario for G&G activity in the region, nor does the PEIS provide any projections for G&G activity beyond the 2013-2020 study period. In any case, BOEM is contemplating an enormous amount of activity with a vast environmental footprint.

B. Compliance with NEPA

Enacted by Congress in 1969, NEPA establishes a national policy to “encourage productive and enjoyable harmony between man and his environment” and “promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man.” 42 U.S.C. § 4321. In order to achieve its broad goals, NEPA mandates that “to the fullest extent possible” the “policies, regulations, and public laws of the United States shall be

¹⁷ Clark, C.W., pers. comm. with M. Jasny, NRDC (Apr. 2010).

¹⁸ Booman, C., Dalen, J., Leivestad, H., Levsen, A., van der Meeren, T., and Toklum, K., Effeter av luftkanonskyting på egg, larver og yngel (Effects from airgun shooting on eggs, larvae, and fry), *Fisken og Havet* 3:1-83 (1996) (Norwegian with English summary); Dalen, J., and Knutsen, G.M., Scaring effects on fish and harmful effects on eggs, larvae and fry by offshore seismic explorations, in Merklinger, H.M., *Progress in Underwater Acoustics* 93-102 (1987); Banner, A., and Hyatt, M., Effects of noise on eggs and larvae of two estuarine fishes, *Transactions of the American Fisheries Society* 1:134-36 (1973); L.P. Kostyuchenko, Effect of elastic waves generated in marine seismic prospecting on fish eggs on the Black Sea, *Hydrobiology Journal* 9:45-48 (1973).

¹⁹ MMS, Atlantic Geological and Geophysical (G&G) Activities Programmatic Environmental Impact Statement (PEIS), available at www.gomr.mms.gov/hompg/offshore/atlocs/gandg.html (accessed May 12, 2010).

interpreted and administered in accordance with [NEPA].” 42 U.S.C. § 4332. As the Supreme Court explained,

NEPA’s instruction that all federal agencies comply with the impact statement requirement – and with all the requirements of § 102 – “to the fullest extent possible” [cit. omit.] is neither accidental nor hyperbolic. Rather the phrase is a deliberate command that the duty NEPA imposes upon the agencies to consider environmental factors not be shunted aside in the bureaucratic shuffle.

Flint Ridge Development Co. v. Scenic Rivers Ass’n, 426 U.S. 776, 787 (1976). Central to NEPA is its requirement that, before any federal action that “may significantly degrade some human environmental factor” can be undertaken, agencies must prepare an environmental impact statement. *Steamboaters v. F.E.R.C.*, 759 F.2d 1382, 1392 (9th Cir. 1985) (emphasis in original).

The fundamental purpose of an EIS is to force the decision-maker to take a “hard look” at a particular action – at the agency’s need for it, at the environmental consequences it will have, and at more environmentally benign alternatives that may substitute for it – before the decision to proceed is made. 40 C.F.R. §§ 1500.1(b), 1502.1; *Baltimore Gas & Electric v. NRDC*, 462 U.S. 87, 97 (1983). This “hard look” requires agencies to obtain high quality information and accurate scientific analysis. 40 C.F.R. § 1500.1(b). “General statements about possible effects and some risk do not constitute a hard look absent a justification regarding why more definitive information could not be provided.” *Klamath-Siskiyou Wilderness Center v. Bureau of Land Management*, 387 F.3d 989, 994 (9th Cir. 2004) (quoting *Neighbors of Cuddy Mountain v. United States Forest Service*, 137 F.3d 1372, 1380 (9th Cir. 1998)). The law is clear that the EIS must be a pre-decisional, objective, rigorous, and neutral document, not a work of advocacy to justify an outcome that has been foreordained.

To comply with NEPA, an EIS must *inter alia* include a “full and fair discussion” of direct and indirect environmental impacts (40 C.F.R. § 1502.1), consider the cumulative effects of reasonably foreseeable activities in combination with the proposed action (*id.* § 1508.7), analyze all reasonable alternatives that would avoid or minimize the action’s adverse impacts (*id.* § 1502.1), address measures to mitigate those adverse effects (*id.* § 1502.14(f)), and assess possible conflicts with other federal, regional, state, and local authorities (*id.* § 1502.16(c)). We offer the following comments to ensure MMS’ compliance with these important mandates.

III. ALTERNATIVES AND MITIGATION

According to NEPA’s implementing regulations, the alternatives analysis is “the heart of the environmental impact statement” and is intended to “provid[e] a clear basis for choice among options by the decisionmaker and the public.” 40 C.F.R. § 1502.14. The alternatives analysis should “serve as the means of assessing the environmental impact of proposed agency actions, rather than justifying decisions already made.” *Id.* § 1502.2(g). Additionally, agencies are required to disclose and analyze measures to mitigate the impacts of proposed actions. *Id.* §§ 1502.14(f), 1502.16(h). This analysis must be “reasonably complete” in order to properly

evaluate the severity of the adverse effects of an agency's proposed action prior to the agency making a final decision. *Robertson v. Methow Valley Citizens Council*, 490 U.S. 332, 352 (1989). Unfortunately, the PDEIS' alternatives and mitigation analyses are incomplete and do not satisfy the regulatory standards.

A. Failure to Develop Reasonable Alternatives

The purpose of an EIS is to "rigorously explore and objectively evaluate all reasonable alternatives" to the proposed action. 40 C.F.R. § 1502.14(a). That discussion of alternatives "is the heart of the [EIS]" (*id.* at § 1502.14), and it "guarantee[s] that agency decision-makers have before them and take into proper account all possible approaches to a particular project (including total abandonment of the project) which would alter the environmental impact and the cost-benefit balance." *Alaska Wilderness Recreation & Tourism Ass'n v. Morrison*, 67 F.3d 723, 729 (9th Cir. 1995) (quoting *Bob Marshall Alliance v. Hodel*, 852 F.2d 1223, 1228 (9th Cir. 1988)); *see also Angoon v. Hodel*, 803 F.2d 1016, 1020 (9th Cir. 1986) ("[T]he touchstone for our inquiry is whether an EIS's selection and discussion of alternatives fosters informed decision-making and informed public participation.") (quoting *California v. Block*, 690 F.2d 753, 767 (9th Cir. 1982)). These standards have not been met.

1. Failure to develop alternatives based on different permissible levels of activity

BOEM should place meaningful caps or limits on offshore activities that disrupt marine mammal behavior. As NOAA has found, "[t]here is currently a great deal of concern that a variety of human sources of marine sound (e.g., vessel traffic, seismic activity, sonar, and construction activities) are acting in a cumulative way to degrade the environment in which sound-sensitive animals communicate."²⁰ Airguns in particular can cause low-frequency background noise to rise significantly over very large areas of ocean (*see infra* at § IV.B.1), and the best available evidence indicates that such noise can interfere with foraging in some species at moderate levels of exposure,²¹ and substantially interfere with the communication abilities of marine mammals, particularly baleen whales, at very considerable distances.²² These effects cannot be eliminated through the use of area closures alone, especially given the long distances at which masking can occur. Yet the DPEIS declines even to consider an alternative limiting the amount of activity that can be conducted in the Atlantic, or part of the Atlantic, over a given period.

²⁰ Memorandum from Dr. Jane Lubchenco, Undersecretary of Commerce for Oceans and Atmosphere, to Nancy Sutley, Chair, Council on Environmental Quality at 2 (Jan. 19, 2010).

²¹ *E.g.*, Miller, P.J.O., Johnson, M.P., Madsen, P.T., Biassoni, N., Quero, M., and Tyack, P.L., Using at-sea experiments to study the effects of airguns on the foraging behavior of sperm whales in the Gulf of Mexico, *Deep-Sea Research I* 56: 1168-1181 (2009).

²² *E.g.*, Clark, C.W., and Gagnon, G.C., Considering the temporal and spatial scales of noise exposures from seismic surveys on baleen whales (2006) (IWC Sci. Comm. Doc. IWC/SC/58/E9); Clark, C.W., Ellison, W.T., Southall, B.L., Hatch, L., van Parijs, S., Frankel, A., and Ponirakis, D., Acoustic masking in marine ecosystems as a function of anthropogenic sound sources (2009) (IWC Sci. Comm. Doc. SC/61/E10).

The DPEIS does not provide any reason for BOEM's lack of consideration of activity limits. In their recent DPEIS for Arctic geophysical exploration, however, the agencies based their tentative rejection of this alternative not on the grounds that it exceeded their legal authority, but that it did not meet the purpose and need of the proposed action.²³

In fact, determining the legally acceptable limits of activity is essential to NMFS' issuance of take authorizations in the Atlantic – which, presumably, would be that agency's purpose and need.²⁴ Pursuant to NMFS' own general regulations, an incidental harassment authorization must be revoked if the authorized takings “individually or in combination with other authorizations” are having more than a negligible impact on the population or an unmitigable adverse impact on subsistence.²⁵ Unfortunately, the DPEIS makes no attempt to assess whether the scope of activities it contemplates satisfies the negligible impact standard. Similarly, considering limits on activities is essential to BOEM's permitting and other requirements under OCSLA.

In the Arctic, instead of developing a suitable alternative for the EIS, the agencies proposed, in effect, to consider overall limits on activities when evaluating individual applications under OCSLA and the MMPA.²⁶ It would, however, be much more difficult for NMFS or BOEM to undertake that kind of analysis in an individual IHA application or OCSLA exploration plan because the agencies often lack sufficient information to take an overarching view of the activities occurring that year. Determining limits at the outset would also presumably reduce uncertainty for industry. In short, excluding any consideration of activity limits from the alternatives analysis in this EIS frustrates the purpose of programmatic review, contrary to NEPA.²⁷

2. Failure to develop alternative based on eliminating duplicative survey effort

It seems obvious that BOEM should eliminate duplication of survey effort and should not permit multiple surveys, or parts of surveys, in the same locations for the same or similar purposes. NMFS' expert Open Water Panel has twice called for the elimination of unnecessary, duplicative surveys, whether through required data sharing or some other means.²⁸ In the Atlantic, data

²³ National Marine Fisheries Service, Effects of Oil and Gas Activities in the Arctic Ocean, Draft Environmental Impact Statement at 2-45 (Dec. 2011).

²⁴ *Id.* at 1-3 to 1-4.

²⁵ 50 C.F.R. § 216.107(f)(2). Additionally, NMFS must ensure that the activity does not take more than “small numbers” of marine mammal species and stocks – another standard that the agency improperly fails to evaluate in the DPEIS.

²⁶ National Marine Fisheries Service, Effects of Oil and Gas Activities in the Arctic Ocean, Draft Environmental Impact Statement at 2-45 (Dec. 2011).

²⁷ *See also* 40 C.F.R. § 1500.2(e) (stating that agencies should identify and assess alternatives that would “avoid or minimize adverse effects of [proposed] actions upon the quality of the human environment”).

²⁸ Burns, J., Clark, C., Ferguson, M., Moore, S., Ragen, T., Southall, B., and Suydam, R., Expert panel review of monitoring and mitigation protocols in applications for incidental harassment authorizations related to oil and gas exploration, including seismic surveys, in the Chukchi and Beaufort Seas at 10 (2010) (Expert Panel Review 2010); Brower, H., Clark, C.W., Ferguson, M., Gedamke, J., Southall, B., and Suydam, R., Expert panel review of

sharing through the use of common surveyors seems particularly appropriate given the large number of wide-ranging 2-D surveys for which applications have already been received.

The DPEIS does not analyze this alternative “because its main benefit (a limit on concurrent surveys) is already addressed by Alternative B.” DPEIS at 2-49. Putting aside the fact that Alternative B may not be adopted, BOEM has obviously mischaracterized the effects and benefits of a consolidation measure. Consolidating surveys would reduce concurrence by the standards of BOEM’s Alternative B only if the surveys in question happened to come within 40 km of one another *while operating* – a scenario that seems likely to represent a relatively small number of instances. On the contrary, the plain benefit of consolidation is to reduce the cumulative, not necessarily simultaneous, impacts of seismic activity on marine species. As NMFS’ expert Open Water Panel observed: “Although the risks to marine mammals and marine ecosystems are still somewhat poorly described, unnecessarily duplicative surveys must increase those risks.”²⁹ BOEM’s stated rationale for not considering this alternative does not make sense.

Additionally, BOEM avers that consolidating and coordinating surveys “does not clearly fall under the mandates of this Agency,” or its sister agencies the Department of Energy and U.S. Geological Survey. DPEIS at 2-49. This argument seems similar to one advanced in the Arctic DPEIS, wherein the agencies suggested that BOEM could not adopt a data sharing measure, on the grounds that it cannot “require companies to share proprietary data, combine seismic programs, change lease terms, or prevent companies from acquiring data in the same geographic area.”³⁰ Yet this analysis overlooks BOEM’s statutory duty under OCSLA to approve only those permits whose exploration activities are not “unduly harmful” to marine life. 43 U.S.C. § 1340(a); *see also* 30 C.F.R. § 550.202. While OCSLA does not define the standard, it is difficult to imagine an activity more expressive of “undue harm” than a duplicative survey, which obtains data that the government and industry already possess and therefore is not necessary to the “expeditious and orderly development, subject to environmental safeguards” of the outer continental shelf. 30 U.S.C. § 1332(3). It is thus within BOEM’s authority to decline individual permit applications that it finds are unnecessarily duplicative, in whole or part, of existing or proposed surveys or data.

Additionally, nothing in OCSLA bars BOEM from incentivizing the use of common surveyors or data sharing, as already occurs in the Gulf of Mexico, to reduce the total survey effort. Certainly the Gulf of Mexico business model has led to the “expeditious and orderly development” of that region. 30 U.S.C. § 1332(3). The DPEIS fails to consider this latter alternative, even though it could substantially reduce the quantity of 2-D survey effort expected in the region over the next several years. BOEM must consider an alternative that eliminates duplicative effort.

3. Failure to develop a viable technology-based alternative

monitoring protocols in applications for incidental harassment authorizations related to oil and gas exploration in the Chukchi and Beaufort Seas, 2011: Statoil and ION Geophysical at 9 (2011) (Expert Panel Review 2011).

²⁹ Burns et al., Expert panel review at 10 (2010).

³⁰ National Marine Fisheries Service, Effects of Oil and Gas Activities in the Arctic Ocean, Draft Environmental Impact Statement at 2-46 (Dec. 2011).

The DPEIS, despite acknowledging the potential for alternative technology to reduce potential impacts on marine wildlife, has failed to develop and consider any alternatives for the development and implementation of that technology. DPEIS at 2-54.

New technology represents a promising means of reducing the environmental footprint of seismic exploration. Industry experts and biologists participating in a September 2009 workshop on airgun alternatives reached the following conclusions: that airguns produce a great deal of “waste” sound and generate peak levels substantially higher than needed for offshore exploration; that a number of quieter technologies are either available now for commercial use or can be made available within the next five years; and that, given the natural resistance of industry, governments should accelerate development and use of these technologies through both research and development funding and regulatory engagement.³¹ Among the technologies discussed in the 2009 workshop report are engineering modifications to airguns, which can cut emissions at frequencies not needed for exploration; controlled sources, such as marine vibroseis, which can dramatically lower the peak sound currently generated by airguns by spreading it over time; various non-acoustic sources, such as electromagnetic and passive seismic devices, which in certain contexts can eliminate the need for sound entirely; and fiber-optic receivers, which can reduce the need for intense sound at the source by improving acquisition at the receiver.³² An industry-sponsored report by Noise Control Engineering made similar findings about the availability of greener alternatives to seismic airguns, as well as alternatives to a variety of other noise sources used in oil and gas exploration.³³

The draft EIS instead relies on out-of-date information in characterizing the availability of certain technologies. For example, marine vibroseis – which has the potential to reduce peak sound levels by 30 decibels or more and virtually eliminate output above 100 Hz – is on the verge of commercial availability, with useable arrays produced by Geo-Kinetics and PGS now being tested for their environmental impacts on fish, and other models in development through the Canadian government and a Joint Industry Program.³⁴ Yet the DPEIS uses a 2010 personal communication with PGS for the proposition that a commercial electric vibroseis array is not “available for data collection at this time” (DPEIS at 2-50) – an outdated observation that does

³¹ Weilgart, L. ed., Report of the workshop on alternative technologies to seismic airgun surveys for oil and gas exploration and their potential for reducing impacts on marine mammals, 31 Aug. – 1 Sept., 2009, Monterey, Calif. (2010), available at www.oceanos-stiftung.org/oceanos/download.php?id=19.

³² *Id.*

³³ Spence, J., Fischer, R., Bahtiarian, M., Boroditsky, L., Jones, N., and Dempsey, R., Review of existing and future potential treatments for reducing underwater sound from oil and gas industry activities (2007) (NCE Report 07-001) (prepared by Noise Control Engineering for Joint Industry Programme on E&P Sound and Marine Life). Despite the promise indicated in the 2007 and 2010 reports, neither NMFS nor BOEM has attempted to develop noise-reduction technology for seismic or any other noise source, aside from BOEM’s failed investigation of mobile bubble curtains.

³⁴ TENGHAMN, R., An electrical marine vibrator with a flextensional shell, *Exploration Geophysics* 37:286-291 (2006); LGL and Marine Acoustics, Environmental assessment of marine vibroseis (2011) (Joint Industry Programme contract 22 07-12).

not reflect current fact. Nor does the DPEIS consider the specific airgun modifications discussed in Weilgart (2010). *See* DPEIS at 2-53.

Critically, the DPEIS fails to include any actionable alternatives to require, incentivize, or test the use of new technologies in the Atlantic, or indeed in any other region. Such alternatives include: (1) mandating the use of marine vibroseis or other technologies in pilot areas, with an obligation to accrue data on environmental impacts; (2) creating an adaptive process by which marine vibroseis or other technologies can be required as they become available; (3) deferring the permitting of surveys in particular areas or for particular applications where effective mitigative technologies, such as marine vibroseis, could reasonably be expected to become available within the life of the EIS; (4) providing incentives for use of these technologies as was done for passive acoustic monitoring systems in NTL 2007-G02; and (5) exacting funds from applicants to support accelerated mitigation research in this area. The final EIS must consider these alternatives.

B. Failure to Consider Additional Time-Place Restrictions

Time and place restrictions designed to protect high-value habitat are one of the most effective means to reduce the potential impacts of noise and disturbance, including noise from oil and gas exploration.³⁵ It was for this express reason that NOAA, in 2011, established a working group on Cetacean Density and Distribution Mapping, to define marine mammal hotspots for management purposes.³⁶ Unfortunately, the PDEIS, while identifying two possible time-area closures for North Atlantic right whales and one possible closure for sea turtles, does not consider any other areas for any other species. Nor, as discussed below, are its proposed right whale closures adequate to protect right whales.

As a general matter, the PDEIS does not give any consideration to year-round area closures, for reasons that are unclear. It makes no sense to open up areas for geophysical exploration – adding to the cumulative noise burden, impairing the communication space of the right whale and other species – that are unlikely to be leased, whether for biological, political, or economic reasons. For example, the lease sale area off Virginia that Interior included in its 2012-2017 leasing program (but aborted after the BP spill) stood more than 50 miles offshore, in order to reduce

³⁵ *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); Dolman, S., Aguilar Soto, N., Notarbartolo di Sciara, G., Andre, M., Evans, P., Frisch, H., Gannier, A., Gordon, J., Jasny, M., Johnson, M., Papanicolopulu, I., Panigada, S., Tyack, P., and Wright, A., Technical report on effective mitigation for active sonar and beaked whales (2009) (working group convened by European Cetacean Society); OSPAR Commission, Assessment of the environmental impact of underwater noise (2009) (report issued as part of OSPAR Biodiversity Series, London, UK); Convention on Biological Diversity, Scientific synthesis on the impacts of underwater noise on marine and coastal biodiversity and habitats (2012) (UNEP/CBD/SBSTTA/16/INF/12).

³⁶ Memorandum from Dr. Jane Lubchenco, Undersecretary of Commerce for Oceans and Atmosphere, to Nancy Sutley, Chair, Council on Environmental Quality at 2 (Jan. 19, 2010).

conflict with military, fishing, and other uses. 73 Fed. Reg. 67201, 67205 (Nov. 13, 2008).³⁷ If lease sales are unlikely within 50 miles of the Virginia shore, seismic exploration can be excluded from these areas while meeting the stated purpose and need. BOEM should identify areas within the mid- and southeast Atlantic that are unlikely to be opened to lease sales within the 2017-2022 period due to conflict of use, political opposition, and other factors, and consider an alternative (or alternatives) that restricts oil and gas exploration in these areas.

Recently, in their DEIS for oil and gas exploration in the Arctic, BOEM and NMFS argued that they lack authority under the MMPA and OCSLA to prescribe year-round closures.³⁸ Instead, they suggest that the proper time for consideration of permanent closures is during the offshore leasing program and lease sale processes.³⁹ Yet BOEM's relegation of this alternative to the leasing process is not consistent with its obligation, at the exploration and permit approval stage, to reject applications that would cause "serious harm" or "undue harm." *E.g.*, 43 U.S.C. § 1340(a); 30 C.F.R. § 550.202. It is reasonable for BOEM to define areas where exploration activities would exceed these legal thresholds regardless of time of year, just as it defines areas for seasonal avoidance pursuant to other OCSLA and MMPA standards. Moreover, the lease sale stage is not a proper vehicle for considering permanent exclusions for strictly off-lease activities, such as the off-lease seismic surveys that would account for all of the oil and gas exploration activity during the first five years of the study period. The DPEIS must consider establishing year-round exclusion areas as well as seasonally-based closures.

Finally, as a general matter, the PDEIS does not consider establishing buffer zones around areas of biological importance, aside from a "setback distance" to prevent seafloor disturbance within the Monitor and Gray's Reef National Marine Sanctuaries and such other buffer zones as may be warranted to protect benthic communities. DPEIS at C-18.⁴⁰ Buffer zones are a standard feature of biosphere reserves; have been recommended by numerous experts for use in mitigation of undersea noise around reserves, exclusion areas, and National Marine Sanctuaries; and are regularly prescribed by NMFS around exclusion areas for Navy sonar training.⁴¹ NMFS has established a list of objectives for habitat avoidance and other mitigation measures, including reduction in the total number of marine mammal takes and the reduction in the severity, intensity, or number of exposures, particularly (but not exclusively) for vulnerable species. *See*,

³⁷ BOEMRE, Virginia Lease Sale 220 Information (2010), *available at* www.gomr.boemre.gov/homepg/lseale/220/matl220.html (accessed June 2012) (confirming lease sale area is at least 50 miles offshore).

³⁸ National Marine Fisheries Service, Effects of Oil and Gas Activities in the Arctic Ocean, Draft Environmental Impact Statement at 2-44 (Dec. 2011).

³⁹ *Id.*

⁴⁰ The DPEIS does incorrectly mischaracterize its proposed seasonal exclusion for right whales, as set forth in Alternative B, as a "continuous buffer... from active acoustic sources" (DPEIS at 4-213) but this exclusion area represents part of the right whale's migratory corridor and calving grounds, not a buffer zone.

⁴¹ *E.g.*, Agardy et al., A global scientific workshop on spatio-temporal management of noise; Hatch, L.T., and Fristup, K.M., No barrier at the boundaries: Implementing regional frameworks for noise management in protected natural areas, *Marine Ecology Progress Series* 395: 223-244 (2009); Hoyt, E., Marine Protected Areas for Whales, Dolphins, and Porpoises: A World Handbook for Cetacean Habitat Conservation and Planning, 2nd Edition (2011); 72 Fed. Reg. 46846, 46846-46893 (Apr. 21, 2007).

e.g., 74 Fed. Reg. 3886 (Jan. 21, 2009). On this basis, BOEM should consider and adopt meaningful buffer zones around its exclusion areas.

More specifically:

1. Time-place restrictions for marine mammals

The DPEIS study area includes important marine mammal habitat that was not considered for time-place restrictions. For example:

(a) North Atlantic right whale habitat

The cetacean species of greatest concern in the region is the North Atlantic right whale, a species that has a minimum population of only about 361 whales and is considered the most imperiled large whale on the planet. In order to protect this species and comply with its obligations under the Endangered Species Act, BOEM must seasonally exclude all North Atlantic right whale habitat areas from seismic and other proposed activities. These areas include both the designated critical habitat identified in the PDEIS' Alternative A as well as areas that have not yet been designated as critical habitat but are known to be important migratory habitat.

Notably, NMFS is considering whether to expand right whale critical habitat in response to a Sept. 16, 2009 petition filed by the Center for Biological Diversity, Humane Society of the United States, Whale and Dolphin Conservation Society, Defenders of Wildlife, and Ocean Conservancy. That petition identified additional areas that are critical for breeding, raising calves, migrating, and feeding, and which should be included as designated critical habitat for the species. In relevant part, the petitioners requested that NMFS:

...

(2) expand right whale critical habitat in the waters off the Southeast United States to include coastal waters from the shore out to 35 nautical miles off the coast of South Carolina, and waters off the coast of Georgia and Florida from approximately 32.0° N latitude, 80.35° W southward to approximately 28° N latitude, 80.35° W longitude...; and

(3) designate as right whale critical habitat coastal waters all waters along the migratory corridor of the mid-Atlantic from the shore out to 30 nautical miles, between the northern border of South Carolina (approximately 33.85° N latitude and 78.53° W longitude) northward to the southeastern corner of Cape Cod, Massachusetts (approximately 41.55° N latitude, 70.0° W longitude), southeastward to the southern

corner of the current Great South Channel Critical Habitat (41.0° N latitude and 69.1° W longitude).⁴²

It is worth noting that a 30 nm coastal exclusion (along the lines defined above) does not include a buffer zone as the DPEIS suggests (DPEIS at 4-213), but reflects the extent of the right whale migratory corridor itself.⁴³ Regardless of their status as critical habitat, these areas should be avoided, and added to the DPEIS' alternatives analysis as an extension to the 20 nm coastal time-area closure of Alternative B.

Additionally, contrary to the present Alternatives A and B (*see* DPEIS at 2-4), a seasonal exclusion for right whales should also apply to HRG surveys, including for renewables. During the migration, any substantial deflection of mothers and calves around a low- to mid-frequency sound source such a sub-bottom profiler – a result that is particularly likely for activities occurring landward of the animals –⁴⁴ could put the animals at greater risk of killer whale predation or exposure to rougher seas. In the calving grounds as well as the migration corridor, any behavioral response similar to that observed in Nowacek et al. (2004) – in which right whales, responding to an acoustic alarm, positioned themselves directly below the water surface – would put them at substantially greater risk of vessel collision. Right whales were demonstrated to respond significantly to alarm signals, which occupied the same frequencies as the sub-bottom profilers intended for HRG surveys, at received levels of 133-148 dB re 1 μ Pa (RMS).⁴⁵ If anything, these levels could underestimate the response threshold for many of the whales, given the heightened reactions to other sound sources that have been observed in baleen whale mothers and calves.⁴⁶

⁴² Center for Biological Diversity, The Humane Society of the United States, Whale and Dolphin Conservation Society, Defenders of Wildlife, and Ocean Conservancy, Petition to Revise Critical Habitat Designation for the North Atlantic Right Whale at 1-2 (2009).

⁴³ Knowlton, A.R., Ring, J.B., and Russell, B., Right whale sightings and survey effort in the mid-Atlantic region: Migratory corridor, time frame, and proximity to port entrances (2002) (report submitted to NMFS ship-strike working group); Kraus, S., New England Aquarium, pers. comm. with Michael Jasny, NRDC (Apr. 2012). *See also* Fujiwara, M., and Caswell, H., Demography of the endangered North Atlantic right whale, *Nature* 414: 537-541 (2001); Kraus, S.D., Prescott, J.H., Knowlton, A.R., and Stone, G.S., Migration and calving of right whales (*Eubalaena glacialis*) in the western North Atlantic, *Reports of the International Whaling Commission* 10: 139-144 (1986); Ward-Geiger, L.I., Silber, G.K., Baumstark, R.D., and Pulfer, T.L., Characterization of ship traffic in right whale critical habitat, *Coastal Management* 33: 263-278 (2005).

⁴⁴ Buck, J.R., and Tyack, P.L., Responses of gray whales to low frequency sounds, *Journal of the Acoustical Society of America* 107: 2774 (2000).

⁴⁵ Nowacek, D.P., Johnson, M.P., and Tyack, P.L., Right whales ignore ships but respond to alarm stimuli, *Proc. Royal Soc. London, Pt. B: Biol. Sci.* 271: 227-231 (2004).

⁴⁶ *E.g.*, McCauley, R.D., Fewtrell, J., Duncan, A.J., Jenner, C., Jenner, M.-N., Penrose, J.D., Prince, R.I.T., Adhitya, A., Murdoch, J., and McCabe, K., Marine seismic surveys: Analysis and propagation of air-gun signals; and effects of air-gun exposure on humpback whales, sea turtles, fishes and squid (2000) (report from Curtin University of Technology). It is also worth noting that, under some conditions, migrating bowheads avoid airgun pulses out to the 120 dB isopleths and gray whales avoid industrial noise and low-frequency sounds out to 120 dB or 140 dB. Buck and Tyack, Responses of gray whales, *supra*; Malme, C.I., Miles, P.R., Clark, C.W., Tyack, P., and Bird, J.E., Investigations of the potential effects of underwater noise from petroleum industry activities on migrating gray whale behavior: Phase II: January 1984 migration (1984) (NTIS PB86-218377); Richardson, W.J., Miller, G.W.,

Received levels of 130 dB and above could easily occur more than 10 kilometers from the chirpers, boomers, and pile drivers at issue here. Real-time visual monitoring is very difficult for right whales, especially during high sea states, nighttime operations, and other low-visibility conditions, and is further complicated by the size of the impact zone that the monitoring effort would have to cover.⁴⁷

As NRDC observed in our comments on BOEM's recent EA on mid-Atlantic Wind Energy Areas, we would support allowing some small amount of sub-bottom profiling activity to occur during the winter exclusion period provided (1) that the operators have conscientiously planned to complete their HRG surveys outside the seasonal exclusion months, (2) that their inability to complete the surveys is due to unforeseen circumstances, and (3) that permitting some small amount of HRG activity to occur during the winter months would allow them to avoid extending their survey effort into the following calendar year. That said, given the conservation status of this species, we recommend extension of the right whale time-area closure to HRG activity.

(b) Cape Hatteras Special Research Area

The area of interest also includes habitat known to be important for multiple cetacean species. For example, the continental shelf break off Cape Hatteras features a major oceanic front created by the Gulf Stream, which veers off into the Atlantic and merges with Labrador Current, creating conditions for warm-core rings and high abundance of marine mammals and fish.⁴⁸ Among the many species that are drawn to this area in high abundance are long- and short-finned pilot whales and Risso's dolphin, whose interactions with the pelagic longline fishery have exceeded the insignificance threshold for potential biological removal and triggered the formation

and Greene, C.R., Displacement of migrating bowhead whales by sounds from seismic surveys in shallow waters of the Beaufort Sea, *Journal of the Acoustical Society of America* 106: 2281 (1999).

⁴⁷ E.g., Barlow, J., and Gisiner, R., Mitigation and monitoring of beaked whales during acoustic events, *Journal of Cetacean Research and Management* 7: 239-249 (2006); 72 Fed. Reg. 46846, 46875 (Aug. 21, 2007) (SURTASS LFA rulemaking); Dolman, S., Aguilar de Soto, N., Notabartolo di Sciara, G., Andre, M., Evans, P., Frisch, H., Gannier, A., Gordon, J., Jasny, M., Johnson, M., Papanicolopulu, I., Panigada, S., Tyack, P., and Wright, A., Technical report on effective mitigation for active sonar and beaked whales (2009) (report from European Cetacean Society); Parsons, E.C.M., Dolman, S.J., Jasny, M., Rose, N.A., Simmonds, M.P., and Wright, A.J., A critique of the UK's JNCC seismic survey guidelines for minimising acoustic disturbance to marine mammals: Best practice? *Marine Pollution Bulletin* 58: 643-651 (2009).

⁴⁸ Churchill, J., Levine, E., Connors, D., and Cornillon, P., Mixing of shelf, slope and Gulf Stream water over the continental slope of the Middle Atlantic Bight, *Deep Sea Research Part I: Oceanographic Research Papers*, 40: 1063-1085 (1993); Hare, J., Churchill, J., Cowen, R., Berger, T., Cornillon, P., Dragos, P., Glenn, S.M., Govoni, J.J., and Lee, T.N., Routes and rates of larval fish transport from the southeast to the northeast United States continental shelf, *Limnology and Oceanography* 47: 1774-1789 (2002); Garrison, L., Swartz, S., Martinez, A., Burks, C., and Stamates, J., A marine mammal assessment survey of the southeast US continental shelf: February-April 2002 (2003) (NOAA Technical Memorandum NMFS-SEFSC-492); Waring, G., Josephson, E., Fairfield-Walsh, C., and Maze-Foley, K., U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments—2008 (2009) (NOAA Tech Memo NMFS NE 210); 74 Fed. Reg. 23349, 23349-23358 (May 19, 2009).

of a take reduction team under the MMPA.⁴⁹ The Cape Hatteras Special Research Area, designated by NMFS as a tool to manage the marine mammal-fishery interactions, captures most of the crucial habitat, having some of the highest densities of cetaceans in the entire region and being one of the most important sites for charter, commercial, and recreational pelagic fisheries.⁵⁰ BOEM must consider excluding – and, indeed, under any meaningful management plan, must exclude – this area.

(c) Other areas identifiable through habitat mapping

Remarkably, BOEM has not attempted any systematic analysis of marine mammal habitat for purposes of establishing time-area closures within the area of interest. This stands in obvious counter-distinction to the Navy's 2008 programmatic EIS for sonar activities in the region, which formulated several alternatives based on predictive modeling of marine mammal habitat. There is no reason why a similar analysis should not be done here. Indeed, given the importance of time-area closures in mitigating acoustic impacts, such an analysis (and the gathering of any needed data in support of that analysis) is essential to a reasoned choice among alternatives. 40 C.F.R. § 1502.22.

- (1) Predictive mapping.— Over the past few years, researchers have developed at least two predictive models to characterize densities of marine mammals in the area of interest: the NODE model produced by the Naval Facilities Engineering Command Atlantic, and the Duke Marine Lab model produced under contract with the Strategic Environmental Research and Development Program, both to fulfill the Navy's responsibilities for offshore activities under NEPA and other statutes.⁵¹ Indeed, the Navy employed the NODE model in developing three habitat-based alternatives, in its own programmatic EIS, for sonar training off the U.S. east coast from 2009 to 2014.⁵² Further, NOAA has convened a Cetacean Density and Distribution Mapping Group with the purpose of evaluating, compiling, supplementing, and enhancing available density information for marine mammals within the U.S. EEZ.⁵³ Its product, which includes habitat-based density maps and other data for nearly all of BOEM's area of interest, broken down by species and month, was

⁴⁹ 74 Fed. Reg. 23349, 23350.

⁵⁰ 74 Fed. Reg. 23349; NMFS, Environmental Assessment, Regulatory Impact Review, and Final Regulatory Flexibility Analysis for the Final Pelagic Longline Take Reduction Plan (Jan. 2009) (produced by NMFS Southeast Regional Office).

⁵¹ U.S. Navy, Final Atlantic Fleet Active Sonar Training Environmental Impact Statement/ Overseas Environmental Impact Statement (2008); Read, A., and Halpin, P., Final report: Predictive spatial analysis of marine mammal habitats (2010) (SI-1390, report prepared for SERDP); Duke Marine Lab, Marine Animal Model Mapper, available at http://seamap.env.duke.edu/serdp/serdp_map.php (accessed June 2012).

⁵² Navy, Final Atlantic Fleet Active Sonar Training EIS.

⁵³ Memorandum from Dr. Jane Lubchenco, Undersecretary of Commerce for Oceans and Atmosphere, to Nancy Sutley, Chair, Council on Environmental Quality (Jan. 19, 2010).

shared in late May at an expert workshop that was partly funded by BOEM, and is slated for public release in early July.⁵⁴

BOEM must use these sources, which represent best available science and, indeed, have partly been used in prior Navy NEPA analyses and rulemakings, to identify important marine mammal habitat and develop reasonable alternatives to the proposed action. *See* 40 C.F.R. § 1502.22. Species of particular importance, aside from the North Atlantic right whale, include the five other large whale species listed under the Endangered Species Act, *i.e.*, blue, fin, sei, humpback, and sperm whales; and beaked whales and harbor porpoises, whose vulnerability to anthropogenic noise is well recognized.

- (2) Persistent oceanographic features.— Marine mammal densities are correlated over medium to large scales with persistent ocean features, such as ocean currents, productivity, and surface temperature, as well as with concentrations in other marine species, such as other apex predators and fish.⁵⁵ The occurrence of these features is often predictable enough to define core areas of biological importance on a year-round or seasonal basis.⁵⁶ In the area of interest, the most important of these features is the Gulf Stream; warm-core rings that develop off the Gulf Stream are likely to provide particularly important habitat for beaked whales, which are considered especially sensitive and vulnerable to anthropogenic sound. Analysis of these features should figure in predictive mapping, but can be used to supplement maps that do not take dynamic features into account.

