CAPE FEAR RIVER WATCH – CENTER FOR BIOLOGICAL DIVERSITY – CLEAN OCEAN ACTION – EARTHJUSTICE – ENVIRONMENTAL DEFENSE FUND – ENVIRONMENT NORTH CAROLINA NATURAL RESOURCES DEFENSE COUNCIL – NORTH CAROLINA COASTAL FEDERATION – NORTH CAROLINA CONSERVATION NETWORK – NORTH CAROLINA LEAGUE OF CONSERVATION VOTERS OCEANA – OCEAN CONSERVATION RESEARCH – SOUND RIVERS SOUTH CAROLINA COASTAL CONSERVATION LEAGUE SOUTH CAROLINA WILDLIFE FEDERATION – SOUTHERN ENVIRONMENTAL LAW CENTER – WILDLIFE CONSERVATION SOCIETY

Via Electronic Mail

October 26, 2015

Mr. Gary D. Goeke, Chief
Environmental Assessment Section
Bureau of Ocean Energy Management (BOEM)
Gulf of Mexico OCS Region
1201 Elmwood Park Boulevard
New Orleans, Louisiana 70123–2394
Email: ggeis@boem.gov

Re: *Request for Supplemental Environmental Impact Review of the Proposed Geological and Geophysical Activities in the Mid- and South Atlantic*

Dear Mr. Goeke:

On behalf of the Natural Resources Defense Council ("NRDC"), Cape Fear River Watch, Center for Biological Diversity, Clean Ocean Action, Earthjustice, Environmental Defense Fund, Environment North Carolina, North Carolina Coastal Federation, North Carolina Conservation Network, North Carolina League of Conservation Voters, Oceana, Ocean Conservation Research, Sound Rivers, South Carolina Coastal Conservation League, South Carolina Wildlife Federation, Southern Environmental Law Center, and Wildlife Conservation Society, and of our millions of members and constituents, we are writing to alert BOEM to the availability of significant new information pertaining to the agency's environmental analysis of Atlantic geological and geophysical ("G&G") surveys, and to urge the agency to undertake a supplemental environmental impact statement.

On March 7, 2014, as you know, BOEM released a Final Programmatic Environmental Impact Statement ("PEIS") pursuant to the National Environmental Policy Act ("NEPA") with the stated purpose of disclosing and mitigating the potential environmental effects of multiple geological and geophysical ("G&G") surveys, to be conducted through 2020 in the agency's Mid- and South Atlantic Planning Areas. 79 Fed. Reg. 13074 (Mar. 7, 2014). The PEIS's impact analysis centers on models that produce an estimate of the total number of marine mammals

injured or otherwise harmed by the proposed G&G activities. New science, however, indicates that the Level A and Level B harm or "take" numbers in the PEIS—which already number in the millions—have been grossly underestimated, potentially by as much as three-fold for some species due to underestimates of marine mammal density and by as much as fifteen-fold (or more) due to reliance on an outdated and inaccurate impact threshold.

This new scientific information is significant, indicates severe environmental consequences from the proposed G&G activity that were not envisioned by the PEIS, and obligates supplementation of the PEIS. 40 C.F.R. § 1502.9.[1]

I. One of the principal environmental impacts analyzed in BOEM's Atlantic PEIS is the marine mammal injury and behavioral disruption resulting from seismic airgun surveys.

The fundamental purpose of an EIS is to force the decision-maker to take a "hard look" at a particular action, and in particular at the environmental consequences it will have. *See* 40 C.F.R. § 1502.1 (an EIS "shall provide full and fair discussion of significant environmental impacts"). To that end, the Atlantic G&G PEIS considers the impact of large-scale exploration by industry of the Mid- and South Atlantic Ocean for potential oil and gas, renewables, and mineral development. PEIS at vii. Specifically, the PEIS contemplates the effects on marine resources and uses of an array of activities related to such exploration including seismic airgun surveys, electromagnetic surveys, geological and geochemical sampling, drilling of test wells, placement of equipment, and remote sensing surveys. While a number of exploration-related actions are considered, the PEIS recognizes that active acoustic sound sources—and especially seismic airguns—stand out among the others contemplated by the program for their unique potential to harm or otherwise impact marine life. *See e.g.* PEIS at 2-40 ("Airguns are the main active acoustic sound source that may affect marine mammals . . . ."). As BOEM explains in the PEIS's Executive Summary, "[d]eep penetration seismic airgun surveys . . . emit acoustic energy pulses into the seafloor over long durations and over large areas," and "are controversial because of . . . potential impacts of the sound produced by these surveys to marine life." PEIS at viii. For this reason, in preparing the PEIS, BOEM gave special consideration to the environmental impacts of seismic surveys. *Id.* (explaining that "the PEIS evaluates airgun surveys in detail").