2. Time-place restrictions for sea turtles

The single time-area closure included in Alternative B, a seasonal avoidance of coastal waters off Brevard County, Florida, is not sufficient to protect endangered and threatened species of sea turtles from harm due to proposed G&G activities off the mid- and south Atlantic.

BOEM's area of interest overlaps with populations of sea turtles, including green, leatherback, loggerhead, hawksbill, and Kemp's Ridley, and contains thousands of nesting locations of particular importance to loggerhead sea turtles. Indeed, the U.S. and Oman represent the majority of nesting sites for loggerhead sea turtles worldwide;⁵⁷ limiting anthropogenic disturbances to these nesting locations is paramount for the global conservation of this species. The DPEIS observes that "...breeding adults, nesting adult females, and hatchlings could be

⁵⁴ NOAA, Cetecean and Sound Mapping, *available at* www.st.nmfs.noaa.gov/cetsound (accessed June 2012).

⁵⁵ Hyrenbach, K.D., Forney, K.A., and Dayton, P.K. (2000), Marine protected areas and ocean basin management, *Aquatic Conservation: Marine and Freshwater Ecosystems* 10:437-458.

⁵⁶ *Id.* ("Design Recommendations for Pelagic MPAs" include the use of persistent oceanographic features like sea temperature to define core areas for protection).

⁵⁷ FWS and NMFS, Recovery Plan for the Northwest Atlantic Population of the Loggerhead Sea Turtle (*Caretta caretta*) Second Revision (2008) (*available at* www.nmfs.noaa.gov/pr/pdfs/recovery/turtle_loggerhead_atlantic.pdf).

exposed to airgun seismic survey-related sound exposures at levels of 180 dB re 1 μ Pa or greater. Potential impacts could include auditory injuries or behavioral avoidance that interferes with nesting activities.” DPEIS at 2-17. The recovery plan for the Northwest Atlantic population of loggerhead sea turtles also notes that several aspects of oil and gas activities, including seismic surveying, threaten these populations.⁵⁸ And recent analysis of sea turtle hearing confirms that loggerheads and other sea turtles have their greatest acoustic sensitivity below 400 Hz, which much of the energy produced by airguns is concentrated.⁵⁹ Given these findings, as well as the global significance of the region for loggerheads, all important habitats for endangered and threatened sea turtles in the area of interest should be avoided.

Although Brevard County, Florida represents vital loggerhead nesting habitat and must be protected, many additional sea turtle nesting sites are found each year within the mid- and south Atlantic planning areas, in Georgia, South Carolina, North Carolina, and other parts of Florida, as displayed in Figures 4-14 and 4-16 of the DPEIS. Volusia County, Florida, for instance, has had an average of 1,865 loggerhead sea turtles nests reported between 2007-2011.⁶⁰ In 2010 on Georgia beaches 1,761 loggerhead nests were found.⁶¹ South Carolina sea turtle nests in 2011 included 4,018 loggerheads, 3 greens and 4 leatherbacks.⁶² North Carolina sea turtle nests in 2011 included 948 loggerheads, 16 greens and 1 Kemp's Ridley.⁶³ Long-term datasets show nesting declines for loggerheads in North Carolina, South Carolina, Georgia, and southeast Florida,⁶⁴ and it is critical to their recovery to protect females heading to and from their nesting beaches as well as hatchlings that enter the neritic zone. Nesting females and hatchlings could be disturbed or injured by the proposed G&G activities in any of these locations through an increase in vessel traffic, accidental oil discharges, and noise propagation from the use of airguns. For these reasons, BOEM should exclude from seismic airgun activity all near-coastal waters from Florida through North Carolina, from May 1 through October 31, to protect both nesting females and hatchlings.

Important foraging and migrating habitat should also receive consideration for time-area closure. Loggerheads that were tracked after nesting at Archie Carr National Wildlife Refuge, in Brevard County, headed north and followed three main foraging and migratory patterns between Virginia

⁵⁸ *Id.*

⁵⁹ Piniak, W.E.D., Mann, D.A., Eckert, S.A., and Harms, C.A., Amphibious hearing in sea turtles, in Popper, A.N., and Hawkins, A., eds., *The Effects of Noise on Aquatic Life* at 83-88 (2012).

⁶⁰ FWC/FWRI Statewide Nesting Beach Survey Program Database as of 8 Feb. 2012, Loggerhead Nesting Data 2007-2011, available at <http://myfwc.com/media/2078432/LoggerheadNestingData.pdf>.

⁶¹ Georgia Department of Natural Resources. Sea Turtle Conservation and Research, available at <http://www.georgiawildlife.com/node/1804> (accessed May 2012).

⁶² South Carolina Department of Natural Resources, SC Marine Turtle Conservation Program, available at <http://www.dnr.sc.gov/seaturtle/> (accessed May 2012).

⁶³ North Carolina Wildlife Commission, Sea Turtle Nest Monitoring System: North Carolina loggerhead, available at <http://www.seaturtle.org/nestdb/index.shtml?view=1&year=2011>.

⁶⁴ NMFS, Loggerhead Sea Turtle (*Caretta caretta*), available at <http://www.nmfs.noaa.gov/pr/species/turtles/loggerhead.htm> (accessed May 2012).

and North Carolina.⁶⁵ These foraging and migratory areas for loggerheads conflict with the mid- and south Atlantic planning areas, and the impacts to loggerheads could occur outside of nesting beaches.

Finally, BOEM must create time-area closures to avoid future conflicts with loggerhead critical habitat. NOAA has established Distinct Population Segments (“DPSs”) for loggerheads, including in the Northwest Atlantic, and has until September 2012 to designate critical habitat for them. 76 Fed. Reg. 58868 (Sept. 22, 2011). The Final PEIS should reflect the current development of this rulemaking. BOEM should consult with NOAA on the designation and incorporate time-area closures within the Final PEIS to avoid conflicts with these areas.

In sum, BOEM should extend its proposed Brevard County exclusion to coastal areas from Florida up through North Carolina during the sea turtle nesting season, from May 1 through October 31; should identify and exclude important foraging and migrating habitat outside the nesting areas; and should establish time-area closures for all loggerhead critical habitat, which NMFS is required to designate, under the Endangered Species Act, by September 2012.

3. Time-place restrictions for fish and fisheries

The DPEIS does not consider any alternative that would exclude important fish habitat areas from G&G and other detrimental activities. While the document describes a number of areas in the mid-Atlantic and southeast Atlantic that provide especially important fish habitat and fishery resources, it simply dismisses effects on these areas.

Similarly, the Draft PEIS does not give serious consideration to space and use conflicts with commercial and recreational fisheries. The document considers such conflicts only in the context of permanent structures that physically block access to fishing sites, which it asserts will be rare. However, lethal and sublethal impacts to targeted fish species, including changes in their behavior or movements, as well as habitat degradation stemming from the proposed action would also adversely impact – and therefore conflicts with – commercial and recreational fishing uses.

The Final PEIS must consider alternatives that exclude key fish habitat and fisheries from the proposed action. These areas include:

- (a) Charleston Bump and gyre complex.— Charleston Bump and the gyre surrounding it as a result of rapidly moving Gulf Stream waters provide a highly productive, nutrient-rich area that contributes significantly to primary and secondary production in the region. In addition, this area provides essential nursery habitat for numerous offshore fish species. The importance and sensitive nature of this seafloor and gyre habitat make it incompatible with the proposed seismic activities.

⁶⁵ Evans, D., Cariani, S., Ehrhart, L.M., Identifying migratory pathways and foraging habitat use by loggerhead turtles (*Caretta caretta*) nesting on Florida’s east coast, *Sea Turtle Conservancy and UCF* (2011).

- (b) The Point (also known as Hatteras Corner).— This area is formed at the confluence of the Gulf of Mexico with other water bodies, creating a highly productive open-water habitat. Adults of many highly migratory species such as tuna and swordfish congregate in this area. In addition, a wide diversity of larval fishes is found here.
- (c) Ten Fathom Ledge and Big Rock.— These areas feature complex and valuable bottom habitat that is known to be used by some 150 reef-associated species. Ten Fathom Ledge encompasses numerous patch reefs consisting of coral, algae, and sponges on rock outcroppings covering 352 km² of ocean floor. Big Rock encompasses 93 km² of deep reef. Both areas are highly vulnerable to damage from bottom disturbances, sedimentation, and contamination associated with the proposed activities.
- (d) Submarine canyons and canyon heads.— These structurally complex ecosystems provide critically important benthic and pelagic habitats for numerous fish species, sharks, sea birds, and marine mammals. The canyons plummet down several miles and their solid undersea walls provide a hard substrate foundation for bottom-dwelling species.⁶⁶ Among these is the golden tilefish, which create unique habitat for co-evolved species by burrowing extensively into the canyon walls, giving them the appearance of miniature, underwater versions of the pueblo villages of the American Southwest.⁶⁷ And the canyons represent high-value habitat for many other species, include monkfish, hakes, skates, American lobster, and red crab, as well as such lesser-known species as cod-like grenadiers and bioluminescent lanternfish.⁶⁸ Endangered sperm whales, beaked whales, dolphins, and other marine mammals come to the canyons and seamounts to feed on the schools of squid and fish that congregate there.⁶⁹ More than 200 species of invertebrates have been identified in the

⁶⁶ Natural Resources Defense Council. Priority Ocean Areas for Protection in the Mid-Atlantic: Findings of NRDC's Marine Habitat Workshop at 25, 27 (Jan. 2001).

⁶⁷ *Id.*; Lumsden, S.E., T.F. Hourigan, A.W. Bruckner, & G. Dorr, eds., The state of deep coral ecosystems of the United States at 211 (2007) (NOAA Technical Memorandum CRCP-3, available at http://coris.noaa.gov/activities/deepcoral_rpt/pdfs/DeepCoralRpt2007.pdf).

⁶⁸ NRDC, Priority Ocean Areas; NMFS, Resource Survey Report: Bottom Trawl Survey. March 7 – April 28, 2007 (2009) (available at http://www.nefsc.noaa.gov/esb/rsr/sbts/sbts_2007/large_file.pdf); NMFS & NEFMC. Protecting Sensitive Deep-Sea Canyon Habitats through Fisheries Management: A Case Study in the Northeastern United States (2009) (available at http://www.nefmc.org/habitat/managing_fisheries_poster.pdf); Marine Conservation Biology Institute, Places in the Sea: Hudson Canyon (2009) (available at http://www.mcbi.org/shining_sea/place_atlantic_hudson.htm); NOAA Ocean Explorer. Mission Plan: Mountains in the Sea" (2009) (available at <http://oceanexplorer.noaa.gov/explorations/03mountains/background/plan/plan.html>); Lumsden et al., The state of deep coral ecosystems at 211; NOAA, Explorations: Deep East: Logs: Summary of the Expedition (2009) (available at <http://oceanexplorer.noaa.gov/explorations/deepeast01/logs/oct1/oct1.html>).

⁶⁹ Waring, G.T., Hamazaki, T., Sheehan, D., Wood, G., and Baker, S., Characterization of beaked whale (*Ziphiidae*) and sperm whale (*Physeter macrocephalus*) summer habitat in shelf-edge and deeper waters off the northeast U.S." *Marine Mammal Science* 17: 703-717 (2001); Waring, G.T., Josephson, E., Maze-Foley, K., and Rosel, P.E., eds., U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments – 2011 (2011).

Atlantic submarine canyons and seamounts, including species of black corals, boreal red corals, sponges, and feather-like sea pens.⁷⁰

Submarine canyon and canyon head habitats are highly vulnerable to damage associated with bottom disturbances, sedimentation, and contamination from the proposed activities; and fish and other canyon species are particularly vulnerable to acoustic impacts from seismic surveys, which may be exacerbated by reverberation from the canyon walls. For these reasons, the Atlantic canyons, including such highly productive areas such as Norfolk Canyon and Georgetown Hole, should be excluded from all such activities, as should all Gear Restricted Areas for golden tilefish.

(e) Areas designated as Habitat Areas of Particular Concern (“HAPCs”) by the Mid-Atlantic or South Atlantic Fishery Management Councils.— BOEM should consider excluding the following designated areas:

- HAPCs for coral, coral reefs, and live/hard bottom habitats
 - North Carolina: 10-Fathom Ledge, Big Rock, The Point
 - South Carolina: Charleston Bump, Hurl Rock
 - Georgia: Gray’s Reef National Marine Sanctuary
 - Florida: Tube worm (*Lophelia*) reefs off FL’s central east coast, *Oculina* Bank off coast from Fort Pierce to Cape Canaveral, nearshore (0-12 ft.) hard bottom off coast from Cape Canaveral to Broward County
- HAPCs for penaeid, rock, and royal red shrimps
- HAPCs for reef fish/snapper-grouper management unit, and areas that meet the criteria for Essential Fish Habitat-HAPCs for these species
 - medium- to high-profile offshore hard bottoms where spawning normally occurs
 - localities of known or likely periodic spawning aggregations
 - nearshore hard bottom areas
 - The Point, Ten Fathom Ledge, and Big Rock
 - Charleston Bump
 - mangrove habitat
 - seagrass habitat
 - oyster/shell habitat
 - all coastal inlets
 - all State-designated nursery habitats of particular importance to snappers-groupers (e.g., primary and secondary nursery areas designated in North Carolina)
 - pelagic and benthic *Sargassum*
 - Hoyt Hills for wreckfish
 - the *Oculina* Bank HAPC
 - all hermatypic coral habitats and reefs

⁷⁰ Oceana. There’s No Place Like Home at 9; Lumsden et al., The state of deep-coral ecosystems, at 200, 203; NRDC, Priority Ocean Areas.

- manganese outcroppings on the Blake Plateau
 - Council-designated Artificial Reef Special Management Zones
 - HAPCs for coastal pelagic species
 - Sandy shoals of Cape Lookout, Cape Fear, and mid-Cape Hatteras; The Point, Ten-Fathom Ledge, Big Rock (North Carolina)
 - Charleston Bump, Hurl Rocks (South Carolina)
 - Nearshore hardbottom (Florida)
- (f) South Atlantic Deepwater MPAs.— These areas, established in 2009 by the South Atlantic Fishery Management Council, support various snapper and grouper species, including snowy grouper, speckled hind, and blue tilefish. Many of the deep-dwelling species the area supports are slow-growing and already struggling to recover from overfishing and habitat damage.
- (g) Gray's Reef National Marine Sanctuary.
- (h) Areas known to be inhabited by and/or proposed as critical habitat for Atlantic sturgeon.

In addition, BOEM must analyze an alternative that would require any entity carrying out the proposed activities to identify aggregations of forage species and prohibit operations within the vicinity of such aggregations that might disturb them. Similarly, BOEM must analyze an alternative that would prohibit the proposed activities from being carried out in the vicinity of spawning aggregations of grouper and snapper species, as well as concentrations of *Sargassum*, which provides vital nursery habitat to numerous species in Atlantic shelf waters and the Gulf Stream.

C. Failure to Adequately Consider Reasonable Mitigation and Monitoring Measures

The DPEIS does not adequately consider, or fails to consider at all, a number of other reasonable measures that would reduce environmental risk from the proposed activities. These measures include:

- (1) Exclusion of airgun surveys around established dive sites.— It is well established that intense undersea noise can jeopardize the health and safety of human divers. For this reason, the Navy has established a significant acoustic stand-off zone around established dive sites, for training and operations of its SURTASS LFA system as well as for other acoustic sources.⁷¹ The Navy's 145 dB stand-off for SURTASS

⁷¹ Navy, Final Overseas Environmental Impact Statement and Environmental Impact Statement for Surveillance Towed Array Sensor System Low Frequency Active (SURTASS LFA) Sonar (2001) (notes that standard was endorsed by Navy's Bureau of Medicine and Surgery and the Naval Sea Systems Command); Navy, Final Supplemental Environmental Impact Statement for Surveillance Towed Array Sensor System Low Frequency Active (SURTASS LFA) Sonar (2007).

LFA is based on research showing severe discomfort in a portion of experienced civilian divers, on exposure to low-frequency noise at that level.⁷² Given the lack of any analogous studies on airgun noise, BOEM should adopt the Navy's 145 dB threshold as the best available standard for high-intensity, low-frequency airguns. The stand-off zone should apply to Monitor and Gray's Reef National Marine Sanctuaries as well as to other established dive sites.

- (2) Survey design standards and review.— BOEM should require that airgun survey vessels use the lowest practicable source levels, minimize horizontal propagation of the sound signal, and minimize the density of track lines consistent with the purposes of the survey.⁷³ None of these measures is considered in the DPEIS. We would note that, in the past, the California Coastal Commission has required the U.S. Geological Survey to reduce the size of its array for seismic hazards work, and to use alternative seismic technologies (such as a minisparker), to reduce acoustic intensities during earthquake hazard surveys to their lowest practicable level.⁷⁴ Additionally, BOEM should consider establishing an expert panel, within the agency, to review survey designs with the aim of reducing their wildlife impacts. These requirements are consistent with both the MMPA's "least practicable impact" requirement for authorizing marine mammal take and OCSLA's "undue harm" requirement for permitting of offshore exploration.
- (3) Sound source validation.— Relatedly, BOEM should require operators to validate the assumptions about propagation distances used to establish safety zones and calculate take (*i.e.*, at minimum, the 160 dB and 180 dB isopleths). Sound source validation has been required of Arctic operators for several years, as part of their IHA compliance requirements, and has proven useful for establishing more accurate, *in situ* measurements of safety zones and for acquiring information on noise propagation.⁷⁵ It should be clarified that safety zone distances would initially be established in site-specific EAs and applications for MMPA authorization, to ensure opportunity for agency review and analysis.

⁷² Navy, Final Overseas Environmental Impact Statement and Environmental Impact Statement for Surveillance Towed Array Sensor System Low Frequency Active (SURTASS LFA) Sonar: Technical Report 3 (1999).

⁷³ Parsons, E.C.M., Dolman, S.J., Jasny, M., Rose, N.A., Simmonds, M.P., and Wright, A.J., A critique of the UK's JNCC seismic survey guidelines for minimising acoustic disturbance to marine mammals: Best practice? *Marine Pollution Bulletin* 58: 643-651 (2009); Burns, J., Clark, C., Ferguson, M., Moore, S., Ragen, T., Southall, B., and Suydam, R., Expert panel review of monitoring and mitigation protocols in applications for incidental harassment authorizations related to oil and gas exploration, including seismic surveys, in the Chukchi and Beaufort Seas (2010) (NMFS Expert Panel Review 2010); Brower, H., Clark, C.W., Ferguson, M., Gedamke, J., Southall, B., and Suydam, R., Expert panel review of monitoring protocols in applications for incidental harassment authorizations related to oil and gas exploration in the Chukchi and Beaufort Seas, 2011: Statoil and ION Geophysical (2011) (NMFS Expert Panel Review 2011).

⁷⁴ See, e.g., California Coastal Commission, Staff Recommendation on Consistency Determination No. CD-16-00 (2000) (review of USGS survey off southern California).

⁷⁵ See, e.g., Burns et al., Expert Panel Review (2010), *supra*; Brower et al., Expert Panel Review (2011), *supra*.

- (4) Expansion of the speed-reduction requirement for vessels engaged in G&G activities.— As it stands, BOEM would require G&G ships to maintain a 10 knot speed restriction only when “mother/calf pairs, pods, or large assemblages of cetaceans are observed near an underway vessel,” or where the conditions specified in the existing right whale ship-strike rule (50 C.F.R. § 224.105) apply. DPEIS at 2-7. This requirement should be expanded.

Ship strikes represent one of the leading threats to the critically endangered North Atlantic right whale. More than half (n=10 of 14) of all North Atlantic right whales that died from significant trauma between 1970 and 2002, and were recovered for pathological examination, had vessel collision as a contributing cause of death (in cases where presumed cause of death could be determined);⁷⁶ and these data are likely to grossly underestimate the actual number of animals struck, as animals struck but not recovered, or not thoroughly examined, cannot be accounted for.⁷⁷ Each fatal strike could constitute jeopardy under the Endangered Species Act. As NMFS has repeatedly stated, “the loss of even a single individual [North Atlantic right whale] may contribute to the extinction of the species” and “preventing the mortality of one adult female a year” may alter this outcome.⁷⁸

For these reasons, significant steps have been taken over the last several years to reduce the threat of right whale collisions by (1) shifting and narrowing Traffic Separation Schemes (“TSS”), (2) designating “areas to be avoided” (“ATBA”), and (3) establishing seasonal speed reductions for vessels in known right whale habitat. With respect to speed reductions, the best available science indicates that limiting ship speed to 10 knots reduces both the collision risk for right whales and the risk of mortality should a collision occur.⁷⁹ NMFS has therefore set a 10 knot limit on ships greater than 65 feet in length transiting certain waters along the eastern seaboard, including areas off the Mid-Atlantic.⁸⁰ The agencies have separately extended this requirement to all construction vessels associated with the Cape Wind project, as well as to both construction *and* support ships associated with the Neptune liquid natural

⁷⁶ Moore, M. J., Knowlton, A.R., Kraus, S.D., McLellan, W.A., and Bonde, R.K., Morphometry, gross morphology and available histopathology in North Atlantic right whale (*Eubalena glacialis*) mortalities (1970-2002), *Journal of Cetacean Research and Management* 6:199-214 (2004).

⁷⁷ Reeves, R.R., Read, A., Lowry, L., Katona, S.K., and Boness, D.J., *Report of the North Atlantic right whale program review*, 13–17 March 2006, Woods Hole, Massachusetts (2007) (prepared for the Marine Mammal Commission).

⁷⁸ See 69 Fed. Reg. 30,857, 30,858 (June 1, 2004); see also 73 Fed. Reg. 60,173, 60,173 (Oct. 10, 2008); 72 Fed. Reg. 34,632, 34,632 (June 25, 2007); 66 Fed. Reg. 50,390, 50,392 (Oct. 3, 2001).

⁷⁹ Laist, D.W., Knowlton, A.R., Mead, J.G., Collet, A.S., and Podesta, M., Collisions between ships and whales, *Marine Mammal Science* 17: 35-75 (2001); Pace, R.M., and Silber, G.K., Simple analyses of ship and large whale collisions: Does speed kill? Biennial Conference on the Biology of Marine Mammals, December 2005, San Diego, CA. (2005) (abstract); Vanderlaan, A.S.M., and Taggart, C.T., Vessel collisions with whales: The probability of lethal injury based on vessel speed, *Marine Mammal Science* 23: 144-156 (2007); NMFS, 2010 Large Whale Ship Strikes Relative to Vessel Speed (2010) (available at http://www.nmfs.noaa.gov/pr/pdfs/shipstrike/ss_speed.pdf).

⁸⁰ 73 Fed. Reg. 60173, 60173-60191 (Oct. 10, 2008).

gas (“LNG”) facility regardless of vessel length. Notably, both the Cape Wind and Neptune LNG speed limits apply to waters beyond those covered by NMFS’ ship-strike rule.⁸¹ A speed reduction measure in this case would, of course, also reduce the risk of fatal ship strikes on other endangered baleen whales, such as fin and humpback whales, which also occur within the WEAs and shoreward.

BOEM should therefore require that all vessels associated with G&G activities, including support vessels, adhere to a 10 knot speed limit when operating or transiting: i.e., at all times. This measure is easily practicable for most vessels involved in G&G activities: seismic boats proceed at a nominal 4.5 knots when operating and at generally slow speeds (below 13-14 knots) when transiting. But specific language on this point is needed, as in the case of the Neptune LNG facility, to ensure that all vessels (and not just those vessels over 65 feet in length) and all affected waters (beyond the areas immediately surrounding the major Mid-Atlantic ports) are covered by the speed limit, and that the requirement persists beyond the original 5-year term of the existing right whale ship-strike rule. Because this measure would likewise reduce the risk of vessel collisions with other species, including other endangered baleen whales, and because it would significantly reduce cavitation noise,⁸² it should apply throughout the year and not only during periods of right whale occurrence.

Finally, as per requirements for the Neptune LNG facility,⁸³ the EA should specify that designated crew members must receive National Oceanic and Atmospheric Administration (“NOAA”) certified training regarding marine mammal and sea turtle presence and collision avoidance procedures, prior to the commencement of construction and support activities.

- (5) Vessel avoidance of important habitat.— It is well established that vessel routing can significantly reduce both cumulative noise exposure and the risk of ship-strikes.⁸⁴ Indeed, the agencies admit in their DPEIS for Arctic exploration that routing ships around important habitat would benefit species in that region, including bowheads,

⁸¹ Cape Wind Associates, Construction and Operations Plan: Cape Wind Energy Project, Nantucket Sound, Massachusetts (Feb. 2011); NMFS, Biological Opinion: Issuance of license to Neptune LNG to MARAD to construct, own, and operate an LNG deepwater port, at 15-16 (2007) (license number F/NEr/2006/04000).

⁸² Renilson, M., Reducing underwater noise pollution from large commercial vessels (2009) *available at* www.ifaw.org/oceannoise/reports; Southall, B.L., and Scholik-Schlomer, A. eds. Final Report of the National Oceanic and Atmospheric Administration (NOAA) International Symposium: Potential Application of Vessel-quieting Technology on Large Commercial Vessels, 1-2 May 2007, at Silver Springs, Maryland (2008) (*available at* http://www.nmfs.noaa.gov/pr/pdfs/acoustics/vessel_symposium_report.pdf).

⁸³ NMFS, Biological Opinion at 15. By contrast, the mitigation set forth in Appendix C of the Draft EA merely requires that vessel and aircraft operators receive a “briefing.” See Draft EA at 226.

⁸⁴ E.g., Hatch, L., Clark, C., Merrick, R., Van Parijs, S., Ponirakis, D., Schwehr, K., Thompson, M., and Wiley, D., Characterizing the relative contributions of large vessels to total ocean noise fields: a case study using the Gerry E. Studds Stellwagen Bank National Marine Sanctuary, *Environmental Management* 42:735-752 (2008).

- belugas, gray whales, and walruses.⁸⁵ Accordingly, the draft EIS should require avoidance of such areas, including right whale calving grounds, as a standard mitigation measure.
- (6) Reduction of noise from vessels used in oil and gas G&G activities.— To further reduce undersea noise, BOEM should require that all vessels used in oil and gas G&G activities undergo measurement for their underwater noise output per American National Standards Institute/ Acoustical Society of America standards (S12.64); that all such vessels undergo regular maintenance to minimize propeller cavitation, which is the primary contributor to underwater ship noise; and that all new industry vessels be required to employ the best ship-quieting designs and technologies available for their class of ship.⁸⁶
- (7) Separation distances— As part of Alternative B, BOEM would require operators to maintain a 40 km separation distance between concurrent airgun surveys. DPEIS at C-21. While we agree with BOEM about the benefits of reducing simultaneous exposure of the same area, we believe the proposed separation distance is too small to accomplish the objective. Forty kilometers represents a doubling of the 160 dB isopleth around a large array, plus an additional 10 km buffer needed for marine species to freely transit through the area or otherwise escape disruptive levels of exposure. But marine mammals experience take at much lower levels of exposure, as discussed below at § IV.B. To take just one example, migrating bowhead whales experience displacement well beyond the 160 dB isopleths, out to 25-30 km; the proposed 40 km separation would do little to mitigate the displacement and allow transit of the animal.⁸⁷ BOEM should consider larger, more conservative separation distances including, but not limited to, 90 km, which is the distance considered in the Arctic DPEIS.
- (8) Designing tracklines to minimize the potential for strandings.— Biologists have expressed concern, based on correlations of airgun surveys with some marine mammal stranding events as well as the traditional use of sound in cetacean drive fisheries, that seismic operations (and other intense noise sources) could cause marine mammals to strand, particularly if used near shore.⁸⁸ To reduce analogous risk in

⁸⁵ NMFS, Effects of Oil and Gas Activities in the Arctic Ocean, Draft Environmental Impact Statement at 4-160 to 4-161 (Dec. 2011).

⁸⁶ Renilson, Reducing underwater noise pollution from large commercial vessels; Southall and Scholik-Schlomer, eds., Final Report of the National Oceanic and Atmospheric Administration (NOAA) International Symposium: Potential Application of Vessel-Quietening Technology on Large Commercial Vessels.

⁸⁷ Richardson, W.J., Miller, G.W., and Greene Jr., C.R., Displacement of migrating bowhead whales by sounds from seismic surveys in shallow waters of the Beaufort Sea, *Journal of the Acoustical Society of America* 106: 2281 (1999).

⁸⁸ Brownell, R.L., Jr., Nowacek, D.P., and Ralls, K., Hunting cetaceans with sound: a worldwide review, *J. Cetacean Res. Manage.* 10: 81-88 (2008); Hildebrand, J., Impacts of anthropogenic sound, in Ragen, T.J., Reynolds III, J.E., Perrin, W.F., Reeves, R.R., and Montgomery, S. (eds.), *Marine Mammal Research: Conservation beyond*

other contexts, Australia and the NATO Undersea Research Program have required planners of mid-frequency sonar exercises to design their tracklines to minimize the potential for embayments and strandings, such as by avoiding tracks that could herd animals into bays and estuaries or keeping transmissions in bays to a minimum.⁸⁹ The potential location of deep-penetration airgun surveys close to shore recommend the use of the same measure in this case.

- (9) Adequate safety zone distances.— BOEM should reconsider the size of the safety zones it would prescribe as part of its nominal protocol for seismic airgun surveys.

The DPEIS proposes establishing a safety zone of 180 dB re 1 μ Pa (with a 500 m minimum) around individual seismic arrays, correctly observing that this standard is generally consistent with NMFS' requirements for other acoustic sources. DPEIS at 2-5. It is not clear, however, whether BOEM took recent research into account when calculating nominal safety zone distances in the document. For example, Gedamke et al. (2011), whose lead author is the present director of NMFS' Bioacoustics Program, has put traditional means of estimating safety zones into doubt. That paper demonstrates through modeling that, when uncertainties about impact thresholds and intraspecific variation are accounted for, a significant number of whales could suffer temporary threshold shift (*i.e.*, hearing loss) beyond 1 km from a relatively small seismic array (source energy level of 220 dB re 1 μ Pa²(s)) – a distance that seems likely to exceed BOEM's estimates (PDEIS at C-10).⁹⁰ Moreover, a recent dose-response experiment indicates that harbor porpoises are substantially more susceptible to temporary threshold shift than the two species, bottlenose dolphins and belugas, that had previously been tested.⁹¹ And a number of recent studies suggest that the relationship between temporary and permanent threshold shift may not be as predictable as previously believed.⁹² Further discussion appears at section IV.B.3 below ("Failure to set proper thresholds for hearing loss"). BOEM must take account of these studies, as, for example, by extending the safety zone by a precautionary distance, as the Navy and NMFS have done to compensate for uncertainties in the

Crisis 101-123 (2006); IWC Scientific Committee, Report of the Scientific Committee of the International Whaling Commission: Annex K: Report of the Standing Working Group on Environmental Concerns (2009).

⁸⁹ Royal Australian Navy, Maritime Activities Environmental Management Plan: Procedure S1 (2006); NATO Undersea Research Centre, NATO Undersea Research Centre Human Diver and Marine Mammal Risk Mitigation Rules and Procedures, at 10 (2006) (NURC Special Pub. NURC-SP-2006-008).

⁹⁰ Gedamke, J., Gales, N., and Frydman, S., Assessing risk of baleen whale hearing loss from seismic surveys: The effect of uncertainty and individual variation, *Journal of the Acoustical Society of America* 129: 496-506 (2011).

⁹¹ Lucke, K., Siebert, U., Lepper, P.A., and Blanchet, M.-A., Temporary shift in masked hearing thresholds in a harbor porpoise (*Phocoena phocoena*) after exposure to seismic airgun stimuli, *Journal of the Acoustical Society of America* 125: 4060-4070 (2009).

⁹² Kastak, D., Mulsow, J., Ghoul, A., Reichmuth, C., Noise-induced permanent threshold shift in a harbor seal [abstract], *Journal of the Acoustical Society of America* 123: 2986 (2008) (sudden, non-linear induction of permanent threshold shift in harbor seal during TTS experiment); Kujawa, S.G., and Liberman, M.C., Adding insult to injury: Cochlear nerve degeneration after "temporary" noise-induced hearing loss, *Journal of Neuroscience* 29: 14077-14085 (2009) (mechanism linking temporary to permanent threshold shift).

case of SURTASS LFA. 67 Fed. Reg. 46712 (July 16, 2002); 72 Fed. Reg. 46846 (Aug. 21, 2007).

Additionally, BOEM should consider establishing a cumulative exposure metric for temporary threshold shift in addition to the present RMS metric, as suggested by Southall et al. (2007).⁹³

Finally, BOEM should consider establishing larger shutdown zones for certain target species. Although time/area closures are a more effective means of reducing cumulative exposures of wildlife to disruptive and harmful sound, these expanded safety zones have value in minimizing disruptions, and potentially in reducing the risk of hearing loss and injury, outside the seasonal closure areas.⁹⁴ Visual sighting of any individual right whale should trigger shut-down; for other species, shut-down should occur if aggregations are observed within the 160 dB isopleth around the sound source.

- (10) Adequate real-time monitoring.— It is well established that real-time visual shipboard monitoring is difficult for all marine mammal and sea turtle species, especially at night and during high sea states and fog.⁹⁵ Supplemental methods that have been used on certain other projects include ship-based passive acoustic monitors, hydrophone buoys and other platforms for acoustic monitoring, aerial surveys, shore-based monitoring, and the use of additional small vessels. Unfortunately, the real-time monitoring effort proposed in the DPEIS is inadequate.

While BOEM seems to require two observers for airgun surveys – the minimum number necessary to maintain 360 degree coverage around the seismic vessel – it otherwise sets forth requirements that are inconsistent with survey conventions and with prior studies of observer effectiveness. *First*, BOEM’s “draft protocol” would allow visual observers to work at four-hour stretches, with two-hour breaks in between, and for a maximum of 12 hours per day. DPEIS at C-41. That four-hour work cycle doubles the amount of time conventionally allowed for marine mammal observation aboard NMFS survey vessels, and is even less appropriate for conditions where, as here, an animal’s health is at stake. *Second*, BOEM’s training requirements for marine mammal observers amount to little more than a desktop course – basically the “poor example” of a 45-minute “DVD” lesson criticized by Parsons et al. (2009) – and do not mandate any prior field experience. DPEIS at C-41 to C-42. Yet, as UK

⁹³ Southall, B.L., Bowles, A.E., Ellison, W.T., Finneran, J.J., Gentry, R.L., Greene, C.R., Jr., Kastak, D., Ketten, D.R., Miller, J.H., Nachtigall, P.E., Richardson, W.J., Thomas, J.A., and Tyack, P.L., Marine mammal noise exposure criteria: Initial scientific recommendations, *Aquatic Mammals* 33:411-521 (2007).

⁹⁴ See MMS, Final Programmatic Environmental Assessment, Arctic Outer Continental Shelf Seismic Surveys – 2006, OCS EIS/EA MMS 2006-038 at 110-111 (June 2006) (noting sensitivity of baleen whale cow-calf pairs).

⁹⁵ See, e.g., Barlow, J., and Gisiner, R., Mitigation and monitoring of beaked whales during acoustic events, *J. Cetacean Res. Manage.* 7: 239-249 (2006); Parsons, E.C.M., Dolman, S.J., Jasny, M., Rose, N.A., Simmonds, M.P., and Wright, A.J., A critique of the UK’s JNCC seismic survey guidelines for minimising acoustic disturbance to marine mammals: Best practice? *Marine Pollution Bulletin* 58: 643-651 (2009).

data have demonstrated, use of observers with no meaningful experience in marine mammal observation, such as ships' crew, results in extremely low levels (approaching zero percent) of detection and compliance.⁹⁶ BOEM should require field experience in marine mammal observation of any

Furthermore, while it includes mandatory passive acoustic monitoring ("PAM") under Alternative B (DPEIS at C-21), the DPEIS discusses the measure in a later section as though it has already been "considered but not selected" (DPEIS at C-25 to C-26). The rationale for this seeming rejection is that the method is limited – but then, as the PDEIS acknowledges, visual observation is limited as well, "and most likely an integrated approach is necessary" (DPEIS at C-25). Real-time PAM has had some success in detecting toothed whale calls in the Arctic and elsewhere, as NMFS and its expert Open Water Panel have recognized; and towed arrays in the Gulf of Mexico have successfully detected sperm whales and implemented shut-down procedures.⁹⁷ Indeed, PAM systems appear to be widely used in the Gulf, in waters deeper than 200 meters; many of the same survey vessels are likely to be employed in east-coast exploration. There is no reason, especially given BOEM's high estimates of hearing loss, why PAM should not be mandated, or at least presumptively required.

Finally, BOEM improperly rules out aerial surveillance as a monitoring measure, apparently due to its limited application and to safety concerns that arise under some conditions. DPEIS at C-27. This, however, is hardly a reason to categorically reject the measure. The offshore industry routinely uses aircraft to carry out its own exploration and production activities; requiring flights to also reduce the environmental impacts of those activities should be viewed in the same light. Furthermore, the industry has run aerial monitoring around surveys in the Arctic since at least the 1980s. For its upcoming Arctic work, Shell is committed to implement an aerial program extending 37 kilometers from shore. 76 Fed. Reg. 69,958, 69,987 (Nov. 9, 2011). We agree that aerial monitoring should not be required of every airgun survey in every location within the two planning areas, but BOEM should consider prescribing it on a case-by-case basis, and should indicate in the Final EIS when they might be required.⁹⁸

For HRG surveys, BOEM must require a sufficient number of competent, trained visual observers. Requiring only one trained observer, as proposed in Appendix C

⁹⁶ Stone, C.J., The effects of seismic surveys on marine mammals in UK waters: 1998-2000 (2003) (Joint Nature Conservation Committee Report 323); *see also* Parsons et al., A critique of the UK's JNCC seismic survey guidelines, *supra*. It is worth noting that the "inexperienced" marine mammal observers involved in the UK study usually still received some basic training. Stone, The effects of seismic surveys, *supra*.

⁹⁷ *Id.*; Gillespie, D., Gordon, J., Mchugh, R., McLaren, D., Mellinger, D.K., Redmond, P., Thode, A., Trinder, P., and Deng, X.Y., PAMGUARD: semiautomated, open source software for real-time acoustic detection and localization of cetaceans, *Proceedings of the Institute of Acoustics* 30(5) (2008).

⁹⁸ We fully support efforts by NMFS, BOEM, the Office of Naval Research and others to develop unmanned planes for offshore aerial monitoring (*see* PDEIS at C-27), but unfortunately that is no substitute at the present time for manned aircraft.

(DPEIS at C-16), is simply not adequate to maintain a steady visual watch for more than two hours or to effectively monitor in all directions around the sound source.⁹⁹ At least two observers should be required to have any chance of effectively spotting marine mammals on both sides of the survey vessel.

(11) Limiting activities in low-visibility conditions.— The DPEIS does not consider limiting activities in low-visibility conditions, which, as the agencies acknowledged in their Arctic DPEIS for exploration activities, can reduce the risk of ship-strikes and near-field noise exposures.¹⁰⁰ Anticipating BOEM's objection, however, it may be said that the agencies' categorical rejection of this measure in the Arctic context is flawed. *First*, they suggest (correctly) that the restriction could extend the duration of a survey and thus the potential for cumulative disturbance of wildlife; but this concern would not apply in circumstances, such as in the right whale migratory corridor, where the prime mitigation concern is migratory species. *Second*, while they suggest that the requirement would be expensive to implement, they do not consider the need to reduce ship-strike risk in heavily-used migratory corridors in order to justify authorization of an activity under the IHA process.¹⁰¹ At the very least, BOEM should commit to consider this measure on a case-by-case basis and to describe the conditions under which it might be required.

(12) Adequate long-term monitoring.— Numerous sources have called for thorough biological surveying before, during, and after seismic surveys in biologically important areas.¹⁰² And yet – remarkably for an activity that even BOEM estimates would take millions of marine mammals each year – the DPEIS does not set forth a long-term monitoring plan nor give any indication that one will be developed. By comparison, the U.S. Navy, when it embarked on regulatory compliance for Atlantic Fleet sonar training, began devising a long-term plan and entered into partnerships with Duke Marine Lab and others to begin vessel surveys, habitat modeling, and

⁹⁹ See Weir, C.R., and Dolman, S.J., Comparative review of the regional marine mammal mitigation guidelines implemented during industrial seismic surveys, and guidance towards a worldwide standard, *Journal of International Wildlife Law and Policy* 10: 1-27 (2007); Parsons, E.C.M., Dolman, S.J., Jasny, M., Rose, N.A., Simmonds, M.P., and Wright, A.J., A critique of the UK's JNCC seismic survey guidelines for minimising acoustic disturbance to marine mammals: Best practice? *Marine Pollution Bulletin* 58: 643-651 (2009).

¹⁰⁰ NMFS, Effects of Oil and Gas Activities in the Arctic Ocean, Draft Environmental Impact Statement at 4-160 to 4-153 (Dec. 2011).

¹⁰¹ IHAs cannot issue to activities with the potential to cause serious injury or mortality. 16 U.S.C. § 1371(a)(5)(D).

¹⁰² E.g., IWC Scientific Committee, Report of the Scientific Committee of the International Whaling Commission: Annex K: Report of the Standing Working Group on Environmental Concerns (2004); IWC Scientific Committee, Report of the Scientific Committee of the International Whaling Commission: Annex K: Report of the Standing Working Group on Environmental Concerns (2006); Parsons et al., A critique of the UK's JNCC seismic survey guidelines, *supra*; Weilgart, L. (ed.), Report of the workshop on alternative technologies to seismic airgun surveys for oil and gas exploration and their potential for reducing impacts on marine mammals, 31 Aug. – 1 Sept., 2009, Monterey, Calif. (2010) (available at www.oceanos-stiftung.org/oceanos/download.php?id=19); Weir and Dolman, Weir, C.R., and Dolman, S.J., Comparative review of the regional marine mammal mitigation guidelines implemented during industrial seismic surveys, and guidance towards a worldwide standard, *Journal of International Wildlife Law and Policy* 10: 1-27 (2007).

research in support of that effort.¹⁰³ Incredibly, the sum total of relevant BOEM research in the Atlantic since 2006 – other than for offshore alternative energy – consists of (1) a study of marine productivity across BOEM’s oil and gas planning areas – a national study in which the Atlantic was included, and (2) a study of sperm whale dive patterns. DPEIS at G-3.

The purpose of any monitoring program is to establish biological baselines, to determine long-term impacts on populations of target species, and to test whether the biological assumptions underlying the DPEIS are correct. There is no sign that BOEM has even begun to think about such a thing. Yet it is imperative that the agencies elaborate a monitoring plan now, during the NEPA process, since BOEM apparently refuses to apply to NMFS for a programmatic, 5-year rulemaking. We urge BOEM to begin consulting *immediately* with NMFS regional fisheries science centers as well as with non-government experts on the components of an effective plan.

We note that any meaningful long-term monitoring program should include passive acoustics. As has been the case in other regions, acoustic data can have enormous value in helping to define marine mammal distribution and abundance, detect impacts from noise-generating activities, and assess cumulative levels of noise exposure for purposes of adaptive management.¹⁰⁴ For example, PAM has served as a critical means of impact assessment for wind farm construction in Europe.¹⁰⁵ It provides an important supplemental source of information for some species, such as researchers have seen in Southern California, where passive acoustics have altered conclusions about baleen whale seasonality that were established on the basis of visual surveys alone. Real-time acoustic monitoring can also improve safety zone monitoring, particularly for cryptic, vocalizing species and for nighttime operations. Finally, PAM is also cost-effective, typically costing far less than visual surveys.¹⁰⁶

¹⁰³ U.S. Navy, Final Atlantic Fleet Active Sonar Training Environmental Impact Statement/ Overseas Environmental Impact Statement (2008).

¹⁰⁴ Hatch, L., Clark, C., Merrick, R., Van Parijs, S., Ponirakis, D., Schwehr, K., Thompson, M., and Wiley, D., Characterizing the relative contributions of large vessels to total ocean noise fields: A case study using the Garry E. Studds Stellwagen Bank National Marine Sanctuary, *Environmental Management* 42:735-752 (2008).; Clark et al., Acoustic masking in marine ecosystems as a function of anthropogenic sound sources; Clark, C.W., Ellison, W.T., Southall, B.L., Hatch, L., Van Parijs, S.M., Frankel, A., and Ponirakis, D., Acoustic masking in marine ecosystems: Intuitions, analysis, and implication, *Marine Ecology Progress Series* 395: 201-222 (2009). (e.g., Hatch et al. 2008; Clark et al. 2009)

¹⁰⁵ Evans, P.G.H. (Ed.), Proceedings of the ECS/ASCOBANS Workshop: Offshore wind farms and marine mammals: impacts and methodologies for assessing impacts, at 50-59, 64-65 (2007) (ECS Special Publication Series No. 49, available at www.wdcs.org/submissions_bin/wind_farm_workshop.pdf); see also Carstensen, J., Henriksen, O. D., and Teilmann, J., Impacts of offshore wind farm construction on harbour porpoises: acoustic monitoring of echolocation activity using porpoise detectors (T-PODs), *Mar. Ecol. Prog. Ser.* 321: 295-308 (2006).

¹⁰⁶ See Scientific Advisory Group for Navy Marine Species Monitoring, Workshop report and recommendations (2011) (available at www.cascadiaresearch.org/Navy MMM Scientific Advisory_group_report_May_2011.pdf) (report by experts convened by U.S. Navy, per NMFS regulation, to evaluate Navy’s range monitoring program for marine mammals).

(13) Adaptive management.— In justifying its decision not to delay seismic exploration, BOEM claims to have taken an “adaptive management approach that would incorporate new technology and improved mitigation measures as they are developed and proven efficacious.” DPEIS at 2-48. Yet nowhere in the DPEIS does the agency set forth the terms of an adaptive management program. Such a program, if it is not mere window-dressing, must include (1) a means of monitoring impacts on target species (see “Adequate long-term monitoring,” above), (2) a means of encouraging and developing mitigation measures (see, e.g., “Failure to develop a viable technology-based alternative,” above), and (3) a means of modifying the proposed action as new information and mitigation measures emerge. The DPEIS provides none of these elements. One can only draw, again, an invidious comparison with the Navy, whose activities throughout the U.S. EEZ include a long-term monitoring program and are subject to annual adaptive management review, on consultation with NMFS. *See, e.g.*, 74 Fed. Reg. 4844, 4854-4858, 4884-4885 (Jan. 27, 2009).¹⁰⁷ Nor does BOEM set forth a protocol for emergency review or suspension of activities, if serious unanticipated impacts, such as a mass stranding or a vessel collision with a right whale, are found to occur – a standard element of Navy sonar mitigation. *See, e.g.*, 50 C.F.R. 216.244(xxx).¹⁰⁸ Here as elsewhere, the agency must expand its analysis of alternatives and mitigation measures.

IV. IMPACTS ANALYSIS

A. Failure to Obtain Essential Information

It is undisputed that there are significant gaps in basic information about the mid- and south Atlantic regions, their wildlife, and the potential effects of noise and disturbance from oil and gas exploration.

NEPA regulations set out an “ordered process” for an agency preparing an EIS in the face of missing information. *Save Our Ecosystems v. Clark*, 747 F.2d 1240, 1244 (9th Cir. 1984). When there is incomplete information relevant to reasonably foreseeable significant adverse impacts that is essential to a reasoned choice among alternatives, an agency must obtain and include the missing information in the EIS if the overall costs of obtaining it are not exorbitant. 40 C.F.R. § 1502.22. If the costs are exorbitant or the means to obtain the information are unknown, agencies must provide in the EIS a number of responses including, a “summary of existing credible scientific evidence” and an evaluation of impacts “based upon theoretical approaches or research methods generally accepted in the scientific community.” *Id.* at § 1502.22(b).

¹⁰⁷ The agencies use MMPA as their vehicle in the Navy context, but of course a different adaptive management scheme could be established through the NEPA process.

¹⁰⁸ *See also, e.g.*, NMFS, Stranding response plan for major Navy training exercises in the AFAST Study Area (2009) (available at www.nmfs.noaa.gov/pr/permits/afast_stranding_protocol_final.pdf).

The regulation furthers NEPA's purpose of ensuring that agencies make "fully informed and well-considered decision[s]," its mandate of "widespread discussion and consideration of the environmental risks and remedies associated with [a] pending project", and its "require[ment] that this evaluation take place *before* a project is approved." *Vt. Yankee Nuclear Power Corp. v. Natural Resources Def. Council*, 435 U.S. 519, 558 (1978) ("fully informed and well-considered decision[s]"; *LaFlamme v. FERC*, 852 F.2d 389, 398 (9th Cir. 1988) (internal quotation marks omitted).

The DPEIS cites to the applicable Council of Environmental Quality ("CEQ") regulation and maintains that it identifies those areas where information is unavailable to support a thorough evaluation of the environmental consequences of the alternatives. *See* DPEIS at 4-6. In fact, however, the document evades the analysis that § 1502.22 requires. In the first place, it fails to identify certain obvious gaps in information – such as important habitat areas for marine mammals – essential to a reasoned choice among alternatives. Beyond this, its modus operandi is to acknowledge major information gaps on virtually every topic under analysis, then insist – without any specific findings about their significance for the agencies' decisionmaking – that BOEM agency has an adequate basis for proceeding. *See, e.g.*, PDEIS at 4-46 (masking in marine mammals), 4-47 to 4-49 (stress and behavioral impacts in marine mammals), 4-79 (behavioral impacts on sea turtles). This approach simply does not satisfy NEPA.

The DPEIS, and the DPEIS that NMFS and BOEM recently prepared for the Arctic, reveal in many instances that relevant studies are already underway, indicating that obtaining essential information is not cost prohibitive. For example, a study undertaken by BP, the North Slope Borough, and the University of California "will help better understand masking and the effects of masking on marine mammals[.]"¹⁰⁹ NOAA has convened working groups on Underwater Sound Field Mapping and Cetacean Density and Distribution Mapping throughout the U.S. territorial sea and exclusive economic zone, including virtually the entirety of the present study area, for purposes of improving cumulative impact analysis and mitigation measures.¹¹⁰ BOEM has an Environmental Studies Program that includes several relevant studies (though few specific to the Atlantic) and, more importantly, should serve as a vehicle for targeted research. *See* DPEIS at Appendix G. As the Ninth Circuit recently found, agencies have an obligation pursuant to NEPA "to ensure that data exists *before approval*" so that decisionmakers can "understand the adverse environmental effect *ab initio*." *Northern Plains Resource Council v. Surface Transport. Bd.*, --- F.3d ---, 2011 WL 6826409, *14 (9th Cir. Dec. 29, 2011) (emphasis in original). BOEM has not done so here.

B. Failure to Set Proper Thresholds for Marine Mammal Take

As a comment letter from Duke Marine Lab has noted, the DPEIS has vastly underestimated marine mammal take from the proposed activity. The reasons for this are manifold, but lie principally in the agency's mistaken adoption of a 160 dB threshold for Level B take and its

¹⁰⁹ NMFS, Effects of Oil and Gas Activities in the Arctic Ocean: Draft Environmental Impact Statement at 4-88 (Dec. 2011).

¹¹⁰ *Id.* at ES-34.

failure to calculate impacts from masking. Nor has BOEM performed a sensitivity analysis to determine how significantly its take and impact estimates would differ if some of its core assumptions – such as its 160 dB threshold – are wrong.

1. Illegal threshold for behavioral take

The DPEIS uses a single sound pressure level (160 dB re 1 μ Pa (RMS)) as a threshold for behavioral, sublethal take in all marine mammal species from seismic airguns. This approach simply does not reflect the best available science, and the choice of threshold is not sufficiently conservative in several important respects. Indeed, five of the world's leading biologists and bioacousticians working in this field recently characterized the present threshold, in a comment letter to BOEM and NMFS, as “overly simplified, scientifically outdated, and artificially rigid.”¹¹¹ See 40 C.F.R. § 1502.22. BOEM must use a more conservative threshold for the following reasons:

- (a) The method represents a major step backward from recent programmatic authorizations. For Navy sonar activity, NMFS has used a combination of specific bright-line thresholds (for harbor porpoises) and linear risk functions that endeavor to take account of risk and individual variability and to reflect the potential for take at relatively low levels.¹¹² In the wake of these past authorizations for acoustic impacts on marine mammals, the agencies' reversion to a single, non-conservative, bright-line threshold for all species is simply not tenable.
- (b) The 160 dB threshold is non-conservative, since the scientific literature establishes that behavioral disruption can occur at substantially lower received levels for some species.

For example, a single seismic survey has been shown to cause endangered fin and humpback whales to stop vocalizing – a behavior essential to breeding and foraging – over an area at least 100,000 square nautical miles in size, and can cause baleen whales to abandon habitat over the same scale.¹¹³ (Similarly, a low-frequency, high-amplitude fish mapping device was recently found to silence humpback whales at distance of 200 km, where received levels ranged from 88 to 110 dB.)¹¹⁴ Sperm whale foraging success, as measured by buzz rate, appears to decline significantly on exposure to airgun received levels above 130 dB (RMS), with potentially serious

¹¹¹ Clark, C., Mann, D., Miller, P., Nowacek, D., and Southall, B., Comments on Arctic Ocean Draft Environmental Impact Statement at 2 (Feb. 28, 2012).

¹¹² E.g., 74 Fed. Reg. 4844, 4844-4885 (Jan. 27, 2009).

¹¹³ Clark, C.W., and Gagnon, G.C., Considering the temporal and spatial scales of noise exposures from seismic surveys on baleen whales (2006) (IWC Sci. Comm. Doc. IWC/SC/58/E9); Clark, C.W., pers. comm. with M. Jasny, NRDC (Apr. 2010); see also MacLeod, K., Simmonds, M.P., and Murray, E., Abundance of fin (*Balaenoptera physalus*) and sei whales (*B. borealis*) amid oil exploration and development off northwest Scotland, *Journal of Cetacean Research and Management* 8: 247-254 (2006).

¹¹⁴ Risch, D., Corkeron, P.J., Ellison, W.T., and van Parijs, S.M., Changes in humpback whale song occurrence in response to an acoustic source 200 km away, *PLoS ONE* 7(1): e29741. doi:10.1371/journal.pone.0029741 (2012).

long-term consequences.¹¹⁵ Harbor porpoises are known to be acutely sensitive to a range of anthropogenic sources, including airguns. They have been observed to engage in avoidance responses fifty miles from a seismic airgun array – a result that is consistent with both captive and wild animal studies showing them abandoning habitat in response to pulsed sounds at very low received levels, well below 120 decibels (re 1 μ Pa (RMS)).¹¹⁶ Bowhead whales migrating through the Beaufort Sea have shown almost complete avoidance at airgun received levels at 120-130 dB (RMS) and below;¹¹⁷ for this reason BOEM has stated in past Arctic lease sale EISs that most bowheads “would be expected to avoid an active source vessel at received levels as low as 116 to 135 dB re 1 μ Pa when migrating.¹¹⁸ Beluga whales are highly sensitive to a range of low-frequency and low-frequency dominant anthropogenic sounds, including seismic airgun noise, which has been shown to displace belugas from near-coastal foraging areas out beyond the 130 dB (RMS) isopleth.¹¹⁹

¹¹⁵ Miller, P.J.O., Johnson, M.P., Madsen, P.T., Biassoni, N., Quero, M., and Tyack, P.L., Using at-sea experiments to study the effects of airguns on the foraging behavior of sperm whales in the Gulf of Mexico, *Deep-Sea Research I* 56: 1168-1181 (2009).

¹¹⁶ E.g., Bain, D.E., and Williams, R., Long-range effects of airgun noise on marine mammals: responses as a function of received sound level and distance (2006) (IWC Sci. Comm. Doc. IWC/SC/58/E35); Kastelein, R.A., Verboom, W.C., Jennings, N., and de Haan, D., Behavioral avoidance threshold level of a harbor porpoise (*Phocoena phocoena*) for a continuous 50 kHz pure tone, *Journal of the Acoustical Society of America* 123: 1858-1861 (2008); Kastelein, R.A., Verboom, W.C., Muijsers, M., Jennings, N.V., and van der Heul, S., The influence of acoustic emissions for underwater data transmission on the behavior of harbour porpoises (*Phocoena phocoena*) in a floating pen, *Mar. Environ. Res.* 59: 287-307 (2005); Olesiuk, P.F., Nichol, L.M., Sowden, M.J., and Ford, J.K.B., Effect of the sound generated by an acoustic harassment device on the relative abundance and distribution of harbor porpoises (*Phocoena phocoena*) in Retreat Passage, British Columbia, *Mar. Mamm. Sci.* 18: 843-862 (2002).

¹¹⁷ Miller, G.W., Elliot, R.E., Koski, W.R., Moulton, V.D., and Richardson W.J., Whales, in Richardson W.J. (ed.), *Marine Mammal and Acoustical Monitoring of Western Geophysical's Open-Water Seismic Program in the Alaskan Beaufort Sea*, 1998 (1999); Richardson, W.J., Miller, G.W., and Greene Jr., C.R., Displacement of migrating bowhead whales by sounds from seismic surveys in shallow waters of the Beaufort Sea, *Journal of the Acoustical Society of America* 106:2281 (1999).

¹¹⁸ See, e.g., Beaufort Sea and Chukchi Sea Planning Areas Oil and Gas Lease Sales 209, 212, 217, and 221: Draft Environmental Impact Statement (2008) (OCS EIS/EA MMS 2008-0055); 71 Fed. Reg. 66,912, 66,913 (2006). although bowheads appear less aversive while feeding, the Arctic EIS rightly acknowledges that they may be “so highly motivated to remain in a productive feeding area” that they experience adverse effects and increased chronic stress. NMFS, Effects of Oil and Gas Activities in the Arctic Ocean, Draft Environmental Impact Statement at 4-99 (Dec. 2011).

¹¹⁹ Miller, G.W., Moulton, V.D., Davis, R.A., Holst, M., Millman, P., MacGillivray, A., and Hannay, D., Monitoring seismic effects on marine mammals—southeastern Beaufort Sea, 2001-2002, in Armsworthy, S.L., et al. (eds.), *Offshore oil and gas environmental effects monitoring/Approaches and technologies*, at 511-542 (2005). See also Findley, K.J., Miller, G.W., Davis, R.A., and Greene, C.R., Jr., Reactions of belugas, *Delphinapterus leucas*, and narwhals, *Monodon monoceros*, to ice-breaking ships in the Canadian high Arctic, *Can. J. Fish. Aquat. Sci.* 224: 97-117 (1990); Cosens, S.E., and Dueck, L.P., Ice breaker noise in Lancaster Sound, NWT, Canada: implications for marine mammal behavior, *Mar. Mamm. Sci.* 9: 285-300 (1993); Fraker, M.A., The 1976 white whale monitoring program, MacKenzie estuary, report for Imperial Oil, Ltd., Calgary (1977); Fraker, M.A., The 1977 white whale monitoring program, MacKenzie estuary, report for Imperial Oil, Ltd., Calgary (1977); Fraker, M.A., The 1978 white whale monitoring program, MacKenzie estuary, report for Imperial Oil, Ltd., Calgary (1978); Stewart, B.S., Evans, W.E., and Awbrey, F.T., Effects of man-made water-borne noise on the behaviour of beluga whales, *Delphinapterus leucas*, in Bristol Bay, Alaska, Hubbs Sea World (1982) (report 82-145 to NOAA); Stewart, B.S., Awbrey, F.T., and Evans, W.E., Belukha whale (*Delphinapterus leucas*) responses to industrial noise in Nushagak

Beaked whales, though never tested experimentally for their response to airgun noise, have shown themselves to be sensitive to various types of anthropogenic sound, going silent, abandoning their foraging, and avoiding sounds at levels of 140 dB and potentially well below.¹²⁰ And these are merely examples, consistent with the broader literature. *See, e.g.*, DPEIS at 4-49.

Little if any of these data were available in 1999, when the High Energy Seismic Survey panel issued the report on which the 160 dB threshold is purportedly based;¹²¹ since that time, the literature on ocean noise has expanded enormously due to massive increases in research funding from the U.S. Navy, the oil and gas industry, and other sources. The evidentiary record for a lower threshold in this case substantially exceeds the one for mid-frequency sonar in *Ocean Mammal Institute v. Gates*, 546 F. Supp.2d 960, 973-75 (D.Hawaii 2008), in which a Hawaiian District Court judge invalidated a NMFS threshold that ignored documented impacts at lower received levels as arbitrary and capricious.

- (c) The use of a multi-pulse standard for behavior harassment is non-conservative, since it does not take into account the spreading of seismic pulses over time beyond a certain distance from the array.¹²² NMFS' own Open Water Panel for the Arctic – which has included some of the country's leading marine bioacousticians – has twice characterized the seismic airgun array as a mixed impulsive/continuous noise source and has stated that NMFS should evaluate its impacts on that basis.¹²³ That analysis is supported by the masking effects model referenced above, in which several NMFS scientists have participated; by a number of papers showing that seismic exploration in the Arctic, the east Atlantic, off Greenland, and off Australia has raised ambient noise levels at significant distances from the array;¹²⁴ and, we expect, by the

Bay, Alaska: 1983 (1983); Edds, P.L., and MacFarlane, J.A.F., Occurrence and general behavior of balaenopterid cetaceans summering in the St. Lawrence estuary, *Canada, Can. J. Zoo.* 65: 1363-1376 (1987).

¹²⁰ Soto, N.A., Johnson, M., Madsen, P.T., Tyack, P.L., Bocconcelli, A., and Borsani, J.F., Does intense ship noise disrupt foraging in deep-diving Cuvier's beaked whales (*Ziphius cavirostris*)? *Mar. Mamm. Sci.* 22: 690-699 (2006); Tyack, P.L., Zimmer, W.M.X., Moretti, D., Southall, B.L., Claridge, D.E., Durban, J.W., Clark, C.W., D'Amico, A., DiMarzio, N., Jarvis, S., McCarthy, E., Morrissey, R., Ward, J., and Boyd, I.L., Beaked whales respond to simulated and actual Navy sonar, *PLoS ONE* 6(3):e17009.doi:10.13371/journal.pone.0017009 (2011) (beaked whales); California State Lands Commission, Draft Environmental Impact Report (EIR) for the Central Coastal California Seismic Imaging Project at H-47 (2012) (CSLC EIR No. 758).

¹²¹ High Energy Seismic Survey Team, High energy seismic survey review process and interim operational guidelines for marine surveys offshore Southern California (1999).

¹²² *See* Expert Panel Review 2011.

¹²³ *Id.*; *see also* Expert Panel Review 2010.

¹²⁴ Gedamke, J., Ocean basin scale loss of whale communication space: potential impacts of a distant seismic survey, Biennial Conference on the Biology of Marine Mammals, November-December 2011, Tampa, FL (2011) (abstract); Nieukirk, S.L., Klinck, H., Klinck, K., Mellinger, D.K., and Dziak, R.P., Seismic airgun sounds and whale vocalization recorded in the Fram Strait and Greenland Sea, Biennial Conference on the Biology of Marine Mammals, November-December 2011, Tampa, FL (2011) (abstract); Nieukirk, S.L., Mellinger, D.K., Moore, S.E., Klinck, K., Dziak, R.P., Goslin, J., Sounds from airguns and fin whales recorded in the mid-Atlantic Ocean, 1999-2009, *Journal of the Acoustical Society of America* 131:1102- 1112 (2012); Nieukirk, S.L., Stafford, K.M.,

modeling efforts of NOAA's Sound Mapping working group, whose public release is supposed to occur in early July. BOEM cannot ignore this science.

- (d) The threshold's basis in the root mean square ("RMS") of sound pressure, rather than in peak pressure, is non-conservative. Studies have criticized the use of RMS for seismic because of the degree to which pulsed sounds must be "stretched," resulting in significant potential underestimates of marine mammal take (see below).¹²⁵

NMFS must revise the thresholds and methodology used to estimate take from airgun use. Specifically, we urge the following:

- (a) NMFS should employ a combination of specific thresholds for which sufficient species-specific data are available and generalized thresholds for all other species.¹²⁶ These thresholds should be expressed as linear risk functions where appropriate. If a single risk function is used for most species, the 50% take parameter for all the baleen whales and odontocetes occurring in the area should not exceed 140 dB (RMS), per the February 2012 recommendation from Dr. Clark and his colleagues. At least for sensitive species such as harbor porpoises and beaked whales, BOEM should use a threshold well below that number, reflecting the high levels of disturbance seen in these species at 120 dB (RMS) and below. Recent analysis by the California State Lands Commission provides another alternative, differentiating among low-frequency, mid-frequency, and high-frequency cetaceans in a manner that is generally consistent with Southall et al (2007).¹²⁷
- (b) Data on species for which specific thresholds are developed should be included in deriving generalized thresholds for species for which less data are available.
- (c) In deriving its take thresholds, NMFS should treat airgun arrays as a mixed acoustic type, behaving as a multi-pulse source closer to the array and, in effect, as a continuous noise source further from the array, per the findings of the 2011 Open Water Panel cited above.
- (d) Behavioral take thresholds for the impulsive component of airgun noise should be based on peak pressure rather than on RMS, or dual criteria based on both peak

Mellinger, D.K., Dziak, R.P., and Fox, C.G., Low-frequency whale and seismic airgun sounds recorded in the mid-Atlantic Ocean, *Journal of the Acoustical Society of America* 115: 1832-1843 (2004); Roth, E.H., Hildebrand, J.A., Wiggins, S.M., and Ross, D., Underwater ambient noise on the Chukchi Sea continental slope, *Journal of the Acoustical Society of America* 131:104-110 (2012).

¹²⁵ Madsen, P.T., Marine mammals and noise: Problems with root-mean-squared sound pressure level for transients, *Journal of the Acoustical Society of America* 117:3952-57 (2005).

¹²⁶ By "thresholds," we mean either bright-line thresholds or linear risk functions.

¹²⁷ California State Lands Commission, Draft Environmental Impact Report at Chap. 4.4 and App. H, *supra*; see also Southall, B.L., Bowles, A.E., Ellison, W.T., Finneran, J.J., Gentry, R.L., Greene, C.R., Jr., Kastak, D., Ketten, D.R., Miller, J.H., Nachtigall, P.E., Richardson, W.J., Thomas, J.A., and Tyack, P.L., Marine mammal noise exposure criteria: Initial scientific recommendations, *Aquatic Mammals* 33:411-521 (2007).

pressure and RMS should be used. Alternatively, BOEM should use the most biologically conservative method of calculating RMS, following Madsen (2005). (See section IV.C. below for additional detail.)

2. Failure to analyze masking effects or set thresholds for masking

The DPEIS fails to consider masking effects, either from continuous noise sources such as ships or from mixed impulsive/continuous noise sources such as airguns. Some biologists have analogized the increasing levels of noise from human activities to a rising tide of “smog” that is already shrinking the sensory range of marine animals by orders of magnitude from pre-industrial levels. DPEIS at 3-43 (citing Clark et al. 2007).¹²⁸ Masking of natural sounds begins when received levels rise above ambient noise at relevant frequencies.¹²⁹ Accordingly, BOEM must evaluate the loss of communication space – and consider the extent of acoustic propagation – at far lower received levels than the DPEIS currently employs.

Researchers at NOAA and Cornell have created a model that quantifies impacts on the communication space of marine mammals. That published model has already been applied to shipping noise off Massachusetts and off British Columbia, and the same researchers involved in the Massachusetts study have applied it to airgun surveys as well.¹³⁰ Additionally, researchers at BP, working with colleagues at the University of California and the North Slope Borough, are applying the model to an analysis of masking effects from seismic operations in the Beaufort Sea.¹³¹ Remarkably, the DPEIS – instead of applying the Cornell/NOAA model – simply states without any discernible support that masking effects on marine mammals would be “minor,”

¹²⁸ See also Bode, M., Clark, C.W., Cooke, J., Crowder, L.B., Deak, T., Green, J.E., Greig, L., Hildebrand, J., Kappel, C., Kroeker, K.J., Loseto, L.L., Mangel, M., Ramasco, J.J., Reeves, R.R., Suydam, R., Weilgart, L., Statement to President Barack Obama of Participants of the Workshop on Assessing the Cumulative Impacts of Underwater Noise with Other Anthropogenic Stressors on Marine Mammals (2009); Clark, C., and Southall, B., Turn down the volume in the ocean, *CNN.com*, Jan. 20, 2012, available at www.cnn.com/2012/01/19/opinion/clark-southall-marine/index.html; McDonald, M.A., Hildebrand, J.A., and Wiggins, S.M., Increases in deep ocean ambient noise in the Northeast Pacific west of San Nicolas Island, California, *Journal of the Acoustical Society of America* 120: 711-718 (2006).

¹²⁹ Clark, C.W., Ellison, W.T., Southall, B.L., Hatch, L., van Parijs, S., Frankel, A., and Ponirakis, D., Acoustic masking in marine ecosystems as a function of anthropogenic sound sources (2009) (IWC Sci. Comm. Doc. SC/61/E10); Clark, C.W., Ellison, W.T., Southall, B.L., Hatch, L., Van Parijs, S.M., Frankel, A., and Ponirakis, D., Acoustic masking in marine ecosystems: intuitions, analysis, and implication, *Marine Ecology Progress Series* 395: 201-222 (2009). See also Castellote, M., Clark, C.W., and Lammers, M.O., Potential negative effects in the reproduction and survival on fin whales (*Balaenoptera physalus*) by shipping and airgun noise (2010) (IWC Scientific Committee Doc. No. SC/62/E3).

¹³⁰ Clark, C.W., Ellison, W.T., Southall, B.L., Hatch, L., van Parijs, S., Frankel, A., and Ponirakis, D., Acoustic masking in marine ecosystems as a function of anthropogenic sound sources (2009) (IWC Sci. Comm. Doc. SC/61/E10); Clark, C.W., Ellison, W.T., Southall, B.L., Hatch, L., Van Parijs, S.M., Frankel, A., and Ponirakis, D., Acoustic masking in marine ecosystems: intuitions, analysis, and implication, *Marine Ecology Progress Series* 395: 201-222 (2009); Williams, R., Ashe, E., Clark, C.W., Hammond, P.S., Lusseau, D., and Ponirakis, D., Inextricably linked: boats, noise, Chinook salmon and killer whale recovery in the northeast Pacific, presentation given at the Society for Marine Mammalogy Biennial Conference, Tampa, Florida, Nov. 29, 2011 (2011).

¹³¹ Fleishman, E., and Streever, B., Assessment of cumulative effects of anthropogenic underwater sound: project summary and status, at 2 (2012).

meaning neither extensive nor severe. DPEIS at 4-44. Furthermore, it asserts that its mitigation protocol would “reduce the potential for masking” by excluding some marine mammals from the narrow safety zone that BOEM would establish around the seismic array (DPEIS at 4-47) – a statement that evinces a fundamental misunderstanding of how airgun noise propagates.

Assessing masking effects is essential to a reasoned consideration of impacts and alternatives, and BOEM’s failure even to apply a relevant, published model that NOAA’s scientists helped develop and that is being used by NOAA, Cornell, BP, the North Slope Borough, the University of California, and St. Andrews University in other regions plainly violates NEPA.

3. Failure to set proper thresholds for hearing loss

The DPEIS appears to estimate cases of temporary threshold shift, or hearing loss, in two ways: by using the original NMFS threshold of 180 dB (SPL), and by applying the hybridized standards set forth in Southall et al. (2007) for different marine mammal functional hearing groups.¹³² Unfortunately, BOEM’s particular use of Southall et al. (2007) neglects the modifications that have since been made to these standards, by Dr. Southall and the U.S. Navy, in light of new scientific information.

First, BOEM must modify its standard for high-frequency cetaceans to account for new threshold shift data on harbor porpoises. The new data show that harbor porpoises experience threshold shift on exposure to airgun signals at substantially lower levels than the two mid-frequency cetaceans (bottlenose dolphins and beluga whales) on which the Southall et al. acoustic criteria were based.¹³³ Given similarities between the harbor porpoise ear and that of other high-frequency cetaceans, both the U.S. Navy – in its recent DEISs for the Atlantic Fleet and the Southern California and Hawaii Range Complexes, and in a related technical report prepared by SPAWAR – and Dr. Southall and colleagues from St. Andrew’s University, in their Environmental Impact Report for a seismic survey off the central California coast, have significantly reduced the temporary and permanent threshold shift criteria for all high-frequency cetaceans.¹³⁴ BOEM must do the same.

¹³² Southall, B.L., Bowles, A.E., Ellison, W.T., Finneran, J.J., Gentry, R.L., Greene, C.R., Jr., Kastak, D., Ketten, D.R., Miller, J.H., Nachtigall, P.E., Richardson, W.J., Thomas, J.A., and Tyack, P.L., Marine mammal noise exposure criteria: Initial scientific recommendations, *Aquatic Mammals* 33:411-521 (2007).

¹³³ Lucke, K., Siebert, U., Lepper, P.A., and Blanchet, M.-A., Temporary shift in masked hearing thresholds in a harbor porpoise (*Phocoena phocoena*) after exposure to seismic airgun stimuli, *Journal of the Acoustical Society of America* 125: 4060-4070 (2009).

¹³⁴ Finneran, J.J., and Jenkins, A.K., Criteria and thresholds for U.S. Navy acoustic and explosive effects analysis (Apr. 2012) (available at the afteis.com website); Navy, Draft Environmental Impact Statement/ Overseas Environmental Impact Statement for Atlantic Fleet Training and Testing (2012); Navy, Hawaii-Southern California Training and Testing Activities Draft Environmental Impact Statement/ Overseas Environmental Impact Statement (2012); California State Lands Commission, Draft Environmental Impact Report (EIR) for the Central Coastal California Seismic Imaging Project at Chap. 4.4 and App. H (2012) (CSLC EIR No. 758) (includes report from Dr. Southall and colleagues at St. Andrews University).