The marine resource identified in the PEIS as having the greatest vulnerability to seismic airgun surveys is marine mammals. *Compare* PEIS at 2-39, 2-41–2-43 (summary of active acoustic impacts to benthic communities, sea turtles, coastal and marine birds, fish, and various uses) *with* 2-39–2-40 (summary of active acoustic impacts to marine mammals). In the mostly dark ocean environment, marine mammals depend on sound to find each other, breed, feed, navigate, and avoid predators—in short, for their survival and reproduction. The PEIS's more than 850,000 sq. km activity area (or the "area of interest") is home to 39 species of marine mammals including six endangered species: the North Atlantic right whale, blue whale, fin whale, sei whale, humpback whale, and sperm whale. PEIS at x. The final PEIS, published in

[1] This letter is intended to alert the agency to new scientific information and does not supplant our previous comments to BOEM on the Draft and Final PEIS.

February 2014, estimates that the planned Atlantic G&G activities will result in as many as 138,000 injuries to marine mammals and in 13.5 million disturbances of marine mammals, including disruptions in vital behaviors such as feeding, mating, and communicating. PEIS Tables 4-9–4-15. Almost all of these injuries and disturbances are attributed to intense underwater noise caused by airgun seismic surveys. *See* Tables 4-15 (comparing take estimates from different sounds sources). For example, seismic surveys are estimated to disturb sperm whales up to 30,356 times per year and North Atlantic right whales as many as 224 times per year; whereas non-airgun surveys are estimated to cause fewer than 12 instances of harm to sperm whales and 1 to North Atlantic right whales per year. *Id.*

II. Significant new information on marine mammal densities and acoustic impacts contradict the assumptions made in BOEM's PEIS, and the agency's continued reliance on outdated information would result in a gross underestimate of the impact to marine mammals, and the geospatial scale of impact, from the proposed Atlantic activities.

Since BOEM's publication of the PEIS, at least two significant scientific studies have become available that bear directly on BOEM's estimate of marine mammal impacts—and therefore, by extension, the expected environmental impact—of the proposed Atlantic G&G survey activity.[2]

(1) In January 2015, the Duke University Marine Geospatial Ecology Lab finalized a set of comprehensive cetacean density models for the U.S. Atlantic (hereinafter, "Atlantic CetMap"). These models were created as part of the U.S. National Oceanic and Atmospheric Administration ("NOAA") Cetacean Density and Distribution Mapping program and are now the best time- and species-specific cetacean density and distribution maps for 28 of the cetacean taxa found in the Mid- and South Atlantic Ocean Planning Areas, *i.e.*, the PEIS's area of interest.

(2) In September 2015, Nowacek et al. published a peer-reviewed paper in *Frontiers in Ecology and the Environment* titled "Marine seismic surveys and ocean noise: Time for coordinated and prudent planning."[3] That study, *inter alia*, assessed the available scientific literature and confirmed that the 160 dB re 1 μPa (RMS) impact threshold—utilized in the PEIS to assess the total "take" or injury of marine mammals—is not only outdated but contravenes the latest and best

[2] While this letter focuses on marine mammal impacts, we note that a number of relevant studies on other taxa have appeared since the PEIS was issued. These include, for example, Voellmy, I.K., Purser, J., Flynn, D., Kennedy, P., Simpson, S.D., and Radford, A.N., Acoustic noise reduces foraging success in two sympatric fish species via different mechanisms, *Animal Behavior* 89: 191-198 (2014); and Sierra-Flores, R., Atack, T., Migaud, H., and Davie, A., Stress response to anthropogenic noise in Atlantic cod *Gadus morhua* L., *Aquacultural Engineering* 67: 67-76 (2015).

[3] Nowacek, D.P., Clark, C.W., Mann, D., Miller, P.J.O., Rosenbaum, H.C., Golden, J.S., Jasny, M., Kraska, J., and Southall, B.L., Marine seismic surveys and ocean noise: Time for coordinated and prudent planning, *Frontiers in Ecology and the Environment* 13: 378-386 (2015). This paper (cited hereinafter as "Nowacek et al. (2015)") and its published supplemental material (cited hereinafter as "WebPanel") are attached to the present letter.

behavioral-response science. Nowacek et al. (2015) recommend that the relevant impact threshold should be substantially lower, a risk function centered at 140 dB re 1 μPa (RMS), to reflect existing data.