Second, and similarly, BOEM must modify its Southall et al. standard for low-frequency cetaceans: the baleen whales. New data from SPAWAR indicates that mid-frequency cetaceans have greater sensitivity to sounds within their best hearing range than was supposed at the time Southall et al. was published.¹³⁵ It is both conservative and consistent with the methodology of that earlier paper to assume that low-frequency cetaceans, which have never been studied for threshold shift, also have greater sensitivity to sounds within their own best hearing range.¹³⁶ For this reason and others, Dr. Southall and his St. Andrew's colleagues reduced the threshold shift criteria for baleen whales exposed to airgun noise, in the report they recently produced for the California State Lands Commission.¹³⁷ Again, BOEM should do the same.

Hearing loss remains a very significant risk where, as here, the agency has not required aerial or passive acoustic monitoring as standard mitigation, appears unwilling to restrict operations in low-visibility conditions, has set safety zone bounds that are inadequate to protect high-frequency cetaceans, and has not firmly established seasonal exclusion areas for biologically important habitat. BOEM should take a conservative approach and apply the more precautionary standard, once the necessary modifications to Southall et al. (2007) have been made.

4. Failure to set proper thresholds for mid-frequency sources

BOEM has also failed to set appropriate take thresholds for sub-bottom profilers and other active acoustic sources.

As NMFS's Open Water Panel has indicated, some sub-bottom profilers used in Arctic oil and gas surveys have source levels and frequency ranges approaching that of certain active military sonar systems, with shorter intervals between pings.¹³⁸ Indeed, the chirp systems analyzed in the DPEIS (DPEIS at D-28) have threshold source levels close to that of the Navy's SQS-56 mid-frequency, hull-mounted sonar.¹³⁹ Additionally, these levels vastly exceed those analyzed for similar chirp systems used in HRG surveys for renewables, according to BOEM's recent programmatic EA for mid-Atlantic offshore wind.¹⁴⁰ BOEM's use of a 160 dB threshold under these circumstances is inappropriate. While we do not recommend the application of the Navy's generalized risk functions for mid-frequency sonar, enough data are available for some taxa to indicate species-specific thresholds. For purposes of authorizing mid-frequency sonar training, NMFS assumes that harbor porpoises are taken at received levels above 120 dB (RMS); and the Navy has adopted a 140 dB (RMS) threshold for beaked whales based on the findings of Tyack

¹³⁵ Finneran and Jenkins, Criteria and thresholds, *supra*.

¹³⁶ See discussion in California State Lands Commission, Draft Environmental Impact Report at H-46, *supra*.

¹³⁷ *Id.* at 4.4-49 to 4-50 and H-46; see also PDEIS at 4-51 (noting need to reassess TTS in light of SPAWAR data).

¹³⁸ See Expert Panel Review 2011.

¹³⁹ See, e.g., 74 Fed. Reg. 4,844 (Jan. 27, 2009); U.S. Navy, Final Atlantic Fleet Active Sonar Training Environmental Impact Statement/ Overseas Environmental Impact Statement (2008).

¹⁴⁰ Cf. BOEM, Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore New Jersey, Delaware, Maryland, and Virginia: Final Environmental Assessment at 28 (2012) (OCS EIS/EA BOEM 2012-003). The chirpers analyzed for wind farm HRG surveys have a source level of 201 dB.

et al. (2011).¹⁴¹ At minimum, BOEM should adopt these specific thresholds for the mid-frequency acoustic sources considered in the DPEIS.

Furthermore, while the DPEIS does not provide ping intervals for sub-bottom profilers, the EA suggests that these sources may sound several times each second. It would be absurd to treat them as non-continuous sources.

C. Failure to Set Adequate Source Levels for Propagation Analysis

The DPEIS posits 230 dB (RMS) as a representative source level for purposes of modeling takes from large airgun arrays and 210 dB (RMS) for modeling takes from small arrays. DPEIS at 3-26. We see two significant issues with these assumptions.

First, as with behavioral risk thresholds, using the root mean square (“RMS”) rather than peak pressure to estimate source levels for airguns is non-conservative and may not be biologically appropriate. The issue is not trivial: as Madsen 2005 observes, the RMS approach can result in underestimates of take of intense, impulsive sounds, depending on which method is used to calculate RMS and whether propagation takes place in a highly reverberant environment.¹⁴² We recommend that BOEM use peak-pressure, or dual criteria of peak-pressure and RMS, to determine behavioral take for the impulsive component of the airgun source. Alternatively – and at the very least – BOEM should use the most biologically conservative method of determining RMS. According to Madsen’s analysis, that method is likely to be the one followed by Madsen

¹⁴¹ *Id.*; Tyack, P.L., Zimmer, W.M.X., Moretti, D., Southall, B.L., Claridge, D.E., Durban, J.W., Clark, C.W., D’Amico, A., DiMarzio, N., Jarvis, S., McCarthy, E., Morrissey, R., Ward, J., and Boyd, I.L., Beaked whales respond to simulated and actual Navy sonar, *PLoS ONE* 6(3):e17009.doi:10.13371/journal.pone.0017009 (2011) (beaked whales). See also Miller, P.J., Kvadsheim, P., Lam, F.-P.A., Tyack, P.L., Kuningas, S., Wensveen, P.J., Antunes, R.N., Alves, A.C., Kleivane, L., Ainslie, M.A., and Thomas, L., Developing dose-response relationships for the onset of avoidance of sonar by free-ranging killer whales (*Orcinus orca*), presentation given at the Society for Marine Mammalogy Biennial Conference, Tampa, Florida, Dec. 2, 2011 (killer whales); Miller, P., Antunes, R., Alves, A.C., Wensveen, P., Kvadsheim, P., Kleivane, L., Nordlund, N., Lam, F.-P., van IJsselmuide, S., Visser, F., and Tyack, P., The 3S experiments: studying the behavioural effects of navy sonar on killer whales (*Orcinus orca*), sperm whales (*Physeter macrocephalus*), and long-finned pilot whales (*Globicephala melas*) in Norwegian waters, Scottish Oceans Institute Tech. Rep. SOI-2011-001, available at soi.st-andrews.ac.uk (killer whales). See also, e.g., Fernández, A., Edwards, J.F., Rodríguez, F., Espinosa de los Monteros, A., Herráez, P., Castro, P., Jaber, J.R., Martín, V., and Arbelo, M., ‘Gas and Fat Embolic Syndrome’ Involving a Mass Stranding of Beaked Whales (Family Ziphiidae) Exposed to Anthropogenic Sonar Signals, *Veterinary Pathology* 42:446 (2005); Jepson, P.D., Arbelo, M., Deaville, R., Patterson, I.A.P., Castro, P., Baker, J.R., Degollada, E., Ross, H.M., Herráez, P., Pocknell, A.M., Rodríguez, F., Howie, F.E., Espinosa, A., Reid, R.J., Jaber, J.R., Martín, V., Cunningham, A.A., and Fernández, A., Gas-Bubble Lesions in Stranded Cetaceans, 425 *Nature* 575-576 (2003); Evans, P.G.H., and Miller, L.A., eds., Proceedings of the Workshop on Active Sonar and Cetaceans (2004) (European Cetacean Society publication); Southall, B.L., Braun, R., Gulland, F.M.D., Heard, A.D., Baird, R.W., Wilkin, S.M., and Rowles, T.K., Hawaiian Melon-Headed Whale (*Peponacephala electra*) Mass Stranding Event of July 3-4, 2004 (2006) (NOAA Tech. Memo. NMFS-OPR-31).

¹⁴² Madsen, P.T., Marine mammals and noise: Problems with root-mean-squared sound pressure level for transients, *Journal of the Acoustical Society of America* 117:3952-57 (2005).

et al. (2002) and Møhl et al. (2003), which involves applying -3 dB end points relative to the wave form envelope.¹⁴³

Second, it is not self-evident that using a single representative or average source level for large or small arrays is a reasonable and sufficiently conservative approach to BOEM's take analysis. As the DPEIS recognizes, the effective source levels of industry arrays may run considerably higher or lower than the one used in its modeling, up to or beyond 255 dB (zero-to-peak) for a large array (DPEIS at D-12). Given that impact areas grow exponentially with increases in source levels, the undercount that would result from excluding surveys with higher source levels could significantly exceed the overcount that would result from excluding surveys with lower source levels. For this reason, BOEM should conduct a sensitivity analysis to ensure that any representative source level, or levels, chosen for modeling do not negatively bias the analysis towards an undercount of take. If there is negative bias, the agency should modify the source level, or levels, and either rerun the model or use a conservative corrective factor to estimate take.

D. Failure to Adequately Assess Impacts on the North Atlantic Right Whale

In its consideration of potential environmental impacts, the DPEIS rightly pays special attention to the highly endangered North Atlantic right whale (*Eubalaena glacialis*), which is considered to be one of the most endangered species of large whales in the world. Indeed, as the National Marine Fisheries Service ("NMFS") has repeatedly stated, "the loss of even a single individual [North Atlantic right whale] may contribute to the extinction of the species" and "preventing the mortality of one adult female a year" may alter this outcome. 69 Fed. Reg. 30,857, 30,858 (June 1, 2004); *see also* 73 Fed. Reg. 60,173, 60,173 (Oct. 10, 2008); 72 Fed. Reg. 34,632, 34,632 (June 25, 2007); 66 Fed. Reg. 50,390, 50,392 (Oct. 3, 2001).

The affected planning areas contain both the majority of the right whale's migratory corridor and the species' only known calving ground. NMFS has characterized the latter as "a location vital to the population" and "a very high-risk area for pregnant females, new mothers, and calves."¹⁴⁴ Waters from the Altamaha River in Georgia (north of Brunswick) to San Sebastian Inlet in Florida (south of Melbourne) are federally-designated as critical habitat, specifically to protect it. *See* 59 Fed. Reg. 28,793, 28,803 (June 3, 1994). In addition, these and other waters in the southeast have been designated as special management areas to protect right whales from significant threats, such as ship-strikes and gillnet fishing. *See, e.g.*, 73 Fed. Reg. 60,173; 72 Fed. Reg. 34,632. In September 2009, several major conservation organizations petitioned NMFS to expand right whale critical habitat, to include the migratory corridor within 30 nautical miles of shore (from the southern border of Massachusetts to the border between North and

¹⁴³ *Id.* *See also* Madsen, P.T., Møhl, B., Nielsen, B.K., and Wahlberg, M., "Male sperm whale behavior during exposures to distant seismic survey pulses," *Aquatic Mammals* 28:231-240 (2002); Møhl, B., Wahlberg, M., Madsen, P.T., Heerfordt, A., and Lund, A., "The monopulsed nature of sperm whale clicks," *Journal of the Acoustical Society of America* 114:1143-1154 (2003).

¹⁴⁴ NMFS, Final Environmental Impact Statement to Implement Vessel Operational Measures to Reduce Ship Strikes to North Atlantic Right Whales at 4-4 (Aug. 2008).

South Carolina) as well as additional calving areas adjacent to existing critical habitat, based on substantial new information about their biological importance.¹⁴⁵

As discussed above, a single seismic source can significantly reduce right whale communication range on a population scale. Recent modeling from Cornell and NOAA shows the right whale to be particularly vulnerable to masking effects from airguns and other low-frequency noise given the acoustic and behavioral characteristics of its calls.¹⁴⁶ Seismic surveys in the Mid-Atlantic and South Atlantic planning areas would add cumulatively to the high levels of noise that right whales already experience from commercial shipping in their foraging grounds and along their migratory route, from LNG tanker traffic through their northeast critical habitat, and from Navy antisubmarine warfare training, which is expected to increase near their calving grounds with the construction of a new instrumented training range off Jacksonville, Florida. The advent of airgun noise on top of these other acoustic intrusions could significantly affect right whale vital rates over large scales. For example, modeling of right whale foraging in the Great South Channel, an area subject to high levels of ship traffic, has found that decrements in the whales' sensory range had a larger impact on food intake than even patch-density distribution, and are likely to compromise fitness in this endangered species.¹⁴⁷

In addition to the threat of noise impacts to right whales, G&G surveying also poses the risk of increasing ship strikes, the leading cause of death for right whales. More than half (10 out of 14) of the post-mortem findings for right whales that died from significant trauma in the northwest Atlantic between 1970 and 2002 indicated that vessel collisions were a contributing cause of death (in the cases where presumed cause of death could be determined);¹⁴⁸ and these data are likely to grossly underestimate the actual number of animals struck, as animals struck but not recovered, or not thoroughly examined, cannot be accounted for.¹⁴⁹ Further, some types of anthropogenic noise have been shown to induce near-surfacing behavior in right whales, increasing the risk of ship-strike at relatively moderate levels of exposure, as noted in the next section below. It is possible that mid-frequency sub-bottom profilers and broadband airguns could produce the same effects, and both should be treated conservatively.

¹⁴⁵ Center for Biological Diversity, Defenders of Wildlife, Humane Society of the United States, Ocean Conservancy, and Whale and Dolphin Conservation Society, Petition to Revise the Critical Habitat Designation for the North Atlantic Right Whale (*Eubalaena Glacialis*) under the Endangered Species Act (Sept. 16, 2009) (submitted to Commerce and NOAA Fisheries).

¹⁴⁶ Clark et al., Acoustic masking in marine ecosystems as a function of anthropogenic sound sources; Clark et al., Acoustic masking in marine ecosystems: intuitions, analysis, and implication.

¹⁴⁷ Mayo, C.S., Page, M., Osterberg, D., and Pershing, A., On the path to starvation: The effects of anthropogenic noise on right whale foraging success, North Atlantic Right Whale Consortium: Abstracts of the Annual Meeting (2008).

¹⁴⁸ Moore, M. J., Knowlton, A.R., Kraus, S.D., McLellan, W.A., and Bonde, R.K., Morphometry, gross morphology and available histopathology in North Atlantic right whale (*Eubalena glacialis*) mortalities (1970-2002), *Journal of Cetacean Research and Management* 6:199-214 (2004).

¹⁴⁹ Reeves, R.R., Read, A., Lowry, L., Katona, S.K., and Boness, D.J., Report of the North Atlantic right whale program review, 13–17 March 2006, Woods Hole, Massachusetts (2007) (prepared for the Marine Mammal Commission).

While the DPEIS proposes two time-areas closures to reduce impacts on right whales, these measures are inadequate to address the impacts described here, for reasons discussed earlier in these comments. Nor does the DPEIS provide any quantitative or even detailed qualitative analysis of masking effects or other cumulative, sub-lethal impacts on right whales. BOEM has again violated NEPA.

E. Failure to Consider Potential for Death and Serious Injury of Marine Mammals

While the DPEIS acknowledges the potential for injury, and indeed allows that some marine mammals will undergo permanent threshold shift as a result of the activity, it improperly dismisses the risk of mortality and serious injury from acoustic impacts.

First, the DPEIS fails entirely to consider the adverse synergistic effect that at least some types of anthropogenic noise can have on ship-strike risk. Mid-frequency sounds with frequencies in the range of some sub-bottom profilers have been shown to cause North Atlantic right whales to break off their foraging dives and lie just below the surface, increasing the risk of vessel strike.¹⁵⁰

Second, as noted above (and contrary to representations in the DPEIS), a number of recent studies indicate that anthropogenic sound can induce permanent threshold shift at lower levels than anticipated.¹⁵¹ Hearing loss remains a significant risk where, as here, the agency has not required aerial or passive acoustic monitoring as standard mitigation, appears unwilling to restrict operations in low-visibility conditions, and has not established seasonal exclusion areas for biologically important habitat other than designated critical habitat for right whales.

Third, the DPEIS wrongly discounts the potential for marine mammal strandings, even though at least one stranding event, the September 2002 stranding of beaked whales in the Gulf of California, is tightly correlated with geophysical survey activity; and even though high-intensity sounds in general have long been used by drive fisheries to force marine mammals ashore.¹⁵²

Fourth, and finally, as noted above, the DPEIS makes no attempt to assess the long-term effects of chronic noise and noise-related stress on life expectancy, survival, and recruitment although proxies are available from the literature on terrestrial mammals and other sources. The need for

¹⁵⁰ Nowacek, D.P., Johnson, M.P., and Tyack, P.L., North Atlantic right whales (*Eubalaena glacialis*) ignore ships but respond to alerting stimuli, *Proceedings of the Royal Society of London, Part B: Biological Sciences* 271:227 (2004).

¹⁵¹ Kastak, D., Mulson, J., Ghoul, A., Reichmuth, C., Noise-induced permanent threshold shift in a harbor seal [abstract], *Journal of the Acoustical Society of America* 123: 2986 (2008); Kujawa, S.G., and Liberman, M.C., Adding insult to injury: cochlear nerve degeneration after “temporary” noise-induced hearing loss, *Journal of Neuroscience* 29:14077-14085 (2009).

¹⁵² Brownell, R.L., Jr., Nowacek, D.P., and Ralls, K., Hunting cetaceans with sound: a worldwide review, *Journal of Cetacean Research and Management* 10: 81-88 (2008); Hildebrand, J.A., Impacts of anthropogenic sound, in Reynolds, J.E. III, Perrin, W.F., Reeves, R.R., Montgomery, S., and Ragen, T.J., eds., *Marine Mammal Research: Conservation beyond Crisis* (2006).

precautionary analysis in this regard is manifest, given BOEM's failure to commit to any substantial long-term monitoring program in the DPEIS – and the probability that even with an effective monitoring program, catastrophic declines in some Atlantic populations would remain likely to go unobserved.¹⁵³

The DPEIS must be revised conservatively to account for potential mortality of marine mammals in the short- and long-term.

F. Failure to Adequately Assess Cumulative Impacts of the Activity

Here as elsewhere, the DPEIS analysis is anemic. The document makes no attempt to analyze the cumulative and synergistic effects of masking, energetic costs, stress, hearing loss, or any of the other impact mechanisms identified over the last several years,¹⁵⁴ whether for its own action alternatives or for the combined set of activities it identifies in its “cumulative impact scenario.” Instead, for each of six sources of impacts, it strings a few unsupported and indeed baseless assumptions together – *e.g.*, that mitigation measures largely dependent on visual detection will eliminate “most” Level A takes, that “no significant noise impacts” would occur, that there is “no evidence of ambient noise levels approaching a threshold” where marine mammals might be significantly affected – and concludes that cumulative impacts would be “negligible” to “minor.” *E.g.*, DPEIS at 4-62 to 4-65. This bare-bones approach disregards available information and analytical methodologies that are clearly relevant to an analysis of reasonably foreseeable impacts. 40 C.F.R. § 1502.22.

- (1) Qualitative or detailed qualitative assessment.— Over the last several years, the scientific community has identified a number of pathways by which anthropogenic noise can affect vital rates and populations of animals. These conceptual models include the 2005 National Research Council study, which produced a model for the Population Consequences of Acoustic Disturbance; an ongoing Office of Naval Research program whose first phase has advanced the NRC model; and the 2009 Okeanos workshop on cumulative impacts.¹⁵⁵ The DPEIS employs none of these methods, and even in its qualitative analysis does not attempt to analyze any pathway of impact.
- (2) Models of masking effects.— As noted above, bioacousticians at NOAA and Cornell have developed a quantitative model to assess loss of communication

¹⁵³ Taylor, B.L., Martinez, M., Gerrodette, T., Barlow, J., and Hrovat, Y.N., Lessons from monitoring trends in abundance of marine mammals, *Marine Mammal Science* 23:157-175 (2007).

¹⁵⁴ National Research Council, *Marine Mammal Populations and Ocean Noise: Determining When Noise Causes Biologically Significant Effects* (2005); Wright, A.J. ed., Report on the workshop on assessing the cumulative impacts of underwater noise with other anthropogenic stressors on marine mammals: from ideas to action, proceedings of workshop held by Okeanos Foundation, Monterey, California, August 26-29, 2009 (2009).

¹⁵⁵ *Id.*

- space over time from both commercial shipping and seismic exploration.¹⁵⁶ Incredibly, the DPEIS does not model for masking effects.
- (3) Energetics.— Researchers have studied the impacts of various types of noise on the foraging success of killer whales and sperm whales. Both species were shown to experience significant decrements in foraging, of 18-19% and greater, within areas of obvious biological importance.¹⁵⁷ The DPEIS fails to consider the impacts of noise on foraging and energetics; indeed, despite its own recognition that animals who remain on their feeding grounds may suffer adverse impacts over time, it repeatedly characterizes “observed” impacts as minor and short-term. *E.g.*, DPEIS at 4-55. Based on the published evidence, for example, the DPEIS should conservatively assume that animals that are not evidently displaced from their feeding grounds nonetheless experience a significant decrement in foraging, of at least 20%, at received levels of 140 dB and greater.
- (4) Chronic noise.— NOAA’s Underwater Sound-Field Working Group has generated cumulative noise maps on ambient noise from ships around the world and on seismic surveys in the Gulf of Mexico, and noise maps covering individual seismic surveys, military training exercises, and piledriving activity.¹⁵⁸ The draft EIS has not incorporated any of this quantitative information into its cumulative impact analysis.
- (5) Stress.— Following from studies on terrestrial mammals, stress from ocean noise—alone or in combination with other stressors—may weaken a cetacean’s immune system, interfere with brain development, increase the risk of myocardial infarctions, depress reproductive rates, cause malformations and other defects in young, all at moderate levels of exposure.¹⁵⁹ Because physiological stress response is highly

¹⁵⁶ Clark, C.W., Ellison, W.T., Southall, B.L., Hatch, L., van Parijs, S., Frankel, A., and Ponirakis, D., Acoustic masking in marine ecosystems as a function of anthropogenic sound sources (2009) (IWC Sci. Comm. Doc. SC/61/E10); Clark, C.W., Ellison, W.T., Southall, B.L., Hatch, L., Van Parijs, S.M., Frankel, A., and Ponirakis, D., Acoustic masking in marine ecosystems: intuitions, analysis, and implication, *Marine Ecology Progress Series* 395: 201-222 (2009).

¹⁵⁷ Lusseau, D., Bain, D.E., Williams, R., and Smith, J.C., Vessel traffic disrupts the foraging behavior of southern resident killer whales *Orcinus orca*, *Endangered Species Research* 6: 211-221 (2009); Williams, R., Lusseau, D. and Hammond, P.S., Estimating relative energetic costs of human disturbance to killer whales (*Orcinus orca*), *Biological Conservation* 133: 301-311 (2006); Miller, P.J.O., Johnson, M.P., Madsen, P.T., Biassoni, N., Quero, M., and Tyack, P.L., Using at-sea experiments to study the effects of airguns on the foraging behavior of sperm whales in the Gulf of Mexico, *Deep-Sea Research I* 56: 1168-1181 (2009). *See also* Mayo, C.S., Page, M., Osterberg, D., and Pershing, A., On the path to starvation: the effects of anthropogenic noise on right whale foraging success, North Atlantic Right Whale Consortium: Abstracts of the Annual Meeting (2008) (finding that decrements in North Atlantic right whale sensory range due to shipping noise have a larger impact on food intake than patch-density distribution and are likely to compromise fitness).

¹⁵⁸ NOAA, Cetecean and Sound Mapping, available at www.st.nmfs.noaa.gov/cetsound (previewed at May NOAA symposium).

¹⁵⁹ *See, e.g.*, Chang, E.F., and Merzenich, M.M., Environmental Noise Retards Auditory Cortical Development, *Science* 498 (2003) (rats); Willich, S.N., Wegscheider, K., Stallmann, M., and Keil, T., Noise Burden and the Risk of Myocardial Infarction, *European Heart Journal* (2005) (Nov. 24, 2005) (humans); Harrington, F.H., and Veitch,

conserved across species, it is reasonable to assume that marine mammals would be subject to the same effects, particularly if, as here, they are exposed repeatedly to noise from oil and gas exploration and other stressors.¹⁶⁰ Indeed, a recent New England Aquarium study of North Atlantic right whales, the closest relative of the bowhead whale, indicates that shipping noise alone can induce chronic stress in marine mammals.¹⁶¹ The DPEIS, while acknowledging the potential for chronic stress to significantly affect marine mammal health, and while expecting that anthropogenic noise would induce physiological stress responses in marine mammals, does not incorporate chronic stress into its cumulative impact analysis, such as by using other species as proxies for lower life expectancies.

- (6) Impacts from other sources.— While it lists numerous other reasonably foreseeable activities that stand to impact the same animal populations (DPEIS at 3-36 to 3-43), the DPEIS makes no attempt to incorporate their effects into its cumulative analysis. Perhaps most prominently, though it notes that naval activities will take increasing numbers of marine mammals in the region, BOEM nowhere accounts for the many millions of takes, including thousands of mortalities and serious injuries and hundreds of thousands of cases of threshold shift, that the Navy presently estimates will occur between January 2014 and January 2019 as a result of its Atlantic training and testing activities.¹⁶² The lack of analysis is not supportable under NEPA.

The data already show that industrial noise can disrupt biologically significant behavior and shrink whale communication range on a region-wide scale. As Dr. Chris Clark (Cornell) postulated in a report of the International Whaling Commission's Scientific Committee, such repeated and persistent acoustic insults over the large areas affected by airgun surveys alone should be considered enough to cause population-level impacts in at least some species of marine mammals.¹⁶³ That analysis has since been underscored by additional quantitative analysis.¹⁶⁴

A.M., Calving Success of Woodland Caribou Exposed to Low-Level Jet Fighter Overflights, *Arctic* 45:213 (1992) (caribou).

¹⁶⁰ A special issue of the *International Journal of Comparative Psychology* (20:2-3) is devoted to the problem of noise-related stress response in marine mammals. For an overview published as part of that volume, see, e.g., A.J. Wright, N. Aguilar Soto, A.L. Baldwin, M. Bateson, C.M. Beale, C.Clark, T. Deak, E.F. Edwards, A. Fernández, A. Godinho, L. Hatch, A. Kakuschke, D. Lusseau, D. Martineau, L.M. Romero, L. Weilgart, B. Wintle, G. Notarbartolo di Sciara, and V. Martin, Do marine mammals experience stress related to anthropogenic noise? (2007).

¹⁶¹ Rolland, R.M., Parks, S.E., Hunt, K.E., Castellote, M., Corkeron, P.J., Nowacek, D.P., Wasser, S.K., and Kraus, S.D., Evidence that ship noise increases stress in right whales, *Proceedings of the Royal Society B: Biological Sciences* doi:10.1098/rspb.2011.2429 (2012).

¹⁶² Navy, Draft Environmental Impact Statement/ Overseas Environmental Impact Statement for Atlantic Fleet Training and Testing (2012).

¹⁶³ IWC Scientific Committee, Report of the 2004 Scientific Committee of the International Whaling Commission, Annex K: Report of the Standing Working Group on Environmental Concerns (2004).

¹⁶⁴ Clark, C.W., Ellison, W.T., Southall, B.L., Hatch, L., van Parijs, S., Frankel, A., and Ponirakis, D., Acoustic masking in marine ecosystems as a function of anthropogenic sound sources (2009) (IWC Sci. Comm. Doc. SC/61/E10); Clark, C., and Rice, A., Seismic airgun surveys and marine vertebrates (2012) (presentation given June 12, 2012 to the Mid-Atlantic Fishery Management Council); NOAA, Cetecean and Sound Mapping, available at

The DPEIS' summary conclusions to the contrary are made without support, and without even attempting to address data gaps through methods accepted within the scientific community.¹⁶⁵

G. Failure to Adequately Define Impact Levels

For each resource, the DPEIS provides specific impact criteria, which are then used to determine whether the overall effect on the resource qualifies as “negligible,” “minor,” “moderate,” or “major.” DPEIS at 4-44, 4-50. Unfortunately, as the ultimate measure of potential effects, these descriptors, as stated and as applied, are problematic in the extreme. They do not incorporate all of the factors relevant to NEPA “significance” analysis; and insofar as they reflect standards embodied in other statutes, such as the Marine Mammal Protection Act and Endangered Species Act, they are fundamentally misapplied.

- (1) As BOEM states at the outset, the DPEIS is intended to provide the information necessary for agency compliance with the Marine Mammal Protection Act, Endangered Species Act, and other statutes, as well as the Outer Continental Shelf Lands Act and NEPA. DPEIS at vii. This approach comports with applicable caselaw. Courts have observed that, when an action is taken pursuant to a specific statute, not only do “the statutory objectives of the project serve as a guide by which to determine the reasonableness of objectives outlined in an EIS,” but “the statutory objectives underlying the agency’s action work significantly to define its analytic obligations.” *Oregon Natural Desert Ass’n v. BLM*, 625 F3d 1092, 1109 (9th Cir. 2010). Indeed, agencies are required by NEPA to explain how alternatives in an EIS will meet requirements of “other environmental laws and policies.” 40 C.F.R. § 1502.2(d). But that does not remove the obligation to evaluate significance according to the factors articulated in CEQ’s regulations: e.g., “(3) “Unique characteristics of the geographic area,” including “ecologically critical areas”; (4) the degree to which impacts “are likely to be highly controversial”; and (5) the degree to which potential impacts “are highly uncertain or involve unique or unknown risks. 40 C.F.R. § 1508.27. Although a defined threshold is particularly needed when an agency prepares an EA, it has consequences here given the programmatic nature of the analysis. BOEM and NMFS may later incorporate portions of the EIS by reference, and under such circumstances, it will be critical to understand the import of the analysis within the context of an established threshold. For that, incorporating the NEPA significance factors is essential.
- (2) As noted above, NEPA regulations require agencies to explain how alternatives meet the requirements of other applicable statutes. 40 C.F.R. § 1502.2(d). And yet BOEM, while referencing elements of the MMPA’s “negligible impact” standard, does not appear to apply the relevant OCSLA standard, “undue harm,” anywhere in the DPEIS. See 43

www.st.nmfs.noaa.gov/cetsound (viewed at May NOAA symposium, showing vast increase in equivalent noise level (L_{EQ}) of ambient noise from seismic in Gulf of Mexico, averaged over one year).

¹⁶⁵ 40 C.F.R. § 1502.22. See also Bejder, L., Samuels, A., Whitehead, H., Finn, H., and Allen, S., Impact assessment research: use and misuse of habituation, sensitization and tolerance in describing wildlife responses to anthropogenic stimuli, *Marine Ecology Progress Series* 395:177-185 (2009).

U.S.C. § 1340(a). The omission is puzzling given the DPEIS' ostensible aim of supporting permitting decisions made under OCSLA. DPEIS at vii. BOEM should consider "undue harm" into its analysis.

- (3) The DPEIS, having incorporated the MMPA's "negligible impact" standard into its significance criteria, fails completely to apply it. In practice, the document does not provide, for example, the necessary information for determining whether any of the proposed alternatives will have a greater than negligible impact on any marine mammal stock. 16 U.S.C. § 1371(a)(5)(D)(i)(I). Instead, the DEIS offers qualitative conclusions, made without any apparent support or indeed any apparent attempt at assessing the cumulative impacts of the activity. For example, Level B takes are considered to result in only "moderate" impacts, even though the surveys "would affect a large number of individuals," since "it is presumed that exposure to elevated sound would be somewhat localized and temporary in duration." DPEIS at 4-55. Not only does this analysis make assumptions about behavioral response and take thresholds that are inconsistent with the available literature, it makes no attempt to translate short-term behavioral impacts into long-term impacts on populations – a failure that violates NEPA. 40 C.F.R. § 1508.7. The 2006 programmatic environmental assessment for seismic surveying in the Arctic incorporated the MMPA "negligible impact" standard by using "potential biological removal" to determine the number of harassed whales that could affect the population's rates of survival and recruitment.¹⁶⁶ The recent Draft Environmental Impact Report, by the California State Lands Commission, for seismic surveys off the Diablo Canyon nuclear reactor site develops another methodology for evaluating a project's cumulative Level A and Level B impacts against the MMPA standard.¹⁶⁷ BOEM must improve its analysis.

H. Failure to Analyze Impacts on Fish and Other Species of Concern

The activities considered in the DPEIS have potential to detrimentally affect multiple fish species, harm vital fish habitat, and conflict with multiple fisheries.

As an initial matter, the DPEIS's consideration of impacts does not give adequate weight to the effects of repeated seismic testing and other activities on the behavior of fish and invertebrates. For instance, the DPEIS dismisses temporary hearing loss in fish as a minor effect without considering whether the hearing loss may be permanent or whether even a temporary loss of hearing renders the fish vulnerable to predation, unable to locate food, or unable to locate a mate.¹⁶⁸ In addition, sublethal disturbance that causes fish to avoid key feeding or spawning

¹⁶⁶ MMS, Final Programmatic Environmental Assessment, Arctic Outer Continental Shelf Seismic Surveys – 2006, OCS EIS/EA MMS 2006-038 at 36-37 (June 2006) (2006 PEA), *available at* http://www.alaska.boemre.gov/ref/EIS%20EA/Final_PEA/Final_PEA.pdf.

¹⁶⁷ California State Lands Commission, Draft Environmental Impact Report (EIR) for the Central Coastal California Seismic Imaging Project at Chap. 4.4 and App. H (2012) (CSLC EIR No. 758).

¹⁶⁸ See McCauley, R.D., Fewtrell, J., Duncan, A.J., Jenner, C., Jenner, M.-N., Penrose, J.D., Prince, R.I.T., Adhitya, A., Murdoch, J., and McCabe, K., Marine seismic surveys: Analysis and propagation of air-gun signals; and effects of air-gun exposure on humpback whales, sea turtles, fishes and squid (2000) (industry-sponsored study undertaken

areas could have a detrimental effect on the population of the species itself. For example, the DPEIS acknowledges that the activities it describes could disrupt feeding by Atlantic sturgeon, which is listed under the Endangered Species Act because its numbers are critically low. DPEIS at 4-131, 4-138. Yet it gives virtually no consideration to what effect disrupted feeding and effects benthic habitat will have when added to the species' ongoing struggle to survive in severely degraded, limited habitat. The DPEIS does not even consider the impacts such as masking, and silencing of fish vocalizations, may have on fish breeding success. For example, masking of black drum fish and toadfish choruses, which overlap with the low-frequency output of seismic airguns, could significantly impair breeding in those species.¹⁶⁹

In the case of coastal pelagic species, also known as forage species, the action's adverse effects could ripple through the food chain. The DPEIS acknowledges that forage species are often very sensitive to sound and tend to avoid the sort of noise generated by G&G activities. DPEIS at 4-131. These species, such as herring, alewife, and others, comprise an important part of the diets of many predatory fish, including tuna and swordfish. Changes in aggregation behavior or movements of forage species could reduce the available food for predatory species, reducing their fitness and numbers and potentially causing them to shift their own movement patterns in response. Any such effects on predatory fish species would likely adversely affect the commercial and recreational fisheries that depend on them. Nor does the DPEIS assess the impact of G&G activities on invertebrates, such as cephalopods like squid and octopus, even though a number of studies have demonstrated that seismic and other low-frequency sound sources can disrupt, injure, and kill these taxa.¹⁷⁰

Indeed, airgun surveys are known to significantly affect the distribution of some fish species, which can impact commercial and recreational fisheries and could also displace or reduce the foraging success of marine mammals that rely on them for prey. Indeed, as one study has noted, fishermen in various parts of the world have complained for years about declines in their catch rates during oil and gas airgun surveys, and in some areas have sought industry compensation for their losses.¹⁷¹ Airguns have been shown experimentally to dramatically depress catch rates of some commercial fish species, by 40 to 80% depending on catch method, over thousands of

by researchers at the Curtin University of Technology, Australia); McCauley, R., Fewtrell, J., and Popper, A.N., High intensity anthropogenic sound damages fish ears, *Journal of the Acoustical Society of America* 113: 638-642 (2003); see also Scholik, A.R., and Yan, H.Y., Effects of boat engine noise on the auditory sensitivity of the fathead minnow, *Pimephales promelas*, *Environmental Biology of Fishes* 63: 203-209 (2002).

¹⁶⁹ Clark, C., and Rice, A., Seismic airgun surveys and marine vertebrates (2012) (presentation given June 12, 2012 to the Mid-Atlantic Fishery Management Council).

¹⁷⁰ André, M., Solé, M., Lenoir, M., Durfort, M., Quero, C., Mas, A., Lombarte, A., van der Schaar, M., López-Bejar, M., Morell, M., Zaugg, S., and Houégnigan, L., Low-frequency sounds induce acoustic trauma in cephalopods, *Frontiers in Ecology and the Environment* 2011: doi:10.1890/100124 (2011); Guerra, A., and Gonzales, A.F., Severe injuries in the giant squid *Architeuthis dux* stranded after seismic explosions (2006) (paper presented at International Workshop on the Impacts of Seismic Survey Activities on Whales and Other Marine Biota, convened by German Federal Environment Agency, Sept. 6-7, 2006, Dessau, Germany); McCauley *et al.*, Marine seismic surveys: analysis and propagation of air-gun signals, and effects of air-gun exposure.