A. The Atlantic CetMap models

The PEIS calculates its total marine mammal injury or "take" figures using distribution numbers based on the U.S. Navy's Operating Area Density Estimates ("NODE") database; however, this year that data set was supplanted by the CetMap models as the best available science. *See* PEIS at 4-60, Appendix E.

The Atlantic CetMap models were commissioned by NOAA as part of a larger nationwide CetMap project, with the stated purpose of creating and making accessible "time- and species-specific" density models that are "*the best* comprehensive cetacean density and distribution maps" available.[4] In the PEIS, BOEM itself "recognize[d] the limitations in the existing NODE database" and anticipated the release of the likely more accurate CetMap models. PEIS Appendix E at E-71 ("BOEM expects that better density data will become available in the near future . . . ."). As the PEIS explains, "[i]n 2011, NOAA convened a working group to map cetacean density and distribution (CetMap) within U.S. waters including the Atlantic . . . . BOEM expects that the CetMap density data will be *superior* to the NODE database used for the calculations in this Programmatic EIS." *Id.* (emphasis added).

In the PEIS, BOEM expressly recognized that the impact analysis was based on incomplete or unavailable information (40 CFR § 1502.22) for all marine mammals with respect to seasonal abundances, distribution, and stock or population size. PEIS at 4-47. However, the agency concluded that "a more complete knowledge base for all types of marine mammals that use the [area of interest] . . . is not available and the acquisition of such information cannot be acquired without exorbitant cost." *Id*. This information is now available at no cost to the agency, is significant, and must be incorporated in BOEM's analysis.

NEPA requires agencies to obtain "high quality information" because "[a]ccurate scientific analysis" is essential to its implementation. 40 C.F.R. § 1500.1(b). The NODE data no longer meet that rigorous standard. The Atlantic CetMap models incorporate 60 percent more shipboard and 50 percent more aerial survey hours than NODE, and the Atlantic CetMap data for the Mid- and South Atlantic region spans a larger total number of survey years (22 years compared to 13 years for NODE) and includes far more recent data (up to 2014 compared to 2005 for NODE).[5]

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[4] NOAA. Cetacean & Sound Mapping: What is CetMap?, *available at* http://cetsound.noaa.gov/ cda-index, *last accessed* September 23, 2015 (emphasis added).

[5] Comment letter from Jason J. Roberts and Patrick N. Halpin, Duke University Marine Geospatial Ecology Lab, to Jolie Harrison, NMFS (Aug. 27, 2015) (hereinafter "Duke IHA Comment Letter"). This comment letter, submitted to NMFS by a Research Associate and by the Director of the Duke Lab, is attached to the present letter.

As a result, the Atlantic CetMap project was able to model abundance for a larger number of taxa and with higher spatial and temporal resolution than NODE.[6]

Not only did the Atlantic CetMap models work with a substantially more robust and current data set, they also improved on the NODE models by controlling for well-established sources of bias not addressed by NODE and by considering a larger set of environmental covariates.[7] NODE's failure to account for certain well-established sources of bias, particularly availability and perception bias, has the greatest consequence for species that exhibit long dive times or are otherwise hard to detect by ship-based observers, but resulted in the systematic underestimation of density for *all* cetacean species. In other words, according to the best available science, the PEIS underestimates the densities of all whale, dolphin, and porpoise species within the agency's area of interest. These bias-based errors are, in many cases, substantial, resulting in a doubling or trebling of marine mammals put at risk by the proposed exploration activities.

For example, the Atlantic CetMap models, in accounting for availability and perception biases, estimate the general trackline detection rate (g(0)) for dwarf and pygmy sperm whales (i.e., *Kogia*) as 0.35. That is, the probability of detecting one of these species directly on the point or trackline of a survey vessel is only 0.35. In line-transect density estimation, density is scaled by the inverse of the detection probability. Accordingly, the NODE density estimates underestimate the density of *Kogia* species by 1/0.35, or a factor of 2.86, due to availability and perception biases alone. For *Kogia*, the difference in density models results in an almost 3-fold increase in the number of whales that are predicted to be present and that could therefore be impacted by the proposed activity.