¹⁷¹ McCauley *et al.*, Marine seismic surveys: analysis and propagation of air-gun signals, and effects of air-gun exposure.

square kilometers around a single array.¹⁷² Large-scale displacement is likely to be responsible for the fallen catch rates: studies have shown both horizontal (spatial range) and vertical (depth) displacement in a number of other commercial species on a similar spatial scale.¹⁷³ Impacts on fisheries were found to last for some time beyond the survey period, not fully recovering within 5 days of post-survey monitoring.¹⁷⁴ Airguns also have been shown to substantially reduce catch rates of rockfish, at least to the distances (less than 5 km) observed in the experiment.¹⁷⁵ Yet the DPEIS – which acknowledging that displacement can increase the risk of predation, disrupt fish spawning and reproduction, alter migration routes, and impact feeding – appears to assume without support that effects on both fish and fisheries would be localized and “minor.” PDEIS at 4-120.

In short, the DPEIS fails to recognize the scale of seismic survey impacts on commercial fish species, does not assess impacts of decreased prey availability on marine mammals, ignores the potential for acoustic impacts on Essential Fish Habitat – and, finally, fails to consider measures to mitigate these impacts, such as excluding surveys from spawning areas and other areas of biological importance to Arctic fish species. BOEM must improve its scant analysis.¹⁷⁶

I. Failure to Adequately Consider Issues Related to Climate Change

The analysis related to the effects of climate change is faulty in a two key respects: (1) it fails to analyze the direct and indirect effects of the proposed action on climate change and ocean acidification, and (2) it fails to explain how the proposed action will impact the marine environment against the backdrop of ocean warming and acidification. Yet NEPA requires analysis of the direct and indirect effects of greenhouse gas (“GHG”) emissions and their consequences for climate change. Indeed, proposed guidance by CEQ concludes that the NEPA

¹⁷² Engås, A., Løkkeborg, S., Ona, E., and Soldal, A.V., Effects of seismic shooting on local abundance and catch rates of cod (*Gadus morhua*) and haddock (*Melanogrammus aeglefinus*), *Canadian Journal of Fisheries and Aquatic Sciences* 53: 2238-2249 (1996); see also Løkkeborg, S., Ona, E., Vold, A., Pena, H., Salthaug, A., Totland, B., Øvredal, J.T., Dalen, J. and Handegard, N.O., Effects of seismic surveys on fish distribution and catch rates of gillnets and longlines in Vesterålen in summer 2009 (2010) (Institute of Marine Research Report for Norwegian Petroleum Directorate).

¹⁷³ Slotte, A., Hansen, K., Dalen, J., and Ona, E., Acoustic mapping of pelagic fish distribution and abundance in relation to a seismic shooting area off the Norwegian west coast, *Fisheries Research* 67:143-150 (2004).

¹⁷⁴ Engås *et al.*, Effects of seismic shooting.

¹⁷⁵ Skalski, J.R., Pearson, W.H., and Malme, C.I., Effects of sounds from a geophysical survey device on catch-per-unit-effort in a hook-and-line fishery for rockfish (*Sebastes ssp.*), *Canadian Journal of Fisheries and Aquatic Sciences* 49: 1357-1365 (1992).

¹⁷⁶ Additionally, BOEM must consider the impacts of seismic surveys and other activities on invertebrates. See, e.g., McCauley, R.D., Fewtrell, J., Duncan, A.J., Jenner, C., Jenner, M.-N., Penrose, J.D., Prince, R.I.T., Adhitya, A., Murdoch, J., and McCabe, K., Marine seismic surveys: Analysis and propagation of air-gun signals; and effects of air-gun exposure on humpback whales, sea turtles, fishes and squid (2000); André, M., Solé, M., Lenoir, M., Durfort, M., Quero, C., Mas, A., Lombarte, A., van der Schaar, M., López-Bejar, M., Morell, M., Zaugg, S., and Houégnigan, L., Low-frequency sounds induce acoustic trauma in cephalopods, *Frontiers in Ecology and the Environment* doi:10.1890/100124 (2011); Guerra, A., and Gonzales, A.F., Severe injuries in the giant squid *Architeuthis dux* stranded after seismic explorations, in German Federal Environment Agency, International Workshop on the Impacts of Seismic Survey Activities on Whales and Other Marine Biota at 32-38 (2006);

process “should incorporate consideration of both the impact of an agency action on the environment through the mechanism of GHG emissions and the impact of changing climate on that agency action.”¹⁷⁷

First, BOEM must fully analyze the direct and indirect effects on climate change from the greenhouse gas emissions attributable to its G&G operations from vessels and other sources. While the DPEIS acknowledges that survey vessels and aircraft involved in G&G activities would emit greenhouse gas pollution, it never quantifies or evaluates the impact of those emissions. *See* DPEIS at 4-4. Additionally, the DPEIS cannot ignore the greenhouse gases that will be released in to the atmosphere as a result of the oil and gas produced as a result of the exploration activities authorized here. NEPA requires that agencies consider a proposed action’s future indirect effects, which are those “caused by an action and are later in time or farther removed in distance, but are still reasonably foreseeable.” 40 C.F.R. § 1508.8(b). The stated need for the action is to determine the extent and location of oil and gas reserves to facilitate oil and gas development. DPEIS at 1-8. Accordingly, BOEM must calculate not only the greenhouse gas emissions from the vessels and activities used for the G&G operations, but the impacts of the greenhouse gases emitted from the produced oil and gas reserves.

Second, the DPEIS fails to explain how its G&G activities will impact marine species and ecosystems that are already compromised by rapid climate change and ocean acidification. The DPEIS’ cursory description of climate change and ocean acidification, which concludes without analysis that the environmental effects are likely to be small, incremental, and difficult to discern from effects of other natural and anthropogenic factors (DPEIS at 3-43), falls short of the hard look required by NEPA. Moreover, simply stating, in the cumulative impacts section, that climate change is a broad cumulative impact is inadequate and does nothing to examine the relevance of the proposed action to that cumulative effect. *See, e.g.*, DPEIS at 4-21, 4-62, 4-85, 4-102, 4-122, 4-135, 4-150, 4-158, 4-164, 4-170, 4-183, 4-199, 4-212. For example, the analysis fails to evaluate the project in light of the increasing frequency and strength of hurricanes in the Atlantic, increasing sea level rise along the Atlantic seaboard, and stress to marine species from ocean warming and acidification that will be compounded by risks from oil and gas exploration and development.

1. Climate change impacts requiring analysis

Climate change is already resulting in warming temperatures, rising sea levels, and increases in the frequency of extreme weather events, particularly heat waves and extreme precipitation events.¹⁷⁸ The average temperature in the United States rose more than 2°F over the past 50 years; by the end of this century, it is expected to increase by 4 to 6.5°F under a lower emissions

¹⁷⁷ Nancy Sutley, Chair, Council on Environmental Quality, Draft NEPA Guidance on Consideration of the Effects of Climate Change and Greenhouse Gas Emissions (Feb. 18, 2010).

¹⁷⁸ U.S. Global Change Research Program, Global Climate Change Impacts in the United States: A State of Knowledge Report from the U.S. Global Change Research Program (2009) (Cambridge University Press).

scenario and by 7 to 11°F under a higher emissions scenario.¹⁷⁹ The decade from 2000 to 2010 was the warmest on record,¹⁸⁰ and 2005 and 2010 tied for the hottest years on record.¹⁸¹

Global average sea level rose by roughly eight inches over the past century, and sea level rise is accelerating in pace.¹⁸² Indeed, sea level is rising faster along the U.S. east coast now than at any other time during at least the past 2,000 years.¹⁸³ About 3.7 million Americans live within a few feet of high tide and risk being hit by more frequent coastal flooding in coming decades because of the sea level rise.¹⁸⁴ The most vulnerable state is Florida, followed by Louisiana, California, New York and New Jersey. Modeling indicates that the Atlantic is in danger of in danger of seeing historical extremes of sea level surges frequently surpassed in the coming few decades.¹⁸⁵ Studies that have attempted to improve upon the IPCC estimates have found that a mean global sea-level rise of at least 1 to 2 meters is highly likely within this century.¹⁸⁶ Others that have reconstructed sea-level rise based on the geological record, including oxygen isotope and coral records, have found that larger rates of sea-level rise of 2.4 to 4 meters per century are possible.¹⁸⁷

As briefly mentioned in the DPEIS, sea turtles that nest on the Atlantic coast will be affected by rising and surging sea levels. The added pressure and displacement from their nesting and migration from the G&G program will further impact these threatened and endangered sea species. Additionally, critical habitat designation for the North Atlantic DPS of loggerhead sea turtles is imminent, and accordingly BOEM should evaluate the extent to which the proposed action will affect areas of potential marine and beach critical habitat. Other coastal wildlife species are also impacted by sea level rise, and these effects must also be evaluated.

¹⁷⁹ *Id.*

¹⁸⁰ National Aeronautic Space Association, *NASA Research Finds Last Decade was Warmest on Record, 2009 One of the Warmest Years* (Jan. 21, 2010), www.nasa.gov/home/hqnews/2010/jan/HQ_10-017_Warmest_temps.html

¹⁸¹ National Oceanic and Atmospheric Administration, *NOAA: 2010 Tied for Warmest Year on Record*, www.noaanews.noaa.gov/stories2011/20110112_globalstats.html

¹⁸² U.S. Global Change Research Program, *Global Climate Change Impacts*, *supra*.

¹⁸³ Kemp, A.C., Horton, B.P., Donnelly, J.P., Mann, M.E., Vermeer, M., and Rahmstorf, S., Climate related sea-level variations over the past two millennia, *Proceedings of the National Academy of Sciences of the United States of America* 108: 11017-22 (2011).

¹⁸⁴ Strauss, B.H., Ziemlinski, R., Weiss, J.L., and Overpeck, J.T., Tidally adjusted estimates of topographic vulnerability to sea level rise and flooding for the contiguous United States, *Environmental Research Letters* 7(1): 014033. doi:10.1088/1748-9326/7/1/014033 (2012).

¹⁸⁵ Tebaldi, C., Strauss, B.H., and Zervas, C.E., Modelling sea level rise impacts on storm surges along US coasts, *Environmental Research Letters* 7(1): doi:10.1088/1748-9326/7/1/014032 (2012).

¹⁸⁶ Rahmstorf, S., A semi-empirical approach to projecting future sea-level rise, *Science* 315: 368-370 (2007); Pfeffer, W.T., Harper, J.T., and O'Neel, S., Kinematic constraints on glacier contributions to 21st-century sea-level rise, *Science* 321: 1340-1343 (2008); Vermeer, M., and Rahmstorf, S., Global sea level linked to global temperature, *PNAS* 2009: doi:10.1073/pnas.0907765106 (2009); Grinsted, A., Moore, J.C., and Jevrejeva, S., Reconstructing sea level from paleo and projected temperatures 200 to 2100 AD, *Clim. Dyn.* 2010: doi:10.1007/s00382-008-0507-2 (2010); Jevrejeva, S., Moore, J.C., and Grinsted, A., How will sea level respond to changes in natural and anthropogenic forcings by 2100? *Geophysical Research Letters* 37: doi:10.1029/2010GL042947 (2010).

¹⁸⁷ Milne, G.A., Gehreis, W.R., Hughes, C.W., Tamisiea, M.E., Identifying the causes of sea-level change, *Nature Geoscience* 2009: doi:10.1038/ngeo544 (2009).

Extreme weather events, most notably heat waves and precipitation extremes, are striking with increased frequency,¹⁸⁸ with deadly consequences for people and wildlife. In 2011 alone, a record 14 weather and climate disasters occurred in the United States, including droughts, heat waves, and floods, that cost at least \$1 billion (U.S.) each in damages and loss of human lives.¹⁸⁹ Tropical cyclones in the Atlantic have already gotten stronger due to warmer waters, and on average storms in recent years have ramped up in severity more quickly than in the past.¹⁹⁰ Over the last 30 years the Atlantic coast has seen a significant increase in hurricane wave heights.¹⁹¹ Models predict a doubling of severe category 4 and 5 hurricanes in the Atlantic within the century,¹⁹² and the risks of oil and gas exploration and development increase during severe storms.

Recent studies on the impacts of climate change on biodiversity have demonstrated that current levels of greenhouse gases are already having significant impacts on species and ecosystems in all regions of the world, including changes in wildlife distribution, physiology, demographic rates, genetics, and ecosystem services, as well as climate-related population declines and extinctions.¹⁹³ Because greenhouse gas emissions to date commit the Earth to substantial climatic changes in the coming decades, and because climate change is occurring at an unprecedented pace with multiple synergistic impacts, climate change is predicted to result in catastrophic species losses during this century. The IPCC concluded that 20% to 30% of plant and animal species will face an increased risk of extinction if global average temperature rise

¹⁸⁸ Coumou, D., and Rahmstorf, S., A decade of weather extremes, *Nature Climate Change* doi:10.1038/nclimate1452 (2012); IPCC, Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation. A Special Report of Working Groups I and II of the Intergovernmental Panel on Climate Change (2012).

¹⁸⁹ National Oceanic and Atmospheric Administration, *Extreme Weather 2011*, <http://www.noaa.gov/extreme2011/>.

¹⁹⁰ Elsner, J.B., Kossin, J.P., and Jagger, T.H., The increasing intensity of the strongest tropical cyclones, *Nature* 455: 92-5 (2008); Kishtawal, C.M., Jaiswal, N., Singh, R., and Niyogi, D., Tropical cyclone intensification trends during satellite era (prepub.); Saunders, M.A., and Lea, A.S., Large contribution of sea surface warming to recent increase in Atlantic hurricane activity, *Nature* 451: 557-60 (2008).

¹⁹¹ Komar, P.D., and Allan, J.C., Increasing hurricane-generated wave heights along the U.S. east coast and their climate controls," *Journal of Coastal Research* 242: 479-488 (2008).

¹⁹² Bender, M.A., Knutson, T.R., Tuleya, R.E., Sirutis, J.J., Vecchi, G.A., Garner, S.T., and Held, I.M., Modeled impact of anthropogenic warming on the frequency of intense Atlantic hurricanes, *Science* 327: 454-8 (2010).

¹⁹³ Chen, I., Hill, J.K., Ohlemuller, R., Roy, D.B., and Thomas, C.D., Rapid range shifts of species associated with high levels of climate warming, *Science* 333: 1024-1026 (2011); Maclean, I.M.D., and Wilson, R.J., Recent ecological responses to climate change support predictions of high extinction risk, *Proceedings of the National Academy of Sciences of the United States of America* 108: 12337-12342 (2011); Parmesan, C., and Yohe, G., A globally coherent fingerprint of climate change impacts across natural systems, *Nature* 421: 37-42 (2003); Parmesan, C., Ecological and evolutionary responses to recent climate change, *Annu. Rev. Ecol. Evol. Syst.* 37: 637-669 (2006); Root, T.L., Price, J.T., Hall, K.R., Schneider, S.H., Rosenzweig, C., and Pounds, J.A., Fingerprints of global warming on wild animals and plants, *Nature* 421: 57-60 (2003); Walther, G., Post, E., Convey, P., Menzel, A., Parmesan, C., Beebee, T.J.C., Fromentin, J., Hoegh-Guldberg, O., and Bairlein, F., Ecological responses to recent climate change, *Nature* 416: 389-395 (2002); Walther, G.R., Berger, S., and Sykes, M.T., An ecological "footprint" of climate change, *Proceedings of the Royal Society B: Biological Sciences* 272: 1427-1432 (2002); Warren, R., Price, J., Fischlin, A., de la Nava Santos, S., and Midgley, G., Increasing impacts of climate change upon ecosystems with increasing global mean temperature rise, *Climatic Change* 106: 141-177 (2011).

exceeds 1.5°C to 2.5°C relative to 1980-1999 levels, with an increased risk of extinction for up to 70% of species worldwide if global average temperature exceeds 3.5°C relative to 1980-1999 levels.¹⁹⁴ Thomas et al. (2004) projected that 15%-37% of species will be committed to extinction by 2050 under a mid-level emissions scenario—a trajectory which the world has been exceeding.¹⁹⁵ Maclean and Wilson (2011) concluded that the harmful effects of climate change on species exceed predictions and that one in ten species could face extinction by the year 2100 if current rates of climate change continue unabated.¹⁹⁶ The updated IPCC Reasons for Concern reflect that current warming is already at a point where significant risks to species and ecosystems are occurring, and that these risks will become “severe” at a ~1°C rise above preindustrial levels.¹⁹⁷ A comprehensive literature review by Warren et al. (2011) found that significant species range losses and extinctions are predicted to occur at a global mean temperature rise below 2°C in several biodiversity hotspots and globally for coral reef ecosystems. At a 2°C temperature rise, projected impacts increase in magnitude, numbers, and geographic scope. Beyond a 2°C temperature rise, the level of impacts and the transformation of the Earth’s ecosystems will become steadily more severe, with the potential collapse of some entire ecosystems, and extinction risk accelerating and becoming widespread.¹⁹⁸

Contrary to the statements in the DPEIS, the impacts of climate change are happening within the next decade and are already occurring. For the North Atlantic, ocean warming has already been reported as contributing to ecosystem shifts.¹⁹⁹ Changes are seen from phytoplankton to zooplankton to fish and are modifying the dominance of species and the structure, diversity and function of marine ecosystems.²⁰⁰ These changes in biodiversity, combined with other impacts from fishing, oil and gas exploration and development, and ocean acidification, can contribute to the decline or extinction of species and must be analyzed in the DPEIS.

¹⁹⁴ IPCC, *Climate Change 2007: Synthesis Report-- An Assessment of the Intergovernmental Panel on Climate Change* (2007).

¹⁹⁵ Thomas, C.D., Cameron, A., Green, R.E., Bakkenes, M., Beaumont, L.J., Collingham, Y.C., Erasmus, B.F.N., Extinction risk from climate change, *Nature* 427: 145-148 (2004); Global Carbon Project, *Carbon Budget 2009*, (2010) (report available at <http://www.globalcarbonproject.org/index.htm>); Raupach, M.R., Marland, G., Ciais, P., Le Quéré, C., Canadell, J.G., Klepper, G., and Field, C.B., Global and regional drivers of accelerating CO2 emissions, *Proceedings of the National Academy of Sciences* 104: 10288 (2007).

¹⁹⁶ Maclean, I.M.D., and Wilson, R.J., Recent ecological responses to climate change support predictions of high extinction risk, *Proceedings of the National Academy of Sciences of the United States of America* 108: 12337-12342 (2011).

¹⁹⁷ Smith, J.B., Schneider, S.H., Oppenheimer, M., Yohe, G.W., Hare, W., Mastrandrea, M.D., Patwardhan, A., Assessing dangerous climate change through an update of the Intergovernmental Panel on Climate Change (IPCC) “reasons for concern,” *Proceedings of the National Academy of Sciences of the United States of America* 106 (11): 4133-4137 (2009).

¹⁹⁸ Warren, R., Price, J., Fischlin, A., de la Nava Santos, S., and Midgley, G., Increasing impacts of climate change upon ecosystems with increasing global mean temperature rise, *Climatic Change* 106: 141-177 (2011).

¹⁹⁹ Beaugrand, G., Edwards, M., Brander, K., Luczak, C., and Ibanez, F., Causes and projections of abrupt climate-driven ecosystem shifts in the North Atlantic, *Ecology letters* 11: 1157-68 (2008).

²⁰⁰ Beaugrand, G., Decadal changes in climate and ecosystems in the North Atlantic Ocean and adjacent seas, *Deep Sea Research Part II: Topical Studies in Oceanography* 56: 656-673 (2009); Kerr, L.A., Connelly, W.J., Martino, E.J., Peer, A.C., Woodland, R.J., and Secor, D.H., Climate change in the U.S. Atlantic affecting recreational fisheries, *Reviews in Fisheries Science* 17: 267-289 (2009).

2. Ocean acidification impacts requiring analysis

The oceans are becoming more acidic faster than they have in the past 300 million years, a period that includes four mass extinctions.²⁰¹ Friedrich et al. (2012) concluded that anthropogenic ocean acidification already exceeds the natural variability on regional scales and is detectable in many of the world's oceans, including Atlantic regions.²⁰² Observed trends over the last couple of decades off Bermuda indicate that aragonite saturation has declined -0.04 per decade—exceeding the last glacial termination by orders of magnitude.²⁰³

BOEM must examine the impacts of its proposed project on the marine environment in light of changes that are already occurring due to ocean acidification. Especially relevant to the proposed project is that the oceans are becoming noisier due to ocean acidification.²⁰⁴ A 0.3 pH decrease causes loss of ~40% sound absorption.²⁰⁵ At levels of acidification predicted before the end of the century sound will travel 70% further in the ocean. The DPEIS must discuss the cumulative impacts of combined ocean acidification and the addition of noise to the marine environment from the proposed project.

Most marine animals respond negatively to ocean acidification, undermining calcification, growth, reproduction, metabolism, and survival.²⁰⁶ Indeed, ocean acidification has already impacted Atlantic wildlife. For example, areas of the Chesapeake Bay have already been lost to oyster harvesting—²⁰⁷ analogous to oyster die-offs in the Pacific Northwest that have now definitively been linked to ocean acidification.²⁰⁸ Oyster populations in the bay are already at historically low levels, and an examination of 23 years of water quality data concluded that significant trends in acidity will have impacts on juvenile oyster growth and survival.²⁰⁹ Already,

²⁰¹ Honisch, B., Ridgwell, A., Schmidt, D.N., Thomas, E., Gibbs, S.J., Sluijs, A., Zeebe, R., The Geological Record of Ocean Acidification, *Science* 335: 1058-1063 (2012).

²⁰² Friedrich, T., Timmermann, A., Abe-Ouchi, A., Bates, N.R., Chikamoto, M.O., Church, M.J., Dore, J.E., Detecting regional anthropogenic trends in ocean acidification against natural variability, *Nature Climate Change* 2 (2): 1-5 (2012).

²⁰³ *Id.*

²⁰⁴ Hester, K.C., Peltzer, E.T., Kirkwood, W.J., and Brewer, P.G., Unanticipated consequences of ocean acidification: A noisier ocean at lower pH, *Geophysical Research Letters* 35: L19601 (2008).

²⁰⁵ Brewer, P.G., and Hester, K.C., Ocean acidification and the increasing transparency of the ocean to low frequency sound, *Oceanography* 22 (4): 86-93 (2009).

²⁰⁶ Kroeker, K.J., Kordas, R.L., Crim, R.N., and Singh, G.G., Meta-analysis reveals negative yet variable effects of ocean acidification on marine organisms, *Ecology Letters* 13: 1419-1434 (2010).

²⁰⁷ Fincham, M.W., Who Killed *Crassostrea virginica*? The Fall and Rise of Chesapeake Bay Oysters (2012) (documentary film made for Maryland Sea Grant at the University of Maryland Center for Environmental Science, summary and excerpt available at www.mdsg.umd.edu/store/videos/oyster).

²⁰⁸ Barton, A., Hales, B., Waldbusser, G.G., Langdon, C., and Feely, R.A., The Pacific oyster, *Crassostrea gigas*, shows negative correlation to naturally elevated carbon dioxide levels: Implications for near-term ocean acidification effects, *Limnol. Oceanogr.* 57: 698-710 (2012).

²⁰⁹ Waldbusser, G.G., Voigt, E.P., Bergschneider, H., Green, M.A., and Newell, R.I.E., Biocalcification in the eastern oyster (*Crassostrea virginica*) in relation to long-term trends in Chesapeake Bay pH, *Estuaries and Coasts* 34(2): 1-11 (2010).

calcification of juvenile oysters is compromised by acidification. Waldbusser et al. (2011) conducted a study of eastern oyster under 4 levels of pH that encompass a range typical of the mesohaline waters of the Chesapeake Bay (7.2–7.9 on the NBS scale). They found that in as little as 2 weeks under various pH levels, shells began to dissolve even in waters that were not corrosive (7.9 pH). The treatments were not atypical for estuarine waters in the Chesapeake Bay and demonstrate that shell dissolution increases with declining pH, especially for fresh shells.²¹⁰

Studies of Northwest Atlantic bivalves demonstrate that changes in ocean acidification and temperature can have significant negative consequences for these coastal animals, especially at larval stages. Eastern oyster and bay scallop are particularly sensitive to ocean acidification, while ocean acidification and temperature rise together impair the survival, growth, development, and lipid synthesis of hard clams and bay scallops.²¹¹

Not only do calcifying organisms suffer from an increasingly acidic ocean environment, but fish and fisheries are threatened as well. New science confirms the negative consequences of ocean acidification on Atlantic herring, Atlantic cod, and *Menidia beryllina*, a common Atlantic estuarine fish. In Atlantic cod, exposure to CO₂ resulted in severe to lethal tissue damage in many internal organs, with the degree of damage increasing with CO₂ concentration.²¹² Larval survival and length of *M. beryllina* unambiguously decreased with increased carbon dioxide treatments.²¹³ Eggs exposed to high levels also had a higher rate of malformations, with larvae developing curved bodies. Increased carbon dioxide in the water also negatively affected Atlantic herring larvae.²¹⁴ Slower-growing larvae are more vulnerable to predation and decreased feeding success.²¹⁵ Since larval survival is critical to recruitment, ocean acidification has the potential to act as an additional source of natural mortality, affecting populations of already exploited fish stocks.²¹⁶

Even now, ocean acidification is putting vulnerable marine animals at the threshold of their tolerance levels. Declines of plankton, shellfish, and fish will reverberate up the marine food web with impacts on entire ecosystems. The DPEIS must quantify and discuss the contribution of the proposed action to further acidification, and it must also evaluate the cumulative impacts of the G&G program on the marine environment, in combination with acidification.

²¹⁰ Waldbusser, G.G., Steenson, R.A., and Green, M.A., Oyster shell dissolution rates in estuarine waters: Effects of pH and shell legacy, *Journal of Shellfish Research* 30: 659-669 (2011).

²¹¹ Talmage, S.C., and Gobler, C.J., Effects of elevated temperature and carbon dioxide on the growth and survival of larvae and juveniles of three species of Northwest Atlantic bivalves, *PLoS ONE* 6(10): e26941.doi:10.1371/journal.pone.0026941 (2011).

²¹² Frommel, A.Y., Maneja, R., Lowe, D., Malzahn, A.M., Geffen, A.J., Folkvord, A., Piatkowski, U., Reusch, T.B.H., and Clemmesen, C., Severe tissue damage in Atlantic cod larvae under increasing ocean acidification, *Nature Climate Change* 2: 1-5 (2011).

²¹³ Baumann, H., Talmage, S.C., and Gobler, C.J., Reduced early life growth and survival in a fish in direct response to increased carbon dioxide, *Nature Climate Change* 2: 6-9 (2011).

²¹⁴ Franke, A., and Clemmesen, C., Effect of ocean acidification on early life stages of Atlantic herring (*Clupea harengus L.*), *Biogeosciences* 8: 3697-3707 (2011).

²¹⁵ *Id.*; Baumann et al., Reduced early life growth and survival in a fish, *supra*.

²¹⁶ Frommel et al., Severe tissue damage in Atlantic cod larvae, *supra*.

V. COMPLIANCE WITH OTHER STATUTES

A number of other statutes and conventions are implicated by BOEM's permitting of G&G activities in the Atlantic. Among those that must be disclosed and addressed during the NEPA process are the following:

A. Marine Mammal Protection Act ("MMPA")

The MMPA prohibits citizens, including federal agencies, or those operating within the jurisdiction of the United States from "taking" marine mammals without first securing either an "incidental take" permit or an "incidental harassment" authorization. 16 U.S.C. § 1371(a); 50 C.F.R. § 216.107. For most activities, "take" is broadly defined to include both the "potential to injure a marine mammal or marine mammal stock in the wild" ("Level A" harassment) and the potential to "disturb" them "by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering" ("Level B" harassment). 16 U.S.C. § 1362(18); 50 C.F.R. § 216.3.

In 1994, Congress amended the MMPA to add provisions that allow for the incidental harassment of marine mammals through incidental harassment authorizations ("IHAs"), but only for activities that result in the "taking by harassment" of marine mammals. 16 U.S.C. § 1371(a)(5)(D)(i). For those activities that could result in "taking" other than harassment, interested parties must continue to use the pre-existing procedures for authorization through specific regulations, often referred to as "five-year regulations." 16 U.S.C. § 1371(a)(5)(A). Accordingly, NMFS' implementing regulations state that an IHA in the Arctic cannot be used for "activities that have the *potential* to result in serious injury or mortality." 50 C.F.R. § 216.107 (emphasis added). In the preamble to the proposed regulations, NMFS explained that if there is a potential for serious injury or death, it must either be "negated" through mitigation requirements or the applicant must instead seek approval through five-year regulations. 60 Fed. Reg. 28,379, 28,380-81 (May 31, 1995).

The caution exhibited by NMFS in promulgating the 1996 regulations is consistent with the MMPA's general approach to marine mammal protection. Legislative history confirms that at the time of the MMPA's original passage Congress intended to build in a "conservative bias" that would avoid adverse or irreversible effects "until more is known." H.R. Rep. 92-707, at 5 (1971) *reprinted in* 1972 U.S.C.C.A.N. 4144, 4148. The committee report that accompanied the House version of the 1994 amendments emphasizes that the IHA provisions were not intended to "weaken any of the existing standards which protect marine mammals and their habitats from incidental takes[.]" H.R. Rep. 103-439, at 37 (1994). Thus, the 1994 amendments preserved the existing five-year regulation process for those activities that risked the possibility of lethal or seriously injurious marine mammal take.

The risk of mortality and serious injury, discussed at section IV.E above, has implications for MMPA compliance. Here, in assessing their MMPA obligations, BOEM presupposes that industry will apply for IHAs rather than 5-year take authorizations and that BOEM will not apply

to NMFS for programmatic rulemaking. DPEIS at 1-13, 5-9. But the potential for mortality and serious injury bars industry from using the incidental harassment process to obtain take authorizations under the MMPA. BOEM should therefore consider applying to NMFS for a programmatic take authorization, and revise its impact and alternatives analyses in the EIS on the assumption that rulemaking is required.

Additionally, we are concerned about BOEM's general statement that an IHA "may not be necessary" for certain HRG surveys if operators can demonstrate that they can effectively monitor out to the 160 dB isopleth, which BOEM construes as the threshold for Level B take. DPEIS at C-15. As noted above, we believe that BOEM has applied the incorrect threshold given (1) the potential for take from mid-frequency sources at received levels well below 160 dB (RMS); (2) the demonstrated sensitivity of some species, such as harbor porpoises and beaked whales, requiring far lower take thresholds; and (3) the virtually continuous acoustic output of some sub-bottom profilers, which suggests that a standard designed for transient sounds should not be used. It is not possible for operators to effectively monitor out to the impact distances implied by these conditions; indeed, it is highly unlikely that operators could monitor – with the 100% efficacy that would be necessary – the smaller distances that BOEM appears to contemplate here, especially if surveys occur at night and other times of low visibility.²¹⁷

B. Endangered Species Act ("ESA")

The ESA requires that agencies give first priority to the protection of threatened and endangered species. *Tenn. Valley Auth. v. Hill*, 437 U.S. 153, 174 (1978) (Supreme Court found "beyond doubt" that "Congress intended endangered species to be afforded the highest of priorities."). Section 2(c) of the ESA establishes that it is "...the policy of Congress that all Federal departments and agencies shall seek to conserve endangered species and threatened species and shall utilize their authorities in furtherance of the purposes of this Act." 16 U.S.C. § 1531(c)(1).

The ESA defines "conservation" to mean "...the use of all methods and procedures which are necessary to bring any endangered species or threatened species to the point at which the measures provided pursuant to this Act are no longer necessary." 16 U.S.C. § 1532(3). Section 7(a)(2) of the ESA requires federal agencies to "insure that any action authorized, funded, or carried out by such agency... is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the adverse modification of habitat of such species... determined... to be critical...." 16 U.S.C. § 1536(a)(2); 50 C.F.R. § 402.14(a). To accomplish this goal, agencies must consult with the National Marine Fisheries Service or U.S. Fish and Wildlife Service, depending upon the species, whenever their actions "may affect" a listed species. 16 U.S.C. § 1536(a)(2); 50 C.F.R. § 402.14(a). Should they find that any listed species is likely to be adversely affected, the consulting agency must issue a biological opinion determining whether the action is likely to jeopardize the continued existence of the species or destroy or adversely modify critical habitat. If so, the opinion must specify reasonable and prudent alternatives that will avoid the likelihood of jeopardy or adverse modification and allow the action to proceed. 16 U.S.C. § 1536(b).

²¹⁷ The limitations of real-time visual monitoring are well known, as observed at sections III.B.1 and III.C.10 above.

For its part, BOEM, as the action agency, has an ongoing, substantive duty to ensure that any activity it authorizes, funds, or carries out does not jeopardize a listed species or destroy or adversely modify its critical habitat. An action agency's reliance on an inadequate, incomplete, or flawed biological opinion cannot satisfy its duty to avoid the likelihood of jeopardy to listed species. *See, e.g., Florida Key Deer v. Paulson*, 522 F.3d 1133, 1145 (11th Cir. 2008); *Pyramid Lake Tribe of Indians v. U.S. Navy*, 898 F.2d 1410, 1415 (9th Cir. 1990); *Stop H-3 Ass'n. v. Dole*, 740 F.2d 1442, 1460 (9th Cir. 1984) (action agency must independently ensure that its actions are not likely to cause jeopardy).

The central purpose of the ESA is to recover species to the point where ESA protections are no longer necessary. 16 U.S.C. §§1531(b), 1532(3). The ESA's emphasis on recovery of species means that BOEM may not authorize or carry out actions that will significantly reduce the likelihood of either the survival *or the recovery* of a listed species. *See, e.g. National Wildlife Federation v. National Marine Fisheries Serv.*, 524 F.3d 917, 932 (9th Cir. 2008).

The DPEIS indicates that BOEM has begun the consultation process, and that a Biological Opinion, if issued, will be included as an appendix to the final document. To be sure, the consultation should include every listed marine mammal, sea turtle, fish, and seabird species in the region, but the agencies should spend particular attention on the North Atlantic right whale. Without substantial additional mitigation, NMFS cannot legally issue a no-jeopardy opinion for this species. As noted above, the right whale is so critically endangered that the loss of a single adult female could threaten its survival; it is particularly vulnerable to masking effects at far distances from low-frequency sound sources, to stress effects from anthropogenic noise, and to ship strikes especially in combination with certain types of sound; and sublethal effects that impair the individual whales' ability to feed, communicate, or travel, or otherwise disrupt normal behavior could compromise their overall fitness and reproductive success, diminishing the species' chances at survival and recovery over the long term. Significantly, the members of the population most vulnerable to the effects of the proposed action are mothers and calves – the individuals most vital to maintaining and rebuilding the population.²¹⁸

In order to comply with the ESA, BOEM must select an alternative that sufficiently protects the right whale, its designated critical habitat, and all known migratory corridors, feeding areas, calving and nursery grounds. The seasonal exclusion proposed in Alternative A would not avoid jeopardy, nor would the additional exclusion (though superior) proposed in Alternative B.²¹⁹

C. Coastal Zone Management Act (“CZMA”)

²¹⁸ *E.g.,* McCauley, R.D., Fewtrell, J., Duncan, A.J., Jenner, C., Jenner, M.-N., Penrose, J.D., Prince, R.I.T., Adhitya, A., Murdoch, J. and McCabe, K., Marine seismic surveys: analysis and propagation of air-gun signals, and effects of air-gun exposure on humpback whales, sea turtles, fishes, and squid (2000).

²¹⁹ *See* Comment letter from Dr. Scott Kraus, Vice-President for Research, New England Aquarium, to BOEM (Aug. 10, 2011) (concerning BOEM's Draft Mid-Atlantic Wind Energy Area EA, and noting the risk that acoustic sources will displace mothers and mother/calf pairs into “rougher and more predator-occupied waters, potentially reducing calf survival”).

The CZMA requires that “[e]ach Federal agency activity within or outside the coastal zone that affects any land or water use or natural resource of the coastal zone shall be carried out in a manner which is consistent to the maximum extent practicable with the enforceable policies of approved State management programs.” 16 U.S.C. § 1456(c)(1)(A). *See also California v. Norton*, 311 F.3d 1162 (9th Cir. 2002) (applying consistency requirement to activities well outside state waters). Under the law, BOEM must provide a consistency determination to the relevant State agency responsible for the State’s CZM program at least 90 days before final approval of the federal activity. 16 U.S.C. § 1456(c)(1)(C); 15 C.F.R. § 930.36(b)(1). The State must provide its concurrence with or objection to the consistency determination within 60 days of receiving the determination and supporting information; otherwise, the federal agency may presume that the State concurs with its consistency determination. 15 C.F.R. § 930.41(a). If the State determines that the federal agency has not provided sufficient information to support the consistency determination, as required by 15 C.F.R. § 930.39(a), it must notify the federal agency of the deficiency and the 60-day clock will not commence until the State receives the necessary information. *Id.*

If the State objects to the consistency determination, the federal agency must work with the State to attempt to resolve their differences before the 90-day notice period expires. After that time expires, the federal may only proceed with the activity over the State’s objection if the agency determines that federal law requirements prevent the activity from achieving full consistency with enforceable state management program policies or the agency concludes, despite the State’s objection, that the activity is fully consistent with such enforceable policies. *Id.* § 930.43(d). In the alternative, a State may issue a conditional concurrence that states the conditions that must be satisfied in order to ensure consistency with specific enforceable policies of the State’s CZM program. The agency must modify the proposed plan or application to include the State’s conditions or notify the State that it refuses to do so, in which case the State’s conditional concurrence will be treated as an objection. *Id.* § 930.4(a)-(b). More specifically:

- (1) Importantly, the consistency requirement applies to multiple phases of OCS activities. When BOEM develops a plan to direct the agency’s future OCS actions, such as the plan of activities considered in the DPEIS, the agency must provide a consistency determination and seek each State’s concurrence that the activities covered by the plan are consistent to the maximum extent practicable with the enforceable policies of the State’s coastal zone management program. 15 C.F.R. § 930 Subpart C. This phase of planning and consistency review helps set the stage for future permitting and licensing decisions regarding OCS activities being carried out pursuant to the plan, but does not take the place of subsequent consistency determinations. Activities carried out by private entities that require a permit or license, such as a G & G permit, and all federal license or permit activities described in an OCS plan, must be determined to be fully consistent with the affected State’s enforceable coastal zone management policies. 15 C.F.R. § 930 Subparts D, E. The DPEIS acknowledges the multi-stage nature of consistency review under the CZMA, but does not indicate that BOEM will undergo review at the present stage. *See* 5-8 to 5-9. BOEM must.

- (2) The CZMA and its regulations broadly define the “may affect” trigger for consistency review. An activity that occurs outside the coastal zone still crosses the threshold if it affects resources within the coastal zone, or if it affects resources (such as whales and fish) that regularly come within the coastal zone but are outside the zone at the time of impact. This definition has significant implications for the high-intensity noise produced by airgun exploration, since a survey occurring tens or even hundreds of miles offshore can still affect coastal resources due to its enormous propagation footprint and its impact on wide-ranging species. *See NRDC v. Winter*, No. 8:07-cv-00335-FMC-FMOx, 2007 WL 2481037 (C.D. Cal. Aug. 7, 2007), *aff’d in rel. part*, 508 F.3d 885 (9th Cir. 2007), *rev’d in part on other grounds sub nom. Winter v. NRDC*, 129 S.Ct. 365 (2008). Perhaps most pressingly, BOEM must include New Jersey – which is omitted from the DPEIS’ distribution list (DPEIS at 5-6) – among the affected coastal states. Further, BOEM must acknowledge the full scope of activity that would affect coastal resources under the Act, for purposes of satisfying this important provision at both the planning and permitting stages.
- (3) Finally, it is crucial that BOEM provide a thorough analysis of the proposed action’s effects on the myriad coastal resources that State programs are designed to protect. Without such a thorough analysis, it is impossible for the states to assess the validity of any consistency determination BOEM issues – particularly in light of the short period of time the states have to object to a consistency determination. In addition, the states need full information to inform their own citizens and give those citizens a meaningful opportunity to comment on the proposed action, as required by 15 C.F.R. § 930.2. As written, however, the DPEIS glosses over many important impacts to coastal resources and, aside from the seasonal restrictions targeted at North Atlantic right whales and loggerhead sea turtles, fails to present reasonable alternatives necessary to protect those resources, including other marine mammals and fisheries. In its final PEIS, BOEM must present these missing alternatives and information, and give State CZM programs sufficient time to assess the information and the proposed actions’ consistency with their enforceable policies.

D. Magnuson-Stevens Fishery Conservation and Management Act

The Magnuson-Stevens Fisheries Conservation and Management Act, 16 U.S.C. § 1801 *et seq.*, requires federal agencies to “consult with the Secretary [of Commerce] with respect to any action authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken” that “may adversely affect any essential fish habitat” identified under that Act. 16 U.S.C. § 1855 (b)(2). In turn, the Act defines essential fish habitat as “those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity.” 16 U.S.C. § 1802 (10). As discussed above, BOEM’s Atlantic study area contains such habitat, and geological and geophysical operations have the significant potential to adversely affect at least the waters, and possibly the substrate, on which fish in these areas depend. Accordingly, and as the DPEIS anticipates, BOEM must consult with the Secretary of Commerce through NMFS and the Mid-Atlantic and South Atlantic Fisheries Management Councils. DPEIS at 5-9.

E. National Marine Sanctuaries Act

The National Marine Sanctuaries Act requires agencies whose actions are “likely to injure a sanctuary resource” to consult with the Office of National Marine Sanctuaries (“ONMS”). 16 U.S.C. § 1434(d). As the DPEIS recognizes, the agency does not need to conduct the activity itself, since any federal agency action, including permitting or licensing, can trigger the requirement; nor must the activity occur within the sanctuary, so long as the resource is likely to be injured. DPEIS at 1-17; 16 U.S.C. § 1434(d). ONMS may also request that the agency initiate the consultation process.²²⁰ Under the consultation scheme, BOEM is required to prepare a Sanctuary Resource Statement; if ONMS determines that the statement is complete and that injury is indeed likely, it must prepare recommended alternatives to the proposed action, which may include relocation, rescheduling, or use of alternative technologies or procedures.²²¹

To ensure compliance with the consultation provision, BOEM should keep several critical points in mind.

First, ONMS in its regulations defines the term “sanctuary resource” quite broadly, to the extent that it includes “virtually every living and nonliving component of the sanctuary ecosystem”;²²² these include any resource “that contributes to the conservation, recreation, ecological, historical, research, educational, or aesthetic value of the Sanctuary.” 15 C.F.R. § 922.182. Consistent with this approach, ONMS defines the term “injure” to mean “change adversely, either in the short or long term, a chemical, biological, or physical attribute of, or the viability of.” 15 C.F.R. § 922.3. The DPEIS appears to interpret these provisions narrowly. *See* DPEIS at 5-9 to 5-10. Yet there can be no question, under these definitions, that an activity that degrades the acoustic habitat of a National Marine Sanctuary, even temporarily, or impinges on the sanctuary’s value for scuba diving or other recreational activities, injures a sanctuary resource. Thus BOEM should not consider itself subject to consultation only if its permitting activities physically injure a marine animal within sanctuary boundaries. The permitting of any seismic survey likely to degrade the acoustic environment of the Monitor or Gray’s Reef NMS, or (given the best available science on scuba diver aversion to low-frequency sound) raise noise levels within the sanctuaries above 145 dB (SPL), is subject to consultation under the Act.

Second, we strongly encourage BOEM to tier consultation with the sanctuaries. As it stands, the agency plans to undertake consultation only with respect to the issuance of survey-specific permits. DPEIS at 1-17. But this approach only risks greater conflict down the line, since BOEM will have less latitude to accept some types of recommended alternatives, such as restricting a survey from certain areas, when the action turns to individual surveys; and it fails to benefit from any streamlining that a tiered process would afford.²²³ BOEM should undertake

²²⁰ NOAA Office of National Marine Sanctuaries, Overview of conducting consultation pursuant to section 304(d) of the National Marine Sanctuaries Act (16 U.S.C. 1434(d)) at 4 (2009).

²²¹ *Id.* at 8.

²²² *Id.* at 5.

²²³ For example, if, as a result of consultation, BOEM establishes a time-area closure around the sanctuaries, its need to consult on individual permitting activities could diminish.

consultation now on its proposed programmatic alternatives and renew the process, if necessary, for individual permits.

F. National Ocean Policy

The National Ocean Policy (“NOP”) is a “stewardship” plan for our coast and ocean, including BOEM’s area of interest. Under NOP, it is the policy of the federal government to “protect, maintain, and restore the health and biological diversity of ocean, coastal, and Great Lakes ecosystems and resources”; “to improve the resiliency of ocean, coastal, and Great Lakes ecosystems, communities, and economies”; “to respect and preserve our Nation’s maritime heritage, including our social, cultural, recreational, and historical values”; “to use the best available science and knowledge to inform decisions affecting the ocean, our coasts, and the Great Lakes”; and “to foster a public understanding of the value of the ocean, our coasts, and the Great Lakes to build a foundation for improved stewardship. Exec. Order No. 13547, 75 Fed. Reg. 43023 (July 22, 2010).

Taken together, the intrusion of oil and gas exploration into the communities of the Atlantic Coast will seriously impact the economies of clean ocean uses. Unlike other regions, where oil and gas operations permeate coastal zone activities, the Atlantic Ocean has been oil and gas industry-free for decades, and has built a clean ocean economy that depends on thriving fisheries, whales to drive ecotourism, and safe, swimmable beaches. The proposed action will lead to the direct displacement of commercial and recreational fishermen and will likely impact long-term ecotourism and coastal cultural values. The President’s Executive Order, which directs all agencies to “take such action as necessary to implement the policy set forth in section 2 of this order and the stewardship principles and national priority objectives,” does not exempt BOEM from any of its provisions. Therefore, BOEM has the responsibility to protect the economies and ecosystems of the Atlantic Ocean under a program of improved understanding, stakeholder engagement, and science-based decisionmaking. This DPEIS does not achieve any of these goals, does not represent good ocean governance, and does not represent the use of good science. Until it does so, BOEM is in violation of the President’s declared policies for the protection of our ocean’s ecosystems and resources.

VI. CONCLUSION

For the above reasons, we urge BOEM first and foremost to adopt Alternative C as its preferred alternative, and next to seriously consider the recommendations we have made to improve analysis and mitigate the far-reaching impacts of the proposed activity.

We would welcome the opportunity to meet with you, your staff, and other relevant offices at any time to discuss these matters. Given the swift timeline BOEM has set for finalizing the DPEIS and producing a record of decision, we would urge you to contact us at the earliest opportunity. For further discussion, please contact Michael Jasny of NRDC (mjasny@nrdc.org).

Very truly yours,

Mr. Gary D. Goeke
July 2, 2012
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EXHIBIT 7



OCEANA

Protecting the
World's Oceans

MEMORANDUM

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May 7, 2014

Via Federal e-Rulemaking Portal

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Re: Final Programmatic Environmental Impact Statement for Geological and Geophysical Activities in the Outer Continental Shelf Waters of the Atlantic Coast in Support of Oil and Gas Exploration and Development, 79 Fed. Reg. 13,074 (March 7, 2014), ID# BOEM-2014-0028-0001

Dear Mr. Goeke:

Oceana and the International Fund for Animal Welfare (IFAW) thank you for the opportunity to submit comments on the above-captioned final programmatic environmental impact statement (“PEIS”) concerning high-intensity seismic surveys in the Atlantic Ocean. This PEIS is important because sound is a fundamental element of the marine environment, but the seismic surveys would include airgun blasts that will harm marine mammals. The sound from airguns can travel hundreds to thousands of miles underwater and across entire ocean basins.¹ Studies have documented the harm from airgun blasts. For example, humpback and fin whales stopped vocalizing in a 100,000 square mile area² during airgun activity. Evidence shows that blasts cause baleen whales to abandon habitats over a similar spatial area.³ Yet even though the proposed action is an activity with significant potential impacts on the marine environment along nearly the entire East Coast of the United States, the PEIS fails to take a hard look at its impacts.

¹ Nieukirk, S.L., Stafford, K.M., Mellinger, D.K., Dziak, R.P., and Fox, C.G., (2004). Low-frequency whale and seismic airgun sounds recorded in the mid-Atlantic Ocean, *Journal of the Acoustical Society of America* 115: 1832-1843.

² Clark, C.W., and Gagnon, G.C., (2006). Considering the temporal and spatial scales of noise exposures from seismic surveys on baleen whales (IWC Sci. Comm. Doc. IWC/SC/58/E9).

³ MacLeod, K., Simmonds, M.P., and Murray, E., (2006). Abundance of fin (*Balaenoptera physalus*) and sei whales (*B. borealis*) amid oil exploration and development off northwest Scotland, *Journal of Cetacean Research and Management* 8: 247-254.

The PEIS is fatally flawed because

- 1) The Bureau of Ocean Energy Management (“the Bureau”) had, but did not consider, information from a Cornell study on the extent of right whales’ presence in the Atlantic Ocean.
- 2) The Bureau failed to consider a full range of alternatives in light of the information published in the Cornell study. As a result, the preferred alternative mitigation measure will not adequately protect right whales.
- 3) The Bureau had, but did not consider, information on acoustic thresholds for marine mammals that shows that marine mammals suffer harm at much lower decibel levels than is assumed in the PEIS.
- 4) The Bureau had, but did not consider, information on the possible indirect impacts of Level B Takes, including the possibility of Level B Takes resulting in mass mortality events.
- 5) The baseline against which the Bureau measured environmental impacts is inaccurate for several reasons, resulting in inadequate consideration of the impacts of the proposed action.
- 6) The Bureau failed to take a hard look at environmental impacts on essential fish habitat (“EFH”).

For these six reasons, the PEIS is fatally flawed, and therefore the Bureau cannot rationally adopt the preferred alternative in the Record of Decision (“ROD”). In order to proceed with a proposal for geological and geophysical (“G&G”) activities in the Outer Continental Shelf (“OCS”) waters of the Atlantic coast, the Bureau must develop an adequate PEIS that considers the best available science, analyzes a full spectrum of reasonable and feasible alternatives, and takes a hard look at the impacts on marine life, especially protected marine mammals.

I. THE BUREAU HAD, BUT DID NOT CONSIDER, INFORMATION FROM A CORNELL STUDY ON THE EXTENT OF RIGHT WHALES’ PRESENCE IN THE ATLANTIC OCEAN.

The Bureau had, but did not consider, information from a study by Cornell University’s Bioacoustics Research Program, regarding the extent of right whales’ presence in the Atlantic Ocean. Under Council of Environmental Quality (“CEQ”) regulations promulgated under the National Environmental Policy Act (“NEPA”), an agency’s evaluation of environmental consequences, in an environmental impact statement (“EIS”), must be based on “accurate” and “high quality” scientific information.⁴ Therefore EISs “must present accurate and complete information to decision-makers to allow informed decisions.”⁵ The Bureau did not base the PEIS

⁴ 40 C.F.R. § 1500.1(b).

⁵ *N.C. Wildlife Fed’n v. N.C. Dept. of Transp.*, 677 F.3d 596 (4th Cir. 2012), cited by David R. Mandelker, *NEPA Law and Litigation* § 10:33:20 (2013 ed.). “[Environmental] impact statement[s] must contain an adequate compilation of relevant data and information....” *Id.*, citing *N. Plains Res. Council, Inc. v. Surface Transp. Bd.*, 668 F.3d 1067 (9th Cir. 2011); *Sierra Club v. U.S. Army Corps of Eng’rs*, 701 F.2d 1101 (2d Cir. 1983); *Native Ecosystems Council v. Weldon*,

on either accurate or complete scientific information by failing to include data from a study performed by researchers at Cornell on the distribution of the right whale, an endangered species within the Atlantic OCS area where seismic surveys are proposed.⁶

In the PEIS, the Bureau listed alternatives to the proposed action. The preferred Alternative mitigation measure (named “Alternative B” in the PEIS) contains the most protective measures for the endangered right whales. This alternative includes a time-area closure extending 20 nautical miles from shore from Delaware Bay to the southern edge of the area of interest (“AOI”), running from November 15 to April 15 within the right whale’s critical habitat, and a closure within the Mid-Atlantic and Southeast U.S. Seasonal Management Areas (“SMAs”) from November 1 to April 30.⁷

In developing the preferred alternative mitigation measure, the Bureau relied on historical sighting data of right whales from the National Marine Fisheries Service (“the Service”) and an assumption that approximately 83% of right whales occur within 20 nautical miles of the coast.⁸ While shipboard and aerial sighting surveys are important, they are also highly limited because they are constrained to daylight hours and favorable weather, spotting whales only when they surface. Some sighting data is recorded by the public and can suffer from a near-shore bias. Long-term passive acoustic monitoring networks, in combination with sighting survey data, provide a much more accurate assessment of right whale distribution in the mid and south Atlantic.

The Cornell study shows that critically endangered North Atlantic right whales are present throughout the year off the Virginia coast.⁹ By using marine autonomous recording units

848 F.Supp. 2d 1207 (D. Mont. 2012); *Border Power Plant Working Grp. v. Dep’t of Energy*, 467 F.Supp. 2d 1040 (S.D. Cal. 2006); *Fund for Animals v. Norton*, 365 F. Supp. 2d 394 (S.D. N.Y. 2005); *Nat’l Wildlife Fed’n v. Norton*, 332 F. Supp. 2d 170, 183 (D.D.C. 2004).

⁶ Aaron Rice, ET. AL., *Acoustic Ecology of North Atlantic Right Whales off the Virginia Coast: Data Quality and Initial Right Whale Presence Results*, Cornell University Bioacoustics Research Program (Oct. 2013). The study was partially funded by and prepared for Oceana and the International Fund for Animal Welfare. Dr. Rice presented the results to Brian Hooker and other staff in the Bureau’s Office of Renewable Energy Programs in Herndon, VA on Thursday, Nov. 14, 2013.

⁷ See Bureau of Ocean Energy Mgmt., *Atlantic OCS Proposed Geological and Geophysical Activities Mid-Atlantic and South Atlantic Planning Areas Final Programmatic Environmental Impact Statement, Vol. I Summary, Time-Area Closure for North Atlantic Right Whales for HRG surveys* at xxvii (2014).

⁸ See Bureau of Ocean Energy Mgmt., *Atlantic Outer Continental Shelf Proposed Geologic and Geophysical Activities Mid and South Atlantic Planning Areas Draft Programmatic EIS, Vol I. Chapter 2.2.21, Expanded Time-Area Closure for North Atlantic Right Whales* at 2-28 (2012).

⁹ Aaron Rice, ET. AL., *Acoustic Ecology of North Atlantic Right Whales off the Virginia Coast: Data Quality and Initial Right Whale Presence Results*, Cornell University Bioacoustics Research Program (Oct. 2013). The study was partially funded by and prepared for Oceana and the International Fund for Animal Welfare. Dr. Rice presented the results to Brian Hooker and other staff in the Bureau’s Office of Renewable Energy Programs in Herndon, VA on Thursday, Nov. 14, 2013.

(“MARUs”) to record right whale vocalizations, Cornell researchers assessed right whale presence in five locations off the Virginia coast. Researchers used MARUs in two separate deployments to provide acoustic coverage from June 3, 2012, to June 13, 2013. All five of the MARUs detected right whale presence at varying distances from shore: 16, 30, 38, 48, and 63 nautical miles. The results indicate a year-round presence of right whales with peak concentrations occurring from mid-January 2013 through late March 2013. This information is not considered in the PEIS, which assumes a mostly seasonal presence. Moreover, the vast majority of right whale detections occurred outside the bounds of the time-area closure proposed by the Bureau as the preferred alternative mitigation measure in the draft EIS.¹⁰ Therefore, the preferred alternative mitigation measure will not adequately protect endangered right whales.

On December 6, 2013, Oceana and IFAW not only sent Secretary Jewell a letter describing the Cornell study’s findings,¹¹ but also met with Bureau leadership to discuss re-scoping the draft EIS in light of the relevant scientific information.¹² The Bureau then failed to include the relevant information from the study in the PEIS.

The Bureau had this information but did not consider it in the PEIS. The assumptions under which the PEIS analyzed impacts, proposed alternatives, and adopted mitigation measures are not justified, and therefore the Bureau cannot rationally adopt the preferred alternative in the PEIS for the ROD.¹³ Accordingly, it is now necessary for the Bureau to re-scope the issue and alternatives, and develop a new draft EIS for public comment prior to advancing further with the Atlantic seismic exploration program.

II. IN LIGHT OF NEW INFORMATION, THE PREFERRED ALTERNATIVE MITIGATION MEASURE WILL NOT ADEQUATELY PROTECT RIGHT WHALES AND THEREFORE THE PEIS IS INADEQUATE BECAUSE IT LACKS AN ALTERNATIVE WHICH WOULD ADEQUATELY PROTECT RIGHT WHALES.

In light of the information published in the Cornell study, the preferred alternative mitigation measure will not adequately protect right whales, so the PEIS is inadequate because it fails to consider a complete range of alternatives. Under NEPA, EISs must include an analysis of “all

¹⁰ See Bureau of Ocean Energy Mgmt., Atlantic OCS Proposed Geological and Geophysical Activities Mid-Atlantic and South Atlantic Planning Areas Final Programmatic Environmental Impact Statement, Vol. I Chapter 2.2.2.1., Expanded Time-Area Closure for North Atlantic Right Whales for Alternative B at 2-36 (2014).

¹¹ Letter from Oceana and IFAW to Sec’y Sally Jewell, Dep’t of Interior (Dec. 6, 2013) (attached) (Re: Significant New Information Requires a New Programmatic Environmental Impact Statement for Atlantic Geological and Geophysical Activities).

¹² Meeting between Walter Cruickshank, Deputy Director, the Bureau, *et al.*, and Jackie Savitz, Vice Pres., Oceana, *et al.* (Dec. 6, 2013). At this meeting, Bureau staff raised the issue that this study is not yet published; however, we explained that research used in these contexts is normally not published. Since this information is of the type normally relied on by scientists in this context, the Bureau cannot postpone considering this information until after the completion of the PEIS.

¹³ 40 C.F.R. § 1502.9.

reasonable alternatives” to the proposed action.¹⁴ The new information published in the Cornell study mentioned above shows a larger spectrum of the potential effects than is included in the PEIS.

Prior to the Cornell study, Alternative B may have seemed to prevent blasts within the temporal and geographic range where whales would be present. However, as discussed above, the Cornell study shows an expanded geographic and temporal range for the presence of whales. On December 6, 2013, Oceana and IFAW sent a letter to, and met with, the Bureau to discuss the Cornell study’s findings.¹⁵ However, the findings were not incorporated into the PEIS.

Therefore, the preferred alternative mitigation measure does not offer adequate protection of right whales, because it does not consider the right whales’ actual geographic and temporal range. Consequently the PEIS is inadequate because it does not consider a full range of alternatives to mitigate the impacts on right whales. Alternative B can be kept as a mid-range alternative, but a new alternative is needed, that will coincide with the correct temporal and geographic range in which whales will be present. Without a new alternative, the PEIS is fatally flawed, and the Bureau cannot rationally rely on it because the EIS does not contain a full spectrum of alternatives to the project.

When re-developing an adequate PEIS, the Bureau should, at a minimum, expand the time area closures to at least 63 miles, where MARUs recorded significant numbers of right whales. A failure to expand the mitigation measures will needlessly threaten the right whale and will increase the proposed numbers of injuries and disturbances of this critically endangered species.

III. THE BUREAU HAD, BUT DID NOT CONSIDER, INFORMATION ON THE ACOUSTIC THRESHOLDS OF MARINE MAMMALS.

The Bureau had, but did not consider, data on the threshold levels for acoustic activity that harms marine mammals—in other words, data that show the decibel levels at which noise becomes too loud and therefore harmful to marine mammals. An EIS must be based on accurate and complete scientific information.¹⁶ The Bureau relied on outdated information and therefore failed to include years of available scientific data. The new information is important because the data show that the impacts from the sound of seismic testing cover a much larger geographic range than originally thought. A larger geographic range of effects would affect a larger number of marine mammals that are not protected by the preferred alternative mitigation measure and are not considered as affected in the PEIS. By failing to consider available data that the Bureau was (1) given and (2) was aware of because of its incorporation in the Draft Guidance,¹⁷ the Bureau failed to base the PEIS on either accurate or complete scientific information.

¹⁴ 40 C.F.R. § 1502.14(a).

¹⁵ See *supra* notes 11, 12.

¹⁶ 40 C.F.R. § 1500.1(b).

¹⁷ See NOAA, *NOAA’s Marine Mammal Acoustic Guidance*, available at: <http://www.nmfs.noaa.gov/pr/acoustics/guidelines.htm>

On July 2, 2012, Oceana and other parties informed the Bureau of the inadequacy of the acoustic threshold data used in the draft EIS.¹⁸ Our communication included dozens of studies concerning acoustic-threshold data that should have been included in the draft EIS.¹⁹ On January 8, 2014, four members of the U.S. House of Representatives sent a letter to the Department of the Interior (“Interior”) urging the agency to use the best available acoustic-threshold data before approving any seismic activity.²⁰ On February 20, 2014, a coalition of 102 scientists sent President Obama a letter urging that the best available science be used for acoustic-threshold data before permitting seismic surveys in the Atlantic.²¹ On February 26, 2014, nine members of the U.S. Senate sent a letter to Interior urging the agency to use the best available science for acoustic-threshold data in the PEIS.²² Despite several notifications of the updated scientific information available, the Bureau failed to consider the current data. Moreover, the Bureau must have been aware of the data because the Service used this data while formulating the new Draft Guidance. In order to accurately assess the scope of marine mammal impacts from proposed seismic airgun surveys, the Service must include all relevant scientific data.

IV. THE BUREAU HAD, BUT DID NOT CONSIDER, INFORMATION REGARDING THE POSSIBILITY OF LEVEL B TAKES CAUSING MASS MORTALITY EVENTS AND OTHER SERIOUS INJURIES.

The Bureau had, but did not consider, information regarding the potential of Level B takes to cause mass mortality events. An EIS must be based on accurate and complete scientific information.²³ The Bureau had, but failed to include, data from a mass mortality event in Madagascar. Therefore, the Bureau did not base the PEIS on either accurate or high quality scientific information.

The high number of Level B takes authorized in the PEIS requires the Bureau to address the severity of the impacts that Level B takes can have, particularly when examining an AOI that contains six species of endangered cetaceans. Level B takes, or disturbances in behavior, have indirect effects, such as behavior alterations, that can change the dynamics of a population and influence stock size.

¹⁸ Oceana, *et al.*, Comments on the Draft PEIS for Atlantic G&G Activities at 37-45 (July 2, 2012) (attached).

¹⁹ *See id.*

²⁰ Letter from Rep. Peter DeFazio, Rep. Frank Pallone, Jr., Rep. Rush Hold, Rep. Joe Carcia to Sec’y Sally Jewell, Dep’t of the Interior (Jan. 8, 2014) (attached) (Letter concerning the impacts of offshore oil and gas exploration and development activities on living marine resources).

²¹ Letter from Matthew Huelsenbeck, *et al.*, to Pres. Obama (Feb. 20, 2014) (attached) (Re: Use the Best Available Science before Permitting Seismic Surveys for Offshore Oil and Gas in the Mid- and South-Atlantic).

²² Letter from Sen. Cory Booker, Sen. Edward Markey, Sen. Brian Schatz, Sen. Maria Cantwell, Sen. Barbara Mikulski, Sen. Sheldon Whitehouse, Sen. Robert Menendez, Sen. Benjamin Cardin, Sen. Barbara Boxer to Sec’y Sally Jewell, Dep’t of the Interior (Feb. 26, 2014) (attached) (Letter concerning the PEIS on seismic airgun testing for offshore oil and gas exploration in the Atlantic Ocean).

²³ 40 C.F.R. § 1500.1(b).

One example of the potential for deadly impacts from Level B takes is the stranding of over 75 melon-headed whales off the coast of Madagascar. An Independent Scientific Review Panel (ISRP) examined the conditions surrounding this stranding to determine plausible cause for the unusual events. This scientific expert panel concluded that the most plausible explanation was the use of a multibeam echosounder, another technology that causes acoustic disturbance in the marine environment.²⁴ The use of this echosounder caused the melon headed whales to divert from their original location, to a bay farther inshore, otherwise known as a behavioral disturbance or Level B take. This diversion caused the whales to enter shallow water, which led to a mass stranding, followed by emaciation, dehydration, and eventually death. This study is a primary example of how Level B takes, or a simple behavioral disturbance, can ultimately lead to harm greater than a Level B take. Two additional instances of airgun use have been linked to beaked whale strandings in the Gulf of California and the Galapagos. While no scientific report was published as in the Madagascar study, U.S. courts required the seismic activity to stop until further investigation was completed.^{25,26} Especially when considering endangered populations, mortalities of this magnitude can have serious population-level consequences.

Additionally, there are other studies of marine mammal populations that examine the effects of behavioral disturbance on survival of marine mammals as well as the possible consequences for population levels. One study of behavioral disturbance to a fin whale pod found that seismic activity caused a migratory diversion. This is classified as a Level B take although it is thought to have implications for the breeding season and fecundity of this population, as it may have caused them to lose a year of calves.²⁷ Literature reviews of the effects of seismic surveys have found potential serious long-term consequences due to chronic exposure to seismic activity. These reviews have also found that populations can be adversely affected by the behavioral disturbances that constitute a Level B take, such as alteration of feeding, orientation, hazard avoidance, migration or social behavior.²⁸

On January 8, 2014, four members of the U.S. House of Representatives sent a letter to the Bureau informing the agency of the mass stranding event in Madagascar and the study that

²⁴ Southall, B.L., Rowles, T., Gulland, F., Baird, R.W., and Jepson, P.D. 2013. Final report of the Independent Scientific Review Panel investigating potential contributing factors to a 2008 mass stranding of melon-headed whales (*Peponocephala electra*) in Antsohihy, Madagascar.

²⁵ Malakoff, D. 2003. Suit ties whale deaths to research cruise. *Science* 298: 722-723.

²⁶ Gentry, R.L. 2002. Mass Stranding of Beaked Whales in the Galapagos Islands, April 2000. http://www.nmfs.noaa.gov/prot_res/PR2/Health_and_Stranding_Response_Program/Mass_Galapagos_Islands.htm.

²⁷ Castellote, M., Clark, C. W., and Lammers, M. O. 2010. Potential negative effects in the reproduction and survival on fin whales (*Balaenoptera physalus*) by shipping and airgun noise. *Int. Whal. Comm. Working Pap. SC/62 E*, 3.

²⁸ Gordon, J.C.D., Gillespie, G., Potter, J., Frantzis, A., Simmonds, M.P., Swift, R., Thompson, D. 2003. A review of the effects of seismic survey on marine mammals. *Marine Technology Society Journal* 37(4): 14-32.

connected the strandings to seismic activity.²⁹ Despite being aware of the information, the Bureau failed to include the information in the PEIS.

V. THE BASELINE AGAINST WHICH THE BUREAU MEASURED ENVIRONMENTAL IMPACTS IS INACCURATE FOR SEVERAL REASONS, CAUSING A FATAL FLAW IN THE PEIS ANALYSIS OF ENVIRONMENTAL IMPACTS.

The baseline against which the Bureau measured environmental impacts is inaccurate for several reasons. The baseline is inaccurate because (1) the Bureau relied on outdated stock assessments; (2) the Bureau did not consider the unusual mortality event (“UME”) occurring for bottlenose dolphins in the Atlantic; (3) the Bureau did not consider the impacts of Hurricane Sandy; and (4) the Bureau did not consider the impacts of the 2010 British Petroleum (“B.P.”) oil-spill disaster in the Gulf of Mexico.

Before the Bureau can claim that the impacts of the proposed G&G activities will have a moderate, rather than major, impact on marine mammals, the Bureau must use updated population information and complete baseline data. The Marine Mammal Protection Act (“MMPA”) requires that marine-mammal stocks be assessed every five years; however 80 percent of marine mammal stocks in U.S. Atlantic waters have not been assessed in the past five years. Of the 46 stocks that have not been recently assessed, two are considered endangered under the Endangered Species Act (“ESA”), and five are considered depleted under the MMPA.³⁰ This stock abundance information must be updated if it is to form the baseline data used by the Bureau to determine possible population effects of seismic activity in the Atlantic.

Furthermore, this baseline data does not take into account the UME that occurred along the Atlantic coast. Beginning in 2013, the Service designated a UME for bottlenose dolphins in the Mid-Atlantic ranging from New York to Florida.³¹ Bottlenose dolphins are estimated to be killed or injured in large numbers during this seismic activity, but the PEIS does not address the unusual mortality event and the population level effects this may have. As the mortality event is so recent, it has not yet been incorporated into the Service population data, which again invalidates the underlying baseline population estimates, particularly for bottlenose dolphins.

In addition, the Bureau did not consider the impacts of Hurricane Sandy in determining the baseline, as urged by a coalition of parties in a December 3, 2012, letter to Interior.³² Finally, the

²⁹ Letter from Rep. Peter DeFazio, *et al.*, at 2.

³⁰ Waring, G.T., Josephson, E., Maze-Foley, K., and Rosel, P.E. 2013. U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments: 2012. U.S. Department of Commerce, NOAA Technical Memorandum p. 419.

³¹ “2013-2014 Bottlenose Dolphin Unusual Mortality Event in the Mid-Atlantic”. NOAA Fisheries. 25 March 2014, *available at*:

<http://www.nmfs.noaa.gov/pr/health/mmume/midatldolphins2013.html>

³² Letter from Clean Ocean Action, *et al.*, to Sec’y Ken Salazar, Department of Interior (Dec. 3, 2012) (attached) (Re: Request for Postponement of Proposed Geological and Geophysical Survey Decisions for Atlantic Ocean Offshore Oil and Gas Energy Development).

Bureau did not consider the impacts of the 2010 B.P. oil-spill disaster, as urged by four members of the U.S. House of Representatives in a January 8, 2014, letter to Interior.³³

Under CEQ regulations, any agency must explain when necessary information is missing or incomplete.³⁴ If the missing or unavailable information is “essential,” then the agency must include the information in the EIS.³⁵ However, if the costs of obtaining the information “are exorbitant or the means to obtain it are not known,”³⁶ the agency must: (1) state that the information is unavailable or incomplete; (2) state the relevance of the information to the impacts discussed in the EIS; (3) summarize the relevant, existing scientific evidence; and (4) evaluate the impacts based on generally accepted theoretical approaches or methods.³⁷

The Bureau failed to include data from a current stock assessment, the UME, Hurricane Sandy, and the B.P. disaster, all of which are essential to the PEIS’s baseline. Because that information is essential, the Bureau must include it in the PEIS, or follow the four steps listed just above, either of which the Bureau failed to do in the PEIS. Therefore the Bureau cannot rationally adopt the preferred alternative in the PEIS. Basic population assessments for marine mammal stocks in the Atlantic must be updated before the Bureau can accurately analyze potential impacts of seismic activity on these populations.

VI. THE BUREAU FAILED TO TAKE A HARD LOOK AT THE ENVIRONMENTAL IMPACTS ON ESSENTIAL FISH HABITATS (EFH).

The Bureau failed to take a hard look at the impacts on EFH. Agencies must take a “hard look” at environmental impacts “likely to result” from the action considered.³⁸ The Bureau must take a hard look at impacts to EFH, as well as the commercial fisheries that rely on these managed species.³⁹ The PEIS merely states that impacts from active acoustic sound sources, such as airguns, would range from minor to moderate.⁴⁰

The available science states that acoustic disturbances of the same magnitude as acoustic surveys can cause physical damage, and disrupt essential behaviors necessary for life functions of fish stocks. Research described below indicates that seismic surveys, and other anthropogenic noises at similar intensities, can impact fish physiology as well as behavior. One study found that direct

³³ Letter from Rep. Peter DeFazio, *et al.*, at 2, 3.

³⁴ 40 C.F.R. § 1502.22.

³⁵ *Id.* at (a).

³⁶ *Id.* at (b).

³⁷ *Id.* at (b)(1).

³⁸ *Town of Orangetown v. Gorsuch*, 718 F.2d 29, 35 (2d Cir. 1983), *cert. denied*, 465 U.S. 1099 (1984).

³⁹ As discussed in Section VII, part of taking a hard look is consulting with the Service regarding “any” action “that may affect EFH.” 50 C.F.R. § 600.920(a)(1).

⁴⁰ See Bureau of Ocean Energy Mgmt., Atlantic Outer Continental Shelf Proposed Geologic and Geophysical Activities Mid and South Atlantic Planning Areas Draft Programmatic EIS, Vol I. Table 2-4, Comparison of Impact Levels for Alternatives A,B, and C at Tables-11 (2014).

mortality from seismic airguns is limited, in some species, to a range of 5 meters from airguns.⁴¹ This same study notes that seismic surveys should be avoided in areas of spawning or fish migration.⁴² Additional studies show that fish exposed to airguns from geological survey exhibit damaged sensory epithelia, with no evidence of repair two months after seismic airgun exposure.⁴³ Physical damage from airguns must be assessed in the context of potential population level effects.

Acoustic impacts detailed in the literature can affect important fish behaviors. There can be economic consequences to these changes in behavior. For example, one study found a 50% reduction in catch of haddock and cod using longlines and trawls in the area of seismic blasting, with significant effects noted over the entire study area of 40 x 40 nautical miles.⁴⁴ Rockfish studies showed CPUE decline by over 50% on average in areas of geophysical surveys with economic losses averaging 49%.⁴⁵ Slotte *et al.* illustrate that the large-scale distribution of both herring and blue whiting systematically showed lower abundances after periods of seismic activity.⁴⁶ While there is little data available for commercially important species that are not finfish, captive squid showed a strong startle response to nearby air-gun start up and evidence suggests that they would significantly alter their behavior at an estimated 2-5 km from an approaching large seismic source.⁴⁷ These behavioral impacts are not addressed in this EIS, and there is no mention of potential population-level effects that could emerge due to repeated behavioral alterations. Qualitative categorization of impacts encompassing such a broad range of impacts from minor to moderate is insufficient detail to satisfy the requirements of NEPA regarding authorization of activities that can be potentially harmful to EFH.