B. Nowacek et al. (2015)

The PEIS relies on a bright-line 160 dB re 1 μPa (RMS) threshold for harm and estimates impacts of the proposed seismic surveys based on the number of times marine mammals in the vicinity of a seismic source are subjected to that exposure level. *See* PEIS Appendix E at E-7. For years a diverse group of ocean noise specialists, including many leading biologists and bioacousticians, have decried the 160 dB threshold—which came out of the High Energy Seismic Survey panel report in 1999 and was based largely on 1980s data—as outdated and incongruous with more recent science. *See e.g.* NRDC et al. Comments on the Draft PEIS for Atlantic G&G Activities (July 2, 2012). As Nowacek et al. (2015) explain, the old impact threshold suffers under its "simplicity, artificial rigidity, and increasingly outdated nature" (at

[6] "For the east coast, [the Atlantic CetMap analysis] provided models for all sighted taxa, while NODEs left 5 unmodeled in the NODE 'east coast north' and 11 unmodeled in the NODE 'east coast south' study areas. [Atlantic CetMap] modeled 15 taxa with DSMs; NODES modeled 6-11, depending on the region. Finally [Atlantic CetMap] produced monthly predictions for 11 taxa; the NODE studies produced seasonal predictions for 6 taxa: 5 with DSMs developed by the NODE authors and 1 derived from the literature (North Atlantic right whales)." Duke IHA Comment Letter at p.12.

[7] As the Duke IHA Comment Letter explains, the Atlantic CetMap analysis "controlled for the influence of sea state, group size, availability bias, and perception bias on the probability of making a sighting (NODEs controlled for none of these), considered 14 dynamic environmental covariates (NODEs considered 2), and implemented other methodological improvements . . . ." Duke IHA Comment Letter at p.12.

380) and does not reflect the best available science, which demonstrates behavioral disruption from seismic airguns at substantially lower received levels (at 382, WebPanel 1).

BOEM admits that its PEIS is based on incomplete or unavailable information (40 CFR § 1502.22) with respect to "the basic biology of specific species and their physiology for underwater hearing," which "may be relevant to reasonably foreseeable adverse impacts on marine mammals that are subject to active acoustic sound sources, i.e., airguns." PEIS at 4-47. Under NEPA regulations, where such relevant information is incomplete or unavailable, the agency must evaluate impacts using "theoretical approaches… generally accepted in the scientific community." 40 CFR § 1502.22(b)(4). The Nowacek et al. (2015) assessment (at 380, WebPanel 1) confirms that the 160 dB threshold applied in the PEIS is no longer accepted by the scientific community, particularly in estimating marine mammal impacts from seismic airguns. Moreover, Nowacek et al. (2015) conclude that an alternative threshold—a dose-function centered on 140 dB (RMS)—more closely reflects the best available scientific evidence on cetaceans than does the threshold used in the PEIS. In short, the data are available to support a revised, more conservative threshold, and this information is obtainable at little or no cost to the agency. 40 C.F.R. § 1502.22(a).

In a July 2, 2012 comment letter on the Draft PEIS for Atlantic G&G activities, many of our organizations set forth some of the scientific literature showing that behavioral disruption can occur at substantially lower received levels than the 160 dB threshold for some species, which has been mounting for some time:[8]

> 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.[9] . . . 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 long-term consequences.[10] 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

[8] Indeed, as our comments on BOEM's Draft and Final PEIS indicate, the scientific literature contradicting the 160 dB (RMS) threshold was robust enough before the PEIS was issued to render the agency's analysis arbitrary and capricious. NRDC and other commenters urged the agency to revise its analysis then, noting that it risked rendering its analysis obsolete before the PEIS was even published. See, e.g., NRDC et al., Comments on the Draft PEIS for Atlantic G&G Activities (July 2, 2012).

[9] 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).

[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).

> 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 μPa (RMS)).[11] Bowhead whales migrating through the Beaufort Sea have shown almost complete avoidance at airgun received levels at 120-130 dB (RMS) and below;[12] 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 μPa when migrating."[13] 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.[14]

Little if any of these data were available in 1999, when the 160 dB threshold was proposed, and since that time, the literature on ocean noise has expanded enormously. Nowacek et al. (2015) review the latest relevant science, among them several additional studies that were published after NRDC's comment letter was submitted but before the PEIS was finalized, as well as several other studies published thereafter. These include a number of papers demonstrating large-scale impacts on baleen whale species across behavioral contexts (feeding, breeding, migrating), tens and indeed hundreds of kilometers from the seismic airgun source; as well as papers showing displacement and feeding rate decline, at received levels well below 160 dB

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[11] *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. Enviro. 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).

[12] 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).

[13] *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).

[14] 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).