⁴¹ Dalen, J., and Knutsen, G. M. 1987. Scaring effects in fish and harmful effects on eggs, larvae and fry by offshore seismic explorations. *Progress in Underwater Acoustics*: 93-102. Springer US.

⁴² Dalen, J., and Knutsen, G. M. 1987. Scaring effects in fish and harmful effects on eggs, larvae and fry by offshore seismic explorations. *Progress in Underwater Acoustics*: 93-102. Springer US.

⁴³ McCauley, R., Fewtrell, J., and Popper, A.N. 2003. High intensity anthropogenic sound damages fish ears. *Journal of the Acoustical Society of America* 113: 638-642.

⁴⁴ Engås, A., Løkkeborg, S., Ona, E., & Soldal, A. V. 1996. Effects of seismic shooting on local abundance and catch rates of cod (*Gadus morhua*) and haddock (*Melanogrammus aeglefinus*). *Canadian Journal of Fisheries and Aquatic Sciences* 53(10): 2238-2249.

⁴⁵ Skalski, J. R., Pearson, W. H., & Malme, C. I. 1992. Effects of sounds from a geophysical survey device on catch-per-unit-effort in a hook-and-line fishery for rockfish (*Sebastes* spp.). *Canadian Journal of Fisheries and Aquatic Science* 49(7): 1357-1365.

⁴⁶ Slotte, A., Hansen, K., Dalen, J., & Ona, E. 2004. Acoustic mapping of pelagic fish distribution and abundance in relation to a seismic shooting area off the Norwegian west coast. *Fisheries Research* 67(2): 143-150.

⁴⁷ McCauley, R., Duncan, A., Penrose, J., & McCabe, K. 2003. Marine seismic surveys: analysis and propagation of air-gun signals; and effects of air-gun exposure on humpback whales, sea turtles, fishes and squid.

May 7, 2014

VII. CONCLUSIONS

In sum, the Bureau should not move forward with permitting seismic activity off of the Mid- and South-Atlantic coasts. The PEIS is fatally flawed, and therefore the Bureau cannot rationally adopt the preferred alternative in the ROD, nor can it commence the proposed activity. In order to proceed with G&G activities in the OCS waters of the Atlantic coast, the Bureau must first develop an adequate PEIS that considers the best available science, analyzes a full spectrum of reasonable and feasible alternatives, and takes a hard look at the impacts. We appreciate the opportunity to provide input and thank you for your time. We will continue to be engaged in this process moving forward.

Sincerely,



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EXHIBIT 8



MARINE MAMMAL COMMISSION

2 July 2012

Mr. Gary D. Goecke
Chief, Regional Assessment Section
Office of the Environment
Gulf of Mexico Outer Continental Shelf Region
Bureau of Ocean Energy Management
1201 Elmwood Park Boulevard, MS-5410
New Orleans, LA 70123-2394

Dear Mr. Goecke:

The Marine Mammal Commission, in consultation with its Committee of Scientific Advisors on Marine Mammals, has reviewed (1) the Bureau of Ocean Energy Management's Draft Programmatic Environmental Impact Statement on Geological and Geophysical Exploration of the Atlantic Outer Continental Shelf and (2) the associated 30 March 2012 notice (77 Fed. Reg. 19321) seeking comments. The Commission provides the following recommendations and rationale.

RECOMMENDATIONS

The Marine Mammal Commission recommends that the Bureau of Ocean Energy Management—

- select alternative B as its preferred alternative;
- amend alternative B to 1) expand the geographic boundary of the time-area restriction on airgun seismic surveys to all coastal waters out to 55 km from shore and 2) require passive acoustic monitoring to detect nearby vocalizing marine mammals for all active acoustic surveys that have the potential to take marine mammals by harassment, including high resolution geophysical surveys;
- add an analysis of the direct and indirect economic costs of implementing each alternative, describe the criteria the Bureau will use to select a preferred alternative, and add an additional comment period so that the public is able to review and judge that material and comment on it;
- increase its efforts to maximize the utility of seismic data while minimizing the number and impacts of new seismic studies, using suggested strategies described below;
- include in its final environmental impact statement an alternative that, as part of the permitting process, would promote the further development, testing, and use of alternative, less harmful technologies to collect the required geophysical information;
- work with other agencies with related responsibilities, the oil and gas industry, scientists, conservation organizations, and other stakeholders to develop standards for baseline data collection and ensure the availability of adequate baseline information before moving forward with the proposed geological and geophysical surveys;
- provide confidence limits and sources of potential bias associated with the density and take estimates that were calculated for each species;

- use the 120-dB re 1 μ Pa threshold to recalculate the Level B harassment zone and associate takes for the use of shallow-penetration sub-bottom profilers and other non-impulsive sound sources;
- include in its calculation of estimated takes an assessment of all potential sound sources associated with geological and geophysical surveys, including exploratory drilling and vessel sounds;
- require, as a term and condition for issuing a geological and geophysical permit, that applicants obtain authorization under section 101(a)(5)(A) or (D) of the Marine Mammal Protection Act to take small numbers of marine mammals incidental to those activities; such approval should also stipulate minimum requirements for mitigation, monitoring, and reporting, as outlined in Appendix C of the draft document;
- use the mitigation measures proposed for seismic airgun surveys (i.e., the seismic airgun survey protocol) as minimal mitigation measures for all high-resolution geophysical surveys and other sounds that have the potential to take marine mammals by Level A or Level B harassment;
- develop comprehensive, standardized monitoring protocols for assessing the effects of geological and geophysical surveys and associated activities on marine mammals;
- prepare annual summaries of marine mammal observer reports, including an analysis of the frequency and outcome of all marine mammal-vessel interactions;
- require that all operators report immediately to the National Marine Fisheries Service and the local marine mammal stranding network all injured and dead marine mammals in the vicinity of the proposed surveys, and suspend those activities if a marine mammal is seriously injured or killed and the injury or death could have been caused by those activities (e.g., a fresh dead carcass is found); and
- revise its cumulative effects analysis to provide a more rigorous and comprehensive assessment of the full impacts of sound and other human-caused and natural activities that affect marine resources in the proposed action area.

Analysis of alternatives

The draft programmatic environmental impact statement evaluates the potential environmental impacts of geological and geophysical surveys in state and federal waters of the South and Mid-Atlantic planning areas of the outer continental shelf and adjacent high seas out to 350 nmi (648 km). The surveys would support oil and gas, renewable energy, and marine minerals exploration and development from 2012 to 2020.

The statement evaluates two action alternatives. Both include mitigation and monitoring measures to avoid, reduce, or minimize impacts on protected species, including marine mammals. They include—

- 1) time-area restrictions on airgun surveys within the Mid-Atlantic and Southeast Seasonal Management Areas designated under 50 CFR 224.105 when vessel speeds are restricted
- 2) (1 November to 1 April for the mid-Atlantic and 15 November to 15 April for the southeast);
- 3) ramp-up, start-up, and shut-down procedures for seismic airgun surveys and at least two protected species observers on duty at all times to monitor the exclusion zone, the radius of which would be determined on a survey-specific basis but in any case would not be less than 500 m;
- 4) no initiation of ramp-up at night or in poor visibility conditions if the minimum source level drops below 160 dB re 1 μ Pa-m (rms); maintaining a minimum source level of 160 dB re 1 μ Pa-m (rms) to avoid visual clearance of the exclusion zone prior to ramp-up would only be authorized under certain situations (e.g., turning, airgun maintenance);
- 5) start-up and shut-down procedures for acoustic sources used in high resolution geophysical surveys operating at a frequency less than 200 kHz and the use of at least one protected species observer on duty at all times to monitor a minimum 200-m exclusion zone (larger exclusion zones may be established where necessary);
- 6) the optional use of passive acoustic monitoring to detect vocalizing marine mammals;
- 7) training of observers in statutory and regulatory requirements, protected species identification, data collection, and reporting of marine mammals in the exclusion zone;
- 8) guidance to vessel operators on vessel strike avoidance, marine debris awareness, and prevention of discharges into the marine environment;
- 9) reporting and protection of suspected historic and prehistoric archaeological resources;
- 10) avoidance of sensitive benthic communities;
- 11) minimizing impacts on National Marine Sanctuary resources and users; and
- 12) coordination of all permitted activities with activities of the military and the National Aeronautics and Space Administration.

Alternative B

Alternative B would provide more protection for marine mammals. In addition to the above, alternative B would (1) expand the time-area restrictions for airgun surveys to include all coastal waters from Cape Canaveral to Delaware Bay out to 20 nmi offshore, (2) add a sea turtle time-area restriction for airgun surveys in waters offshore Brevard County, Florida, during the nesting season, (3) require seismic operators to use passive acoustic monitoring for all seismic airgun surveys, and (4) maintain a minimum of 40-km between vessels that are conducting simultaneous deep penetration seismic surveys.

The continuous time-area restrictions along the east coast would protect breeding and migrating right whales as well as other cetaceans in near-coastal waters (e.g., bottlenose dolphins, common dolphins, white-sided dolphins, spotted dolphins, harbor porpoise, and humpback whales). However, the Commission believes that the proposed corridor is too narrow and should be expanded from 37 km (20 nmi) to 55 km (30 nmi) offshore. Prior to issuing its 2008 regulations to reduce whale-vessel collisions (73 Fed. Reg. 60173), the National Marine Fisheries Service had proposed a protective corridor out to 55.6 km (71 Fed. Reg. 36299). The width of the area was reduced based on potential economic impacts on shipping, even though it reduced protection for

right whales. Since then, Schick et al. (2009) have confirmed that migrating right whales occur at least 55 km and as far as 200 km offshore in the mid-Atlantic. Hence, in the Commission's view, the area that would be restricted under alternative B likely would not provide adequate protection for migrating whales.

The 40-km spacing requirement for vessels conducting simultaneous deep penetration airgun surveys is intended to prevent the merger of two ensonified areas to create a single, much larger obstacle to migration. The use of passive acoustic monitoring would provide additional assurance that marine mammals in the area would be detected and shut-down procedures implemented as appropriate. It also would provide a more accurate estimate of the number of animals exposed to airgun noise. This technology already is required for certain seismic surveys in the Gulf of Mexico and the Arctic, and recent advances have improved its use for detecting, classifying, and localizing marine mammals using open-source software (e.g., PAMGUARD). The Commission has commented often on the limited effectiveness of visual observations and believes that passive acoustic monitoring should be used during all surveys with active sound sources that may take marine mammals, including high resolution geophysical surveys.

Because it provides greater protection for marine mammals, including the highly endangered North Atlantic right whale, the Marine Mammal Commission recommends that the Bureau of Ocean Energy Management select alternative B as its preferred alternative. The Commission further recommends that the Bureau amend alternative B to 1) expand the geographic boundary of the time-area restriction on airgun seismic surveys to all coastal waters out to 55 km from shore and 2) require passive acoustic monitoring to detect nearby vocalizing marine mammals for all active acoustic surveys that have the potential to take marine mammals by harassment, including high resolution geophysical surveys.

The Bureau has stated that the additional mitigation measures proposed under alternative B would add direct and indirect economic costs to the industry, and that the Bureau wishes to review the totality of the record generated by the programmatic environmental impact statement in the public review period to assist in identifying its preferred alternative. However, the information the Bureau is reviewing is not clear because it did not describe the direct and indirect economic costs associated with each alternative. The omission of economic information is inconsistent with the Bureau's regulations implementing the National Environmental Policy Act, which state that the preferred alternative is the alternative the Bureau believes would "best accomplish the purpose and need of the proposed action while fulfilling its statutory mission and responsibilities, giving consideration to *economic*, environmental, technical, and other factors" (emphasis added) (43 CFR § 46.420). The Marine Mammal Commission therefore recommends that the Bureau of Ocean Energy Management add an analysis of the direct and indirect economic costs of implementing each alternative, describe the criteria the Bureau will use to select a preferred alternative, and add an additional comment period so that the public is able to review and judge that material and comment on it.

Reducing the potential for redundant seismic surveys

At least 38 marine mammal species occur in the North Atlantic during all or part of the year (Waring et al. 2011). The area of interest for the proposed surveys includes a wide range of marine mammal habitats. The surveys would involve the use of seismic airguns that emit high energy, low frequency acoustic pulses that travel long distances and may disrupt important marine mammal behaviors (i.e., feeding, resting, migrating, breeding, calving) and—at close range—can cause physical or physiological injury (Gordon et al. 2004). The noise also can mask biologically important sounds, such as communication calls between conspecifics (Richardson et al. 1995). Baleen whales (right, humpback, fin, blue, and minke whales) are the most likely to be affected by the proposed activities because of their sensitivity to low frequency sounds, whereas other cetaceans could be adversely affected if close enough to the sound source.

The Bureau has received nine applications for geological and geophysical activities in the Atlantic. Eight of those have proposed two-dimensional seismic surveys in some or all of the area of interest to identify potential oil and gas reserves. The projected two-dimensional seismic activity in the south and mid-Atlantic for 2012 to 2020 exceeds the total level of seismic survey activity documented for the entire Atlantic from 1968 to 2005 (Minerals Management Service 2007). If seismic activities proceed as projected, the potential for multiple surveys of the same areas by different applicants is considerable (Figure E-19, page E-59)—especially during 2013 and 2014, the two years of highest projected seismic survey activity.

Conducting multiple seismic surveys of the same area will increase risks to marine mammals and marine ecosystems unnecessarily with no meaningful gain in information. Permitting unnecessarily duplicative surveys is contrary to the charge of balancing orderly resource development with protection of the human, marine, and coastal environments, as directed by the Outer Continental Shelf Lands Act of 1953 (43 U.S.C. 1331 et seq.), as amended. The Bureau stated that they considered coordinating and consolidating seismic surveys to eliminate duplication of survey effort but rejected this approach because the vessel spacing requirements of alternative B would limit concurrent surveys. The Commission agrees that alternative B would prohibit concurrent overlapping or immediately adjacent surveys, but it would not prevent two or more operators from conducting multiple, unnecessarily redundant seismic surveys of the same area at a different time of year or in subsequent years.

As the permitting authority for companies that conduct geological or geophysical exploration of the Outer Continental Shelf, the Bureau is responsible under the National Environmental Policy Act to identify and evaluate alternatives that avoid unnecessary adverse impacts on the environment. The Bureau also must ensure that permitted activities are compliant with the provisions of other federal laws, including the requirement under the Marine Mammal Protection Act that any permitted taking of marine mammals have a negligible and least practicable impact on the affected marine mammal species or stocks.

The Bureau's analysis of existing seismic survey data provides a comprehensive assessment of undiscovered technically recoverable oil and gas resources in the Atlantic (Post et al. 2012).

Rather than re-survey large areas of the Atlantic for which two-dimensional seismic surveys already exist, or conduct multiple overlapping surveys of the same areas, the Bureau should require the oil and gas industry to make the most use of existing, publicly available seismic data. The Bureau also should provide broader access to seismic data that has been collected but that may not yet be in the public domain. This could help to focus and restrict the scope of future surveys to areas that show the most promise for oil and gas development, especially considering that oil and gas resources in the south and mid-Atlantic are expected to be relatively small (Bureau of Ocean Energy Management 2011, Post et al. 2012). The Bureau also should encourage companies that are engaged in or interested in acquiring seismic data in the same areas to collaborate on data collection to limit the number of surveys that are required.

The Commission has emphasized the need to minimize redundant seismic surveys in the Gulf of Mexico and the Arctic. The Bureau has considered methods to achieve that objective under the current regulatory framework, but the Commission believes more could be done. To that end, the Marine Mammal Commission recommends that the Bureau of Ocean Energy Management increase its efforts to maximize the utility of seismic data while minimizing the number and impacts of new seismic studies. Steps that could be taken include—

- analyzing fully all existing, publicly available seismic data;
- encouraging industry to release seismic data that is not yet in the public domain;
- collaborating on seismic surveys in areas of common interest;
- limiting the geographic scope, frequency, sound output, and/or duration of surveys that occur in any given year, especially in preferred marine mammal habitat areas;
- having the Bureau conduct seismic surveys and making them available to the industry for a fee;
- auctioning the right to conduct seismic surveys in certain planning areas or blocks; and
- providing tax or other incentives to companies that use alternative, less harmful technologies for the collection of seismic data.

Clearly, the Bureau will need to engage the industry in identifying the best ways to move forward, but the Bureau will have to provide the leadership and retain decision-making authority to ensure the necessary progress.

Alternatives to airguns

As noted previously, sound from seismic airguns poses a number of risks to marine mammals. In its draft environmental impact statement the Bureau discussed several alternative (i.e., non-airgun) technologies including the use of marine vibrators (vibroseis), low-frequency acoustic sources, deep-towed acoustics/geophysics systems, low-frequency passive acoustic systems, and controlled source electromagnetic systems. Some may have the potential to replace airguns, but all are still in various stages of development and not yet commercially available for use on the scale considered in the proposed action. For that reason, the Bureau rejected an alternative that would have prohibited the use of seismic airguns.

Rather than immediately prohibiting airguns, the Bureau should seek an orderly transition by industry from airguns to alternative technologies. In addition to time, such a transition undoubtedly will require permitting incentives and additional research investments. But unless the Bureau steps forward and facilitates a transition to new, less harmful technologies, the development and use of those technologies will be stalled.

Marine vibroseis is a particularly promising and potentially less harmful alternative to airguns for collecting subsurface geophysical data (Weilgart 2010). The draft environmental impact statement indicates that it could be commercially viable within two to four years with additional investment in design and testing. This is well within the nine-year timeframe considered for the proposed action. Controlled source electromagnetic technology also provides an alternative to seismic airguns for characterizing oil and gas resources identified using traditional airgun surveys. That technology already has been used in Norway to direct three-dimensional surveys toward the most prospective oil and gas areas prior to drilling (pers. comm. D. Ridyard, EMGS).

Given the need for and potential of alternative technologies to replace or minimize the use of airguns, the Marine Mammal Commission recommends that the Bureau of Ocean Energy Management include in its final environmental impact statement an alternative that, as part of the permitting process, would promote the further development, testing, and use of alternative, less harmful technologies to collect the required geophysical information.

Baseline information

A thorough evaluation of the potential impacts of geophysical surveys and related vessel activities on marine mammals and their habitats depends on the availability of good baseline information. That information is essential to inform efforts to identify and avoid potential harmful interactions with sensitive populations (e.g., those listed as threatened or endangered under the Endangered Species Act or depleted under the Marine Mammal Protection Act) and to minimize impacts on particularly sensitive areas (e.g., marine protected areas, national monuments, essential fish habitats, designated critical habitats, and biological hotspots or areas of particular biological richness). It also should be collected at temporal and spatial scales necessary to characterize the variability inherent in the affected ecosystem. For potentially affected marine mammals, the necessary information includes their stock structure, population status, abundance and trends, distribution and seasonal movements, habitat use patterns, and trophic relationships. For example, additional baseline data regarding migrating North Atlantic right whales could be collected using tagging or aerial surveys to assess their movement patterns (e.g., their distance from shore at different times of the year).

The Bureau has acknowledged that baseline information is lacking for many marine mammals in the area of interest. However, the Bureau has concluded that the cost of acquiring such information would be exorbitant and such information could not be collected in time to evaluate the impacts of the proposed action. The Commission agrees that the collection of comprehensive baseline information requires a long-term and consistent commitment of effort and resources, and

that federal funding for such studies has been limited. Nevertheless, such information is needed to inform decision-makers regarding whether, where, and under what conditions to conduct activities that could have acute or long-term adverse effects on marine mammals and other marine species. In addition, the Commission does not consider the cost of collecting such information to be exorbitant, particularly when viewed in the context of the billions of dollars involved in oil and gas development. In any given year, the total funding for marine mammal research and conservation is on the order of 200 million dollars or less. At the same time, the annual profits of some individual oil companies are in the tens of billions of dollars. Furthermore, the failure to invest in the necessary studies undermines our professed intent to manage our marine resources on the basis of sound science.

The Commission has long argued that the industry and regulatory agencies have a responsibility to ensure that the research needed to manage resource use is conducted in a timely and comprehensive manner. The Bureau's Environmental Studies Program, in collaboration with other federal agencies, has committed to providing multi-year funding to the National Marine Fisheries Service for the Atlantic Marine Assessment Program for Protected Species. That program is supporting a broad-scale, multi-year data collection of abundance and seasonal distribution data for marine mammals and other wildlife in the area of interest for geological and geophysical surveys. The Commission commends that joint effort as it will improve the quality of baseline information needed for assessments of marine mammal stocks. For that reason, it should continue to be a high priority for the Bureau. However, as noted by the Bureau, the resources provided still fall short of what is needed. The Commission believes that the Bureau and the industry need to find additional means of supporting essential research. The industry, in particular, should provide multi-year financial support for stock assessment surveys and stock structure research in areas where seismic surveys are proposed because the risks to marine mammals stem from their activities. The industry should consider efforts to address and manage these risks responsibly as a cost of doing business.

The development of a rigorous program to collect baseline information in the Atlantic, especially in advance of any future leasing activities, is well within existing scientific capacity and would require only a very small fraction of the total cost of developing energy resources in this region. A long-term and consistent investment in baseline data collection would ensure that the decisions regarding proposed survey activities are guided by the best available scientific information. For those reasons, the Marine Mammal Commission recommends that the Bureau of Ocean Energy Management work with other agencies with related responsibilities, the oil and gas industry, scientists, conservation organizations, and other stakeholders to develop standards for baseline data collection and to ensure the availability of adequate baseline information before moving forward with the proposed geological and geophysical surveys.

Estimating takes

The data used to estimate takes of marine mammals in the area of interest is based on incomplete or outdated stock assessment surveys. The Bureau used density estimates derived from limited shipboard surveys conducted between 1994 and 2006 by the National Marine Fisheries Service. The density estimates were then extrapolated to other areas for which density estimates

were not available, including areas beyond the exclusive economic zone. As a result, the reliability of the density estimates is uncertain, as are the resulting take estimates. In addition, the uncertainty has not been quantified and hence is not available and apparent to decision-makers. To better convey the uncertainty or reliability of the density and take estimates used in the draft environmental impact statement, the Marine Mammal Commission recommends that the Bureau of Ocean Energy Management provide confidence limits and sources of potential bias associated with the density and take estimates that were calculated for each species.

The Bureau used 160 dB re 1 μ Pa (rms) as the behavioral disturbance criteria for the calculation of Level B incidental takes from all sound sources, pulse and non-pulse. Although 160 dB re 1 μ Pa (rms) is appropriate for pulse signals, such as airguns, it is not appropriate for non-impulsive sound sources, such as chirp (shallow penetration) sub-bottom profilers. The National Marine Fisheries Service recently clarified that for non-impulsive sound sources, whether continuous or intermittent, Level B harassment is presumed to begin at received levels of 120 dB re 1 μ Pa (76 Fed. Reg. 43639). Consistent with that guidance, the Level B harassment zone should be calculated based on that threshold rather than 160 dB re 1 μ Pa. To address this concern, the Marine Mammal Commission recommends that the Bureau of Ocean Energy Management use the 120-dB re 1 μ Pa threshold to recalculate the Level B harassment zone and associate takes for the use of shallow-penetration sub-bottom profilers and other non-impulsive sound sources.

The Bureau also noted that certain activities (e.g., drilling of deep stratigraphic or shallow test wells, geotechnical bottom sampling for renewable energy site characterization) would generate continuous sounds associated with the drilling rig or the support vessel's dynamic positioning thrusters. However, the Bureau did not include those sound sources in its modeling or calculation of take estimates. To address this shortcoming, the Marine Mammal Commission recommends that the Bureau of Ocean Energy Management include in its calculation of estimated takes an assessment of all potential sound sources associated with geological and geophysical surveys, including exploratory drilling and vessel sounds.

Mitigation, monitoring, and reporting measures

Seismic airgun and high resolution geophysical surveys both use active sound sources that have the potential to take marine mammals by Level A or Level B harassment, as defined under the Marine Mammal Protection Act. Operators conducting those surveys are required to seek authorization under section 101(a)(5)(A) or (D) of the Marine Mammal Protection Act to take small numbers of marine mammals incidental to those activities. In the case of cetaceans and pinnipeds, authorization is to be sought from the National Marine Fisheries Service and, in the case of manatees, from the Fish and Wildlife Service. The Bureau has not been consistent in its guidance to applicants regarding compliance with the Marine Mammal Protection Act, and this has led to confusion and litigation. To avoid confusion for applicants seeking permits to conduct geological and geophysical surveys in the south and mid-Atlantic, the Marine Mammal Commission recommends that the Bureau of Ocean Energy Management require, as a term and condition for issuing a geological and geophysical permit, that applicants obtain authorization under section 101(a)(5)(A) or (D) of the Marine Mammal Protection Act to take small numbers of marine

mammals incidental to those activities; such approval should also stipulate minimum requirements for mitigation, monitoring, and reporting, as outlined in Appendix C of the draft document.

The Bureau has proposed that the exclusion zone for each survey would be determined on a survey-specific basis, but in any case would not be less than 500 m for airgun seismic surveys and 200 m for high-resolution geophysical surveys. The Commission has previously commented on the need to obtain in-situ sound propagation measurements to calculate survey-specific exclusion zones, and commends the Bureau for including that provision in its proposed mitigation measures for both airgun surveys and high-resolution geophysical surveys.

As seismic airgun and high-resolution geophysical surveys both use active sound sources that have the potential to take marine mammals by Level A or Level B harassment, it is unclear why the Bureau has proposed different mitigation measures for the two types of surveys. The survey protocols proposed for high resolution geophysical surveys are inconsistent with those proposed by Cape Wind Associates for geophysical surveys, which included the use of ramp-up procedures, multiple observers, and a minimum 500-m exclusion zone. The Commission believes that the mitigation measures proposed for airgun surveys, including the use of passive acoustic monitoring as identified under alternative B and expanded to include also monitoring of high-resolution geophysical surveys, are minimal requirements for all surveys involving active sound sources. Therefore, the Marine Mammal Commission recommends that the Bureau of Ocean Energy Management use the mitigation measures proposed for seismic airgun surveys (i.e., the seismic airgun survey protocol) as minimal mitigation measures for all high-resolution geophysical surveys and other sounds that have the potential to take marine mammals by Level A or Level B harassment.

Rigorous monitoring is needed to assess the effectiveness of mitigation measures and to determine the effects of survey activities on marine mammals at different times and in different locations. Such effects often are assessed by measuring changes from baseline conditions. The monitoring program should follow hypothesis-driven, standardized protocols for data collection to facilitate consistency in data collection and analysis, whether by industry, government, or contracted researchers. Monitoring protocols should be rigorous enough to detect effects caused by specific survey activities or other key anthropogenic or natural events that may be occurring at the same time in the project area. Figure 1 represents a conceptual framework that could be used to guide the development of monitoring protocols (adapted from MMC 2011). For that purpose, the Marine Mammal Commission recommends that the Bureau of Ocean Energy Management develop comprehensive, standardized monitoring protocols for assessing the effects of geological and geophysical surveys and associated activities on marine mammals.

The Bureau's recently published summary of seismic survey mitigation measures and marine mammal observer reports indicated that the presence of marine mammals and the resulting ramp-up and shut-down procedures do not cause frequent delays during surveys (Barkaszi et al. 2012). The summary also indicated that shut-down procedures in response to sightings of small cetaceans also would not cause significant delays. The Commission has commented on several occasions that

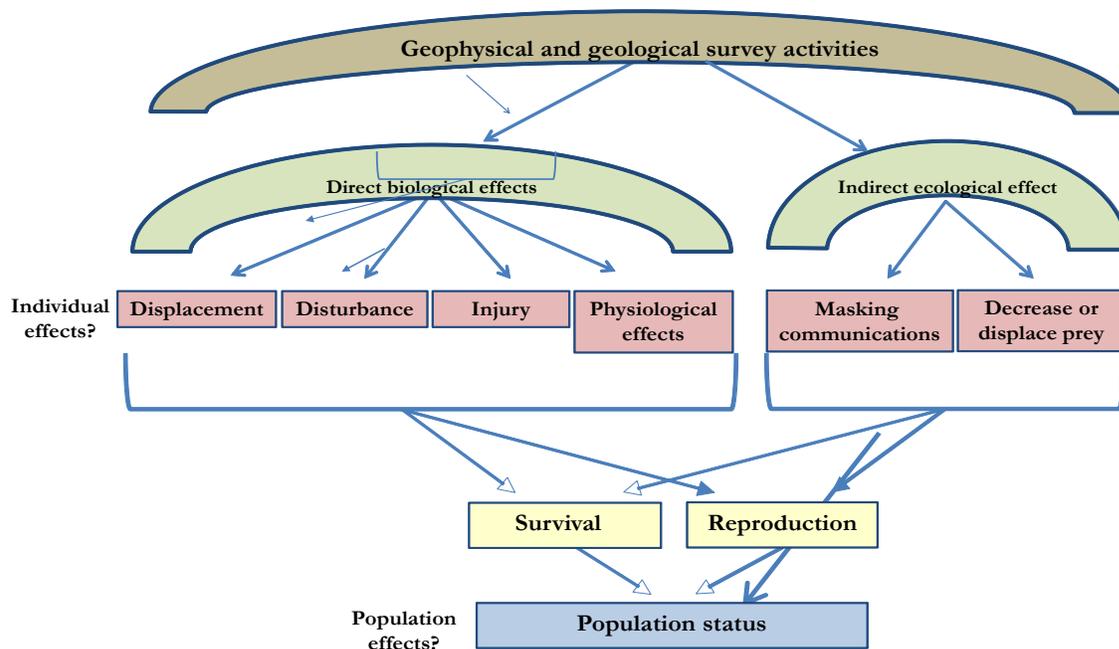


Figure 1. Conceptual framework for assessing the effects of geophysical and geological survey and associated activities on marine mammals.

shut-down procedures should be used to protect all marine mammals, not just whales, and the analysis in the summary report suggests that implementing this recommendation would not create significant economic concerns. Indeed, the Bureau proposes to require that ramp-up and shut-down procedures be used to protect all marine mammals. The one situation where this may not be feasible is when dolphins approach a vessel or towed equipment to bow-ride or draft off the equipment. The frequency of such interactions and the best ways to manage them are not clear. To provide that information, the Marine Mammal Commission recommends that the Bureau of Ocean Energy Management prepare annual summaries of marine mammal observer reports, including an analysis of the frequency and outcome of all marine mammal-vessel interactions.

Incidental harassment authorizations issued under sections 101(a)(5)(A) and 101(a)(5)(D) generally require reporting of all injured or dead marine mammals. The Bureau's proposed activities have the potential to harass marine mammals. Therefore, the Marine Mammal Commission recommends that the Bureau of Ocean Energy Management require that all operators report immediately to the National Marine Fisheries Service and the local marine mammal stranding network all injured and dead marine mammals in the vicinity of the proposed surveys, and suspend those activities if a marine mammal is seriously injured or killed and the injury or death could have been caused by those activities (e.g., a fresh dead carcass is found).

Cumulative effects

The Bureau's analysis of cumulative effects evaluated the incremental increase of certain aspects of the proposed action when added to other impacts of a similar nature (for example, the incremental increase in sound from the proposed active acoustic surveys when added to other sources of underwater noise). However, the analysis falls short in evaluating the combined effect of all impacts resulting from the proposed action when compared to all existing and reasonably foreseeable future actions. The Commission recognizes the difficulty in monitoring and evaluating the individual effects of specific activities on marine mammals, let alone the combined effects of multiple activities in a constantly changing environment. This is especially true considering that effects resulting from the proposed action likely will involve behavioral changes in the affected marine mammals and/or indirect effects on prey species, the long-term biological significance of which are harder to assess than the significance of acute effects such as injuries or mortalities.

Nevertheless, numerous guidelines are available for developing a conceptual framework to analyze the cumulative effects of sound and other stressors on marine mammals and the marine environment (Council on Environmental Quality 1997, National Research Council 2005, Moore et al. 2012). A comprehensive analytical framework is necessary to determine if, when, and where marine resources, including marine mammals, are being exposed to cumulative effects that reduce their status or hinder their potential to grow and recover. Therefore, the Marine Mammal Commission recommends that the Bureau of Ocean Energy Management revise its cumulative effects analysis to provide a more rigorous and comprehensive assessment of the full impacts of sound and other human-caused and natural activities that affect marine resources in the proposed action area.

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

Sincerely,



Timothy J. Ragen, Ph.D.
Executive Director

cc: Michael Payne, National Marine Fisheries Service

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EXHIBIT 9

OCEAN CONSERVATION RESEARCH



Science and technology serving the sea

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June 14, 2012

Re: Comments on the Draft PEIS for Atlantic G&G Activities

Dear Mr. Goeke,

We welcome the opportunity to review and comment on the Draft Environmental Impact Statement on the Atlantic OCS Proposed Geological and Geophysical Activities (hereinafter DEIS). We will attempt to be thorough and informative in our review comments. We will also be focusing the bulk of our comments on the acoustical impacts of the proposed actions because this is our area of expertise.

While the document reflects much work and a comprehensive exploration into the possible impacts of the proposed activities as required by the National Environmental Policy Act (NEPA), we believe that the DEIS leaves much to be desired if it is to be considered a guiding document for environmental stewardship.

This observation is made in particular light of the fact that despite our assumptions about the boundless ability of the ocean to absorb the assaults of human enterprise we are rapidly finding that the ocean is in very poor shape. This is a consequence of reckless resource extraction and relentless dumping and pollution. The fact is that in many of the more extreme cases ocean environmental degradation has been a significant byproduct industrial practices – particularly the practices of the petroleum exploration and extraction industry.

It was due to the extents of environmental degradation due to reckless and unregulated industrial practices that in the early 1980's a moratorium was placed on exploration and extraction on the US Outer Continental Shelf (OCS). It was clear at that time that the coastal resources for commercial and recreational fishing, and the socio-economic value of clean and vibrant coastal environments were far too valuable to put at risk to the dangers of the fossil fuel extraction and production chain.

This moratorium remained in place until 2008 when the original bill requiring annual reinstatement expired. It was the assumption that technologies and techniques had

improved that would diminish the likelihood of catastrophic events the likes of which ushered in the 1980's moratoriums in the first place.

Unfortunately as we found in April 2010, the technologies are still dangerous and unpredictable. The full extent of the damages in the Deepwater-Horizon-Macondo well disaster is still unknown, and likely to continue to unfold well into the future. It is also clear that while technologies have advanced significantly in the past 27 years since the initial moratorium (and the reason that legacy OCS surveys are no longer suitable), the task has also become more complex as the reach of exploration sinks down into ever-deeper waters, and ever deeper hydrocarbon deposits.

This has left us with a technology bank that while impressive, is definitely not up to the task. I substantiate this statement by referring to the recently out-of-control gas well in the North Atlantic (Total-Elgin gas leak) and the ongoing leaks, spills, and blowouts that have continued to plague the ocean from Timor, to Nigeria, to Brazil, to the Gulf of Mexico just in this last year. And while the "Atlantic Geological and Geophysical Activities DEIS" is not specifically about deepwater extraction operations, it pre-supposes fossil fuel extraction and production.

Unfortunately that despite the ongoing global problems associated with offshore hydrocarbon exploration and extraction that we are not learning that the cost of powering our global economy with fossil fuel is becoming increasingly expensive. These costs are not just "borne at the pump;" rather they are heavily distributed into the environment at the cost of nature's bounty and the compromised quality of our own lives.

It is also clear from how the three alternatives are presented in the DEIS that Alternative A or B are assumed to be not just the preferred alternatives, but the likely ones as well. This is obviated by the many reinforcing assumptions made to "pave the way" for the proposed Geological and Geophysical activities, but also in the quaint convention used of highlighting the word "**negligible**" throughout the document. This highlighted word shows up some 956 times in just 550 pages. (The highlighted word "**minor**" shows up 513 times in the document, "**moderate**" only 131 times.) While this observation is only a casual metric, it does appear to reveal a bias in the drafting of the DEIS.

The words "**negligible**," "**minor**," and "**moderate**" indicate value judgments which while they are sometimes backed up through more detailed discussions in Vol. 1 Chapter 4 using citations, these citations do not track consistently and clearly back to the summary impact assessments. We feel that any assessment in the DEIS should be directly backed up with either peer reviewed literature or some other qualified accountability.

We are also concerned about the arbitrary use of impact conventions when evaluating an action for its "Level A" or "Level B" threshold. The current standard is used by National Marine Fisheries Service (NMFS) under the Marine Mammal Protection Act (MMPA). It is a blunt metric and could use some refinement, but it is the standard. Using it in parallel selectively substituting it with the "Southall Criteria"¹ is confusing and inconsistent,

¹ Southall, B.L., A.E. Bowles, W.T. Ellison, J.J. Finneran, R.L. Gentry, C.R. Greene Jr., D. Kastak, D.R. Ketten, J.H. Miller, P.E. Nachtigall, W.J. Richardson, J.A. Thomas, and P.L. Tyack. 2007. Marine mammal noise exposure criteria: Initial scientific recommendations. *Aquatic Mammals* 33(4):411-521.

particularly since the “Southall Criteria” is only an initial scientific recommendation and has not yet gone through an EIS review as would be required under the National Environmental Policy Act (NEPA) to be used as a guiding document for this DEIS.

And while I believe that the “Southall Criteria” will eventually represent a significant improvement to the current impact threshold assessment process. The motivation behind using one or the other is particularly confusing when there is such a disparity between the results. The table below highlights a few examples of these disparities from Section 4.2.2.2.2 page 4.52- 4.53 referring to “Level A” harassment.

Species	Southall 2007 Criteria (Quoted in the DEIS) ²	NMFS “180 dB” criteria (Not quoted in DEIS) ³
Risso’s Dolphin	8 - 731	444 - 3180
Striped Dolphin	86 - 1020	495 – 2038
Atlantic Spotted Dolphin	154 – 1496	640 - 3180
Bottlenose Dolphin	3 - 39	1314 - 11748

Table 1: Disparity between estimated “Level A” takes between the Southall 2007 (Table 4-9 in the DEIS) and the 180 dB “historic” criteria (table 4-10 in the DEIS).

The reason for choosing one standard over the other is not clear in the arguments, but the numbers in Table 1 suggest that the lower estimation of the “Level A” takes were used in the DEIS, which would seem to infer a “cherry picking” to derive a desired outcome. We suggest that historic NMFS standard be consistently used throughout the DEIS until that time when the Southall Criteria is complete and has gone through public review as required by the National Environmental Policy Act (NEPA).

Another conceit appears occasionally throughout the DEIS that “marine mammals within the AOI are familiar with vessel noises, so the effects of vessel noises are expected to be **negligible to minor.**”⁴

Firstly, forced habituation is not a mitigation strategy. Additionally, “habituation” is a faulty assumption because there is no evidence that marine mammals (or fish for that matter) habituate to broad-band noise that would potentially mask biologically significant signals. In fact it has recently been determined that chronic shipping noise induces stress in bowhead whales,⁵ so the assumption that animals habituate to vessel noise is patently false and should to be removed from both the marine mammal as well as the fisheries sections of the DEIS until proven to be true.

² From DEIS Vol. 2., Table 4-9 “Annual Level A Take Estimates from Seismic Airgun Sources Using Southall et al. (2007) Criteria for Marine Mammal Species during the Project Period (2012-2020)”

³ From DEIS Vol. 2., Table 4-10 “Annual Level A Takes Estimates from Seismic Airgun Sources Using 180-dB Criteria for Marine Mammal Species during the Project Period (2012-2020)”

⁴ This “presumption” or “assumption” appears in Vol. 1 Summary p.xv, Ch. 2 pages 15, 31, and 40, Ch. 4 page 58 and 255.

⁵ Rosalind M. Rolland, Susan E. Parks, Kathleen E. Hunt, Manuel Castellote, Peter J. Corkeron, Douglas P. Nowacek, Samuel K. Wasser and Scott D. Kraus (2012) “Evidence that ship noise increases stress in right whales” Proc. R. Soc. B doi:10.1098/rspb.2011.2429

Rolland et. al.(2012)⁶ points to another serious shortcoming in the entire DEIS; While there are sections throughout the document addressing “Cumulative” impacts of the activities, these are considered as “incremental” impacts⁷ rather than synergistic impacts.

Biological systems are not adding machines; they have operating ranges that can be stable in the center of their range, but as the systems approach the extents of their range they become instable and subject to amplification of synergistic inputs. Subjecting entire ecosystems to a chronic assault such as noise, physical disruption, or chemical pollution will at some point cause an irrecoverable instability that will crash the system.

In this context the DEIS fails to address anything but the immediate or concurrent impacts of an assault, assuming that once the assault has “moved on” or ceased that it no longer has a measurable impact. While our ability to account for synergistic impacts is rudimentary at best, precaution and empirical evidence would dictate that we factor in synergistic impacts even while we don’t entirely understand them.

Furthermore, while we may be arguable that “Level B” behavioral adaptations to proposed activities would be disruptive but recoverable, there is absolutely no justification for biological damage indicated in a “Level A” harassment. Even short term “recoverable” assaults such as temporary threshold shift (TTS) are barbaric. NMFS issuing “Incidental Harassment Authorizations” or “Take Permits” for “Level A” harassment is the apex of institutional hubris. If someone were to apply to the Department of Health and Human Services for a permit to yell in someone’s ear, or spill diesel fuel in their salad they would be watched cautiously and put on some “security risk list.” So why are institutions encouraged to apply for permission to damage animals? It is patently unethical to damage an animal unless you are going to eat it, or it is going to eat you.

While the forgoing opinions do not have a structural procedure within NEPA to address, they substantiate a systematic shortcoming in this process which is continuously echoed throughout the DEIS: What is the overall impact of 956 “**negligible**” impacts on top of 513 “**minor**” impacts, added to 131 “**moderate**” impacts?

Specific oversights and shortcomings in the DEIS

While it is the purpose of the DEIS to model and address the entire foreseen impacts of the proposed actions, given the complexity of the subject environment and the challenges of introducing complicated technologies and procedures into it, understanding the possible range of impacts is speculative at best. There is no way that comprehensive foreknowledge can be formed with the limited data available.

This situation is addressed to some extent in the DEIS with “When an agency is evaluating reasonably foreseeable significant adverse effects on the environment in an EIS and there is incomplete or unavailable information, the agency reports that such information is lacking...the agency is required to report what relevant information is

⁶ Ibid.

⁷ DEIS 2.4.1

incomplete and why it is unavailable... Complex environmental evaluations are always to some degree a documentation exercise in the face of imperfect information.⁸”

To this I would add that environmental evaluations are also a studied speculation fed by available, but necessarily incomplete data. This speculation “fills in the gaps” – of which there are many in the field of marine biology, with assumptions – of which there are many in this DEIS. The aforementioned assumption about “habituation” is clearly an incorrect assumption.

Another assumption that is also found in the DEIS is the assumption that “ramp-up” or “soft start” of seismic surveys are effective mitigation strategies. In fact Jochens et. al. (2008)⁹ indicates that there was no avoidance behavior with ramp up in sperm whales. This could be due to a number of factors; one possibility being that animals familiar with the seismic survey pulses did not find suitable respite in swimming away from the source so they just waited it out. This hypothesis would be supported by the observation in the study that a whale lingered at the surface throughout the exposure, and then sounded immediately after the last pulse.

Another possibility is that the subjects of Jochens et.al controlled exposure experiments had already been so deeply exposed to airgun blasts that their hearing was already significantly compromised and did not find much reason to avoid airguns (particularly since the study exposures were so carefully controlled to not exceed Level B harassment thresholds).

It may be that some highly mobile and migratory animals would avoid airgun surveys, but animals that exhibit strong site-fidelity such as the sperm whales or sedentary fish would likely not depart from their legacy hunting grounds, or in the case of the fish “shelter in place” rather than seek refuge in unknown areas. Engås et al. (1996)¹⁰ and Løkkeborg and Sodal (1993)¹¹ showed decreased catch rates of fish following seismic surveys, but the fishing technique in the study was long-lining, requiring some action on the part of the fish, so whether the fish left the area or were not feeding due to physiological compromise remains ambiguous.

Thus the assumption that “ramping up” and “soft starts” constitute an effective mitigation should be withdrawn from the DEIS until proven otherwise.

The comment on page xviii in the summary, and in section 2.1.3.5, and 4.2.5.1.4 that “there is no permanent damage in fish ears” is incorrect and based on outdated literature.¹² The citation from Smith et. al. (2006)¹³ is work done on a goldfish, a

⁸ DEIS section 4.1.4.1

⁹ Jochens et.al. 2008 “Sperm Whale Seismic Study in the Gulf of Mexico” Minerals Management Service contract.

¹⁰Engås, A. S. Løkkeborg, E. Ona, and A.V. Soldal. 1996.” Effects of seismic shooting on local abundance and catch rates of cod (*Gadus morhua*) and haddock (*Melanogrammus aeglefinus*)”. Can. J. Fish. Aquat. Sci. 53:2238-2249.

¹¹ Løkkeborg, S. and A.V. Soldal. 1993. The influence of seismic exploration with airguns on cod (*Gadus morhua*) behaviour and catch rates. ICES mar. Sci. Symp., 196:62-67.

¹² McCauley, R. D., Fewtrell, J. & Popper, A. N. (2003). High intensity anthropogenic sound damages fish ears. Journal of the Acoustical Society of America 113, 638–642.

¹³ Smith, M.E., A.B. Coffin, D.L. Miller, and A.N. Popper. 2006. Anatomical and functional recovery of

freshwater air-breathing fish that resides in turbid environments. The goldfish has been categorized as a “hearing specialist” due to adaptations that are specific to their environment which have no analogies in open ocean fish. So the comment about “fish not suffering lasting hearing damage” and the associated assumptions should be removed from the DEIS.

There is also the phrase “No mortality or injury is expected in any case because there has been no observation of direct physical injury or death to fishes from airguns” found in the fisheries impacts sections of the DEIS. This phrase is only partially correct, as there is evidence of physical injury of fishes from airguns in McCauley et. al. 2003¹⁴. And while there may be no direct evidence of fish mortality from airguns, if fish sensory systems are compromised by seismic surveys it may lead to intermediate or long term impacts that are not evident immediately after a survey. In this case an absence of evidence does not indicate an absence of harm. Engås et. al 1996 does indicate damage to caged fish, but sedentary fish, while not caged would not necessarily attempt to leave their habitat to escape a pervasive noise, particularly since the pressure-gradient wavelengths are too long for localization, and the particle motion vectors in the far field would be ambiguous and not provide benthic and demersal (and often sedentary) species cues or incentives to leave familiar habitats.

The DEIS treats invertebrates very lightly – almost dismissively. In section 2.1.3.1 the comment is made that “...limited available data assessing physiological effects or biochemical responses of marine invertebrates to underwater noise indicate that serious pathological and physiological effects are unlikely.” This is clearly not the case according to André et.al (2006)¹⁵ wherein giant squid mortality was directly correlated to seismic airgun surveys. This is clearly a case where the writers of the DEIS were wrong when they assumed that in a paucity of evidence that the impacts would be “**negligible.**”

These findings, along with the prior work of Angel Guerra et.al (2004)¹⁶ should be incorporated into the DEIS section 2.1.3.1 and 4.2.1.2.2, and the assumptions revised to reflect the papers.

Also in section 4.2.1.2.2 is after citing Payne (2007)¹⁷ the comment is made that “this particular species of lobster was not present in the AOI,” thus dismissed. While this species of lobster is not present in the AOI, it stands to reason that other arthropods may suffer the same damage under similar exposures – an “assumption” on our part that holds

the goldfish (*Carassius auratus*) ear following noise exposure. Journal of Experimental Biology 209:4193-4202.

¹⁴ McCauley, R. D., Fewtrell, J. & Popper, A. N. (2003). High intensity anthropogenic sound damages fish ears. Journal of the Acoustical Society of America 113, 638–642

¹⁵ Michel André, Marta Solé, Marc Lenoir, Mercè Durfort, Carme Quero, Alex Mas, Antoni Lombarte, Mike van der Schaar, Manel López-Bejar, Maria Morell, Serge Zaugg, and Ludwig Houégnigan (2011) “Low-frequency sounds induce acoustic trauma in cephalopods” Front Ecol. Environ. 2011; doi:10.1890/100124

¹⁶ A. Guerra, A.F. González and F. Rocha (2004) A review of the records of giant squid in the north-eastern Atlantic and severe injuries in *Architeuthis dux* stranded after acoustic explorations” International Council for the Exploration of the Sea CC:29

¹⁷ Payne, J.F., C.A. Andrews, L.L. Fancey, A.L. Cook, and J.R. Christian. 2007. Pilot study on the effects of seismic air gun noise on lobster (*Homarus americanus*). Canadian Technical Report of Fisheries and Aquatic Sciences 2712. 46 pp.

much more water than the blanket use of goldfish hearing as a proxy for all marine teleost fishes found in the DEIS.

Also found in section 4.2.1.2.2 and consistent with worrying convention in the DEIS to conflate an absence of data with an absence of harm is the comment that “The BOEM has determined that incomplete or unavailable data or information on the physiological effects or biochemical response of marine invertebrates in the AOI that results from acoustic noise is not relevant to reasonably foreseeable significant adverse impacts or essential to a reasoned choice among the alternatives.”

This phrase and the assumptions that it substantiates should be pulled from the DEIS as it is only an opinion and not substantiated by the literature.

Some comments on modeling

Sound propagation and noise attenuation in the ocean is a complex topic. Almost any marine setting will exhibit propagation characteristics that defy our ability to model. This may obviate a need for ongoing monitoring during any potentially noisy operation as a matter of course. In lieu of comprehensive regional and temporal sound propagation models to feed with data we must rely on some stock, simple assumptions. Some simple assumptions are used in the DEIS, but given the scope of the proposed actions both in spatial and temporal terms, the simple models used in the DEIS fail to capture the extents of the impacts.

One assumption is that sound will propagate in a hemispherical pattern away from the source until the acoustical energy encounters a boundary. The ‘broad brush’ attenuation formula for this is: $20\log_{10}(r_1/r_2)$ where r_1 is the reference distance (usually 1 meter) and r_2 is the subject distance for evaluation.

Once the energy hits the seafloor the energy tends to spread in a cylindrical pattern wherein the attenuation formula is $10\log_{10}(r_1/r_2)$. Because the first boundary encountered is the seafloor, the sound levels at a distance within the depth of the ocean directly beneath the source will be more in line with attenuation at $20\text{dB } \log_{10}$ of r . Far field will be more in line with $10\log_{10} r$. But there is some continuum between these attenuation conditions, so depending on the distance between the receiver and the source the attenuation factor may be closer to 17 in the “nearish field” and 13 in the far field.

Additionally, while it is not mentioned anywhere in the DEIS there is a secondary transmission path in the “mixed layer” above the marine thermocline that behaves as a “surface duct.” While the propagation in this transmission path is dependent on the wavelength of the source, the angle of incidence, the depth of the mixed layer, and the surface conditions, the attenuation characteristics are more in consistent with the cylindrical model of $10\log_{10} r$. (see Urick 1983)¹⁸

¹⁸ Urick, R. J. 1983. Principles of Underwater Sound. (3rd Edition). McGraw-Hill Book Company, New York, NY. Chapter 6

Transmission in the surface duct, along with the far-field cylindrical propagation highlights concerns in the “nearish” field pertaining to both required “exclusion zones” and the efficacy of marine mammal observers (MMO). It is already impractical to expect MMOs to effectively spot marine mammals at distances over 1000 meters in calm seas during the day. In these conditions a large airgun array with a source level of 229 dB re:1 μ Pa @ 1m^(FN.19) would require 10km to attenuate to 180dB re:1 μ Pa exposure level.

$$229\text{dB} - 180\text{dB} = 49\text{dB} \rightarrow 10\log_{10} (1/13000) = -41\text{dB}$$

MMO effectiveness over these ranges is not just impractical, it is improbable. So it is clear that in most situations a large capacity survey cannot avoid subjecting any marine mammal within 10km to Level A harassment exposures from either the surface ducting or the cylindrical propagation of acoustical energy.

If you add the “second hit” from the reflected sound off of the sea bottom, and the direct noise from the hemispherical propagation, the receiver is hit with at least three distinct wave fronts from multi-path sources (all three transmission paths have differing geometrical lengths as well as different transmission speeds due to temperature, pressure, and salinity factors). These three paths need to be integrated into the Sound Exposure Level (SEL) metric in the near-to-intermediate field.

Additionally, due to the various transmission artifacts there may be situations in the far field in which the noise from the surveys are not heard as distinct pulses, but as a continuous noise due to reverberation and multipath effects.^{2021,22,23} Because the noise would be continuous it should be mitigated under the 120dB “continuous noise” exposure threshold, particularly since the surveys will likely be occurring around the clock anyway.

These considerations preclude the use of large capacity seismic surveys if Level A harassment conditions are to be avoided.

Regarding the mitigation strategy of separating the survey vessels by more than 40 km: While the model was not clearly articulated it appears that the DEIS used the hemispherical attenuation factor of $20\log_{10} r$ to derive the 40km “mitigation” strategy.

A more accurate model for this setting is to determine what the exposure level would be at the midpoint (20km) between the two survey vessels. We assume that a source level of 235 dB (convergence in the far field is not influenced by the directivity of the array).

¹⁹ 235 dB (from Appendix D Table-22) – 6dB to accommodate for directionality of the array.

²⁰ Guerra, M., Thode, A.M., Blackwell, S.B., Macrander, A.M. (2011) “Quantifying seismic survey reverberation off the Alaskan North Slope.”, *J. Acoustical Society of America* 130:5 3046-3058

²¹ Nieu Kirk, S.L., Mellinger, D.K., Moore, S.E., Klinck, K., Dziak, R.P., Goslin, J. (2012) “Sounds from airguns and fin whales recorded in the mid-Atlantic Ocean, 1999-2009”, *J. Acoustical Society of America* 131:1102- 1112

²² Nieu Kirk, S.L., Stafford, K.M., Mellinger, D.K., Dziak, R.P., and Fox, C.G.(2004) “Low-frequency whale and seismic airgun sounds recorded in the mid-Atlantic Ocean” *J. Acoustical Society of America* 115: 1832-1843

²³ Roth, E.H., Hildebrand, J.A., Wiggins, S.M., and Ross, D. (2012). “Underwater ambient noise on the Chukchi Sea continental slope” *J. Acoustical Society of America* 131:104-110

Using the hemispherical propagation model:

$$20\log_{10} (1/20000) = 86\text{dB} \rightarrow 235\text{dB} - 86\text{dB} = 149\text{dB re: } 1\mu\text{Pa}$$

Each survey would contribute 149dB to the system, which at the mid-point between them would yield 152dB (adding two equal sound levels increases the overall level by 3dB). But as we know, far field propagation is not hemispherical, rather it is more cylindrical. Using exclusively the cylindrical model:

$$10\log_{10} (1/20000) = 43\text{dB} \rightarrow 235\text{dB} - 43\text{dB} = 192\text{dB re: } 1\mu\text{Pa}$$

Each survey would contribute 192dB to the system, which at the mid-point between them would combine to add +3dB yielding 195dB – well above the 180dB exclusion zone. (These levels would also be significantly beyond the visual reach of MMOs.)

Of course the attenuation factor is somewhere between these two models, but this – like the surface ducting transmission path, is not accounted for in the DEIS.

Section comments on Alternatives:

In Section 2.1.3.1 (associated with chapter 4.2.1) evaluating the impacts of Alternative A, the statement is made regarding the lack of pressure gradient sensors in most marine invertebrates. It is known that many invertebrates have particle motion sensing systems. It is also mentioned that there is limited data on the vulnerability of these sensing systems to mechanical damage, and with this lack of data the writers of the DEIS assume therefore that marine invertebrates are “unlikely” to suffer physiological or pathological impacts from noise exposure.

Unfortunately most of the data we do have on the impacts of large vector particle motion on marine invertebrates is limited to intertidal animals and coastal animals such as lobster, shrimp, clams, scallops, and octopus which would have evolved sensory systems adapted to coastal turbulence and crashing waves and thus not necessarily vulnerable to high amplitude, coherent-vector particle motion. But there has been a correlation to squid mortality and damage associated with seismic airgun surveys, so the blanket assumption that damage to marine invertebrates “is expected to be **negligible**” is an assumption that is not supported by the range of evidence²⁴ (see also ref. 15, 16, and 17 above).

In Section 2.1.3.2 (associated with chapter 4.2.2) regarding the impacts of boomer, chirp, and sub-bottom profilers, and multi-beam depth sounders, the statement is made that “some of [these] are expected to be beyond the functional hearing range of marine mammals or would be detectable only at very close range.” With the exception of the multi-beam depth sounders, these other sources would be detectable by odontocetes and should be evaluated for impacts.

²⁴ R.D. McCauley, J. Fewtrell, A.J. Duncan, C. Jenner, M-N. Jenner, J.D. Penrose, R.I.T. Prince, A. Adhitya, J. Murdoch and K. McCabe (2000) “Marine seismic surveys— a study of environmental implications” The Australian Petroleum Production & Exploration Association Journal p.692-708

Also in Section 2.1.3.2 the Level B impacts of vessel noise is discounted by the fact that Level B impacts from seismic surveys and other active noise sources have been accounted for. While numerically the exposure levels may have been accommodated in the Level B exposure criteria, this is an over-simplification of the response of animals to increasingly complex noises. It is likely that a fully operating seismic survey with system calibration signals, sea-floor profilers, and various other noises added to the sum of the noises of the vessel would have a more pronounced behavioral impact than the simple exposure impact of each of the sounds separately. It would stand to reason that a complex and varying sound field would have greater impacts than the impacts of just sound type at a specific amplitude – even if each one of them was at or below the Level B harassment threshold. Response to sound quality rather than level alone is substantiated in Frankel and Clark (1998).²⁵ (This argument appears in section 4.2.2.2 p.4-58 under Vessel Noise Evaluation as well.)

A more accurate (but equally simplistic) model would treat each noise source that exceeded the Level B harassment threshold as a separate Level B harassment.

While it is not entirely within the range of our acoustical impacts evaluation, under the same section 2.1.3.2 regarding accidental oil spills that “marine mammals would be expected to avoid areas of heavy fuel sheen” and thus the impacts would be “**negligible to minor.**”²⁶ Avoidance behavior of oil-sheen waters has not been confirmed and would not necessarily be an evolutionary adaptation. The fact is that there are many compelling photographs and accounts of dolphins and whales surfacing through oil sheens during the BP oil disaster of 2010.²⁷ Additionally since the BP disaster the number of dead cetaceans washing ashore has increased significantly with evidence of hydrocarbon poisoning in their systems.²⁸ The “avoidance behavior” assumption should be pulled from the DEIS along with the assumptions that the comment substantiates.

Chapter 4 Description and Analysis comments

Where not previously addressed in these comments, the following comments are in consideration of Chapter 4 statements and evaluations.

In Section 4.2.2.2.2 “Evaluation” (p.4-52) the comment is made referencing Au and Hastings (2008)²⁹ that mammalian ears “behaves like an integrator with an integrator time constant,” which in the paper is determined to be 100ms, and through this mechanism a 10ms pulse integrated over 100ms represents a 10dB decrease in exposure (presumably impacts). While this does mathematically work into the “Sound Exposure

²⁵ Frankel, A.S. and C. W. Clark. 1998. Results of low-frequency playback of M-sequence noise to humpback whales, *Megaptera novaeangliae*, in Hawaii. Canadian Journal of Zoology 1998:521-535.

²⁶ DEIS p. 2-16

²⁷ See the photos by John Wathan <http://www.docudharma.com/diary/21948/wathen-bp-slick-covers-dolphins-whales-video-text>

²⁸ Leigh Coleman “Baby dolphin deaths rise along Gulf Coast” Reuters Feb. 23, 2011

²⁹ Au, W.L. and M.C. Hastings. 2008. Hearing in marine animals. In: Principles of marine bioacoustics. New York: Springer-Verlag.

level” metric³⁰ this metric is for physiological impacts only, there is no evidence of decreased stress from repetitive exposures of "short duration shocks" over longer pulses.

In the same section, p.4-53 “Level A Incidental Take Estimates” are referenced to Tables 4-9 and 4-10. These tables variously refer to either the “Southall criteria” or the “180dB criteria.” The reason for choosing one over the other standard is not clear here, except that the “Southall Criteria” numbers are all significantly smaller. As mention before, the Southall Criteria should not be used until complete and approved through NEPA review.

In this same paragraph regarding the use of “other equipment, including sub-bottom profilers, side-scan sonars, and depth sounders” concurrently with airguns would have no additional impacts because “airguns represent the highest energy source” this “it is reasonable to assume that there would be no additional take from the electromechanical sources operating concurrently.”

As indicated above it is a faulty assumption based on noise level exposure alone - we can assume that like humans, other animals respond negatively to the complexity of any agonistic signal. For example a racing engine may not in-and-of-itself be too alarming, but if it is accompanied by the noise of grinding metal, or a the beeping of an alarm - even if the noises do not measurably add to the overall noise level, they will induce very different impacts on the nervous system.

Additionally, the noises of the other electromechanical systems are operating across different frequency bands which would not necessarily be masked by the low frequency noise of airguns. Concurrent noise sources are not a set of individual exposures, rather they all contribute to an entire soundscape. These “holo-phonic” impacts will be far greater than individual sound sources or even the sum of concurrent sound sources. In this context a survey operation with two or more boats and an array of profilers and multi-beam sonars should be evaluated across the entire noise spectrum, and over the entire time of the operation. In this context many of these surveys would qualify as “continuous noise sources, and thus subject to the 120dB mitigation criteria.

In the “Conclusion” section the airgun evaluation it is stated from Tables 4-10 and 4-11 that “Incidental take calculations presented in for seismic airgun survey-related noise may be “conservative” because the exposure evaluations “do not consider functional hearing sensitivity ranges for the various species and so assume that all of the species are equally sensitive to received sound frequencies and levels.”

While it is true that various animals have adapted to their own acoustical niches, we must assume that these animals reside in a complete bio-acoustic habitat with other animals and that the receivers are not just individual subjects in a test environment.

It would actually be more realistic to state that the auditory thresholds of odontocetes have been determined by way of captive animals that have been habituated (trained) to respond to operant conditioning and to cooperate with Audio Evoked Potential auditory

³⁰ Hastings MC, Popper AN (2005). Effects of Sound on Fish. California Department of Transportation Contract 43A0139, Task Order 1. Available from URL: http://www.dot.ca.gov/hq/env/bio/files/Effects_of_Sound_on_Fish23Aug05.pdf

testing. These individual animals only approximate the hearing responses of wild animals which often respond as a group to sound stimulus and are adapted to be more responsive to environmental sounds.

Additionally the auditory responses of mysticetes have only been approximated by way of anatomical studies of dead animals and modeled from other vertebrate hearing and thus the auditory threshold models do not clearly represent the entire auditory response capabilities of living baleen whales residing in their natural habitat.

In the same section p.4-55 it is insinuated that animals with differing hearing priorities would have the chance to evade a slow-moving seismic operation to “avoid exposure to injurious sound levels.” What is not taken into consideration is the likelihood that most animals are in a particular area because they need to be there – for feeding, community coherence, family bonding, and breeding opportunities. Forced relocation due to exposure to agonistic stimulus undoubtedly increases stress, compromising metabolic, social, and immune system functions.

On p.4.56 referring to the “non-airgun HRG surveys” impacts conclusion section, the statement is made that “Level A take estimates that were calculated utilizing only the 180-dB criterion do not consider functional hearing sensitivity ranges for the various species and so assume that all of the species are equally sensitive to received sound frequencies and levels.”

This statement appears to be a specious attempt to soft-pedal exposure impacts. The decision to use the “180 dB Criteria” as a mitigation threshold is an accepted, historical standard predicated on known auditory thresholds found in captive animals. It was chosen as a mitigation threshold after long deliberation. Deconstruction of this standard for the purpose of this DEIS is inappropriate.

In the same paragraph: “assuming selective avoidance of the sound source by individual animals and operations within an open ocean environment” is implied as a mitigation strategy. This is not a mitigation strategy; rather it is why mitigation strategies are required. This statement should be pulled from the DEIS along with the assumptions it purportedly substantiates.

In the evaluation of noise impacts from “Vessels and Equipment Noise” p.4-57 that “broadband source levels for most small ships (a category that would include seismic survey vessels and support vessels for drilling of COST wells or shallow test wells) are anticipated to be in the range of 170-180 dB re 1 μ Pa at 1 m and source levels for smaller boats (a category that would include survey vessels for renewable energy and marine minerals sites) are in the range of 150-170 dB re 1 μ Pa at 1 m (Richardson et al., 1995).” As these operations are continuous and not periodic or pulse noises the mitigation threshold would be 120dB re: 1 μ Pa, so the exclusion zone in the loudest instance would be:

$$180\text{dB} - 60\text{dB} = 120\text{dB}$$

$20\log_{10}(1/1000) = -60\text{dB}$ or 1000m for spherical propagation, and

$13\log_{10}(1/40000) = -60\text{dB}$ or 40km for far field propagation per our earlier argument.

Also on the same page is the statement:

“Drilling-related noises from semi-submersible platforms in deeper waters ranges in frequencies from 10 to 4,000 Hz, and therefore audible to all cetacean and pinniped species within the AOI. Drilling sound source levels from semi-submersible platforms are estimated at 154 dB re 1 μ Pa-m. Source levels for drillships have been reported to be as high as 191 dB re 1 μ Pa during drilling. It is expected that marine mammals would detect drilling-related noises within a radius of audibility.”

This statement needs to be clarified: Semi-submersible platforms are stabilized by way of thrusters, which have not been characterized in the literature, nonetheless with a source level of 191dB and due to the continuous characteristic of the noise will need to be mitigated at the 120dB exclusion zone, not just “within a radius of audibility.”

Given: 191dB – 69dB = 120dB

$20\log_{10}(1/2850) = -69\text{dB}$ or 2.85km for spherical propagation, and

$13\log_{10}(1/200000) = -69\text{dB}$ or 200km for far field propagation per our earlier argument

Of course this is a simple model and does not account for frequency-dependent sound absorption over distance, but is also does not account for surface channel propagation or effects of multipath propagation over distance. The appropriate use of the 120dB mitigation threshold would preclude the use of semi-submersible platforms in the Area of Interest for exploratory drilling, and in the future for extraction and production.

Summary and Conclusion

While BOEM, and their legacy agencies MMS under the Department of the Interior have not been known to be precautionary, the Atlantic Geological and Geophysical DEIS appears to over-extend hospitality to industry by systematically failing to address many impacts that will occur if either Alternative A or Alternative B is approved.

From the foregoing discussion the following corrections and recommendations should be included in the Atlantic Geological and Geophysical DEIS:

1. NMFS –MMPA Level A and level B criteria should be used exclusively throughout the DEIS. The “Southall Criteria” should not be used until it is complete and has gone through NEPA review.
2. The words “**negligible**” and “**minor**” in the DEIS should be always traceable to peer reviewed papers that substantiate the particulars of the specific evaluation.
3. All references to “habituation” should be removed from the DEIS, especially where it is inferred as a mitigation strategy because it is not supported by the literature.
4. All references to “Ramp-up” and “Soft Start” being used as a mitigation strategy should be either pulled from the DEIS, or included with the caveat that there is no evidence that these techniques are effective (until proven otherwise).

5. All references to fish not being subject to permanent hearing damage should be removed from the DEIS along with the consequent assumptions associated with the comment because it is not supported by the literature.
6. References to acoustical impacts on marine invertebrates – particularly squid, should be updated and included in the EIS to reflect current state of understanding.^{31,32,33,34,35}
7. Sound propagation models should include provisions for surface duct transmission paths in seismic surveys, and thruster-stabilized platform and drill-ship operations.
8. Sound propagation models of seismic surveys should account for reverberation and multipath effects in the far field. If the far field noise artifacts are not distinguishable as discrete pulses then the noise criteria should fall under the 120dB mitigation threshold for continuous noise.
9. Exposure to the same seismic signal that arrives at the receiver as multiple signals due to time domain differences in direct, reflected, surface, and SOFAR ducting should be considered separately and figured into the overall Sound Exposure Level (SEL) metric.
10. Complex noise exposures should be integrated as a complete sound field over time rather than taken as a set of discrete noise sources. As such most seismic surveys would be considered “continuous noise sources” in the far field and should be subject to the 120 dB Continuous Noise mitigation criteria.
11. Expecting MMOs to effectively find marine mammals at night or in exclusion zones greater than 1000 meters is impractical even in calm sea states. Seismic survey operations should be limited to times and conditions in which MMOs can actually locate marine mammals within the prescribed exposure-dependent “exclusion zone”.
12. Boomers, chirp, and sub-bottom profilers, should be more closely scrutinized in terms of their respective impacts on odontocetes.
13. Suggesting an animal’s “selective avoidance” be used as a mitigation strategy is circular reasoning and fails to address the purpose of the DEIS. Comments to this effect found throughout the DEIS should be pulled from the document.
14. Under any airgun operation the noise propagation models used in the Final EIS should be verified in the field with acoustical monitoring both in the near and far fields until there is confidence that the EIS models represent the actual noise propagation in the field.

³¹ Michel André, Marta Solé, Marc Lenoir, Mercè Durfort, Carme Quero, Alex Mas, Antoni Lombarte, Mike van der Schaar, Manel López-Bejar, Maria Morell, Serge Zaugg, and Ludwig Houégnigan (2011) “Low-frequency sounds induce acoustic trauma in cephalopods” *Front Ecol Environ* 2011; doi:10.1890/100124

³² T. Aran Mooney, Roger T. Hanlon, Jakob Christensen-Dalsgaard, Peter T. Madsen, Darlene R. Ketten and Paul E. Nachtigall” Sound detection by the longfin squid (*Loligo pealeii*) studied with auditory evoked potentials: sensitivity to low-frequency particle motion and not pressure *J Exp Biol* 2010 213:3748-3759.

³³ R.D. McCauley, J. Fewtrell, A.J. Duncan, C. Jenner, M-N. Jenner, J.D. Penrose, R.I.T. Prince, A. Adhitya, J. Murdoch and K. McCabe (2000) “Marine seismic surveys— a study of environmental implications” *The Australian Petroleum Production & Exploration Association Journal* p.692-708

³⁴ A. Guerra*, A.F. González and F. Rocha (2004) A review of the records of giant squid in the north-eastern Atlantic and severe injuries in *Architeuthis dux* stranded after acoustic explorations” *International Council for the Exploration of the Sea* CC:29

³⁵ Payne, J.F., C.A. Andrews, L.L. Fancy, A.L. Cook, and J.R. Christian. 2007. Pilot study on the effects of seismic air gun noise on lobster (*Homarus americanus*). *Canadian Technical Report of Fisheries and Aquatic Sciences* 2712. 46 pp.

15. Semi-submersible drilling platforms and thruster stabilized drilling ships need to be evaluated for noise contribution while in operation and due to the continuous noise characteristic of their thrusters, and need to be mitigated at the 120dB re 1 μ Pa exclusion criteria.

It appears from the forgoing that neither Alternative A nor Alternative B will meet safe exposure criteria established under the Marina Mammal Protection act, and will cause significant habitat and wildlife damage. This should be avoided. Waiving the extents of the damages with “take authorizations” and “harassment permits” is a short-sighted hubristic strategy that does not take into consideration our own species dependence on healthy, productive marine habitats.

It is increasingly clear that the costs of promoting fossil fuel exploration and production is becoming prohibitively high. The good news in this is that consideration of the true costs of hydrocarbon exploration, extraction, production, and consumption will give our economic society greater incentives to conserve the fossil fuel that we can extract without the extreme collateral damage, and to develop energy alternatives that are regenerative and less damaging to our own habitat.

Thank you for this opportunity to review and comment on the proposed actions.

Sincerely,

A handwritten signature in black ink, appearing to read "Michael Stocker", with a long horizontal flourish extending to the right.

Michael Stocker
Director

EXHIBIT 10

TABLE 6—ESTIMATED DENSITIES OF MARINE MAMMAL TO SOUND LEVELS ≥ 160 dB DURING USGS'S SEISMIC SURVEY IN THE NORTHWEST ATLANTIC OCEAN OFF TO SOUND LEVELS ≥ 160 dB DURING USGS'S SEISMIC SURVEY IN THE NORTHWEST ATLANTIC OCEAN OFF SPECIES AND ESTIMATES OF NUMBERS OF MARINE MAMMALS EXPOSED THE EASTERN SEABOARD, AUGUST TO SEPTEMBER 2014 AND APRIL TO AUGUST 2015

Species	Authorized take for 2014/2015 (includes increase to average group size)
North Atlantic right whale	3
Humpback whale	41
Minke whale	4
Bryde's whale	6
Sei whale	6
Fin whale	6
Blue whale	2
Sperm whale	166
Pygmy sperm whale	66
Dwarf sperm whale	66
Northern bottlenose whale	4
Cuvier's beaked whale	168
True's, Gervais', Sowerby's, and Blainville's beaked whale	
Bottlenose dolphin	499
Atlantic white-sided dolphin	66
Fraser's dolphin	200
Atlantic spotted dolphin	2112
Pantropical spotted dolphin	1448
Striped dolphin	9832
Spinner dolphin	130
Clymene dolphin	393
Short-beaked common dolphin	406
Rough-toothed dolphin	32
Risso's dolphin	684
Melon-headed whale	200
Pygmy killer whale	50
False killer whale	30
Killer whale	12
Short-finned pilot whale	1394
Long-finned pilot whale	1394
Harbor porpoise	8
Harbor seal	0
Gray seal	0
Harp seal	0
Hooded seal	0
TOTAL	19428