(RMS), in a variety of cetacean species.[15] Again, Nowacek et al. (2015, at WebPanel 1) conclude not only that the agency's 160 dB threshold is inaccurate, but that "a probabilistic function with a 50% midpoint at ~140 dB (RMS) that accounts, even qualitatively, for contextual issues like affecting response probability (e.g., whether the animal is feeding or traveling) comes much closer to reflecting the existing data than does the 160 dB (RMS) step-function" that the PEIS uses.

Reliance on the outdated, arbitrary 160 dB threshold is nontrivial. It results in a gross underestimate in the PEIS of the activity's impact area and of the harm or "take" experienced by marine mammals, and therefore undermines the document's environmental impact analysis. The PEIS itself modeled acoustic propagation from a 5400 in^3 airgun array at 21 different sites across the Atlantic study area. *See* PEIS Appendix D at D-62–D-72. At a water depth of 2,560 meters, the radius of the 160 dB (RMS) exposure isopleth is 5,040 m (or a total impact area of 79.8 km^2). PEIS Appendix D at D-3. At that same depth, the radius of the 140 dB (RMS) exposure isopleth is about 20,000 m (or a total impact area of 1,256 km^2). *Id.* Put another way, the area considered ensonified to 140 dB at this site would be more than 15 times greater than the area considered ensonified to 160 dB—a discrepancy that is likely to have an enormous impact on both total number of marine mammals impacted and the number of times they are impacted. And a behavioral risk function *centered* at 140 dB (RMS), per Nowacek et al. (2015), would result in high percentages of take at still greater distances than those indicated here.

Finally, it is worth noting that behavioral thresholds do not account for the full range of seismic airgun impacts on marine mammals that can occur at substantial distances from an array. For example, it does not account for the "masking" of biologically important sounds, including communication calls of conspecifics, exacerbated by the documented spreading of seismic pulses across the interpulse interval. As Nowacek et al. (2015) conclude, masking "can occur at received levels that are just above the ambient noise level," and "masking should be integrated into impact assessment methods and are relevant to seismic airgun signals." Nowacek et al. (2015) WebPanel 1 (internal citation omitted). The paper suggests ways to move beyond the threshold method of analyzing harm in order "to capture a more realistic metric for the potential impacts of seismic surveys and other marine noise-generating activities," which "incorporate[s]

[15] E.g., Blackwell, S.B., Nations, C.S., McDonald, T.L., Greene, Jr., C.R., Thode, A.M., Guerra, M., and Macrander, M., Effects of airgun sounds on bowhead whale calling rates in the Alaskan Beaufort Sea, *Marine Mammal Science* 29(4): E342-E365 (2013); Blackwell, S.B., Nations, C.S., McDonald, T.L., Thode, A.M., Mathias, D., Kim, K.H., Greene, Jr., C.R., and Macrander, M., Effects of airgun sounds on bowhead whale calling rates: Evidence for two behavioral thresholds. *PLoS ONE* 10(6): e0125720. doi:10.1371/journal.pone. 0125720 (2015); Castellote, M., Clark, C.W., and Lammers, M.O., Acoustic and behavioural changes by fin whales (*Balaenoptera physalus*) in response to shipping and airgun noise, *Biol. Conserv.* 147:115–22 (2012); Cerchio, S., Strindberg, S., Collins, T., Bennett, C., and Rosenbaum, H., Seismic surveys negatively affect humpback whale singing activity off Northern Angola, *PLoS ONE* 9(3): e86464. doi:10.1371/journal.pone.0086464 (2014); Miller, G.W., Monitoring seismic effects on marine mammals—southeastern Beaufort Sea, 2001–2002, *in* Armsworthy, S.L., Cranford, P.J., and Lee, K. (eds.), *Offshore oil and gas environmental effects: monitoring, approaches and technologies* (2005); 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 Res Pt. I* 56: 1168–81 (2009); Pirotta, E., Brookes, K.L., Graham, I.M., and Thompson, P.M., Variation in harbour porpoise activity in response to seismic survey noise, *Biol. Lett.* 10: 20131090 (2014).

the spatial and temporal dynamics and spectral characteristics of the acoustic field generated by the specific activity . . . as well as account for the aggregate sound field resulting from multiple anthropogenic activities . . .” (Nowacek et al. (2015), at 380). For example, for masking Nowacek et al. (2015) endorse recently derived metrics to quantify loss of communication space as a superior means of establishing communication and foraging thresholds for impacts from airgun sounds. (*Id.* at WebPanel 1.[16])

III. NEPA requires that BOEM supplement the PEIS in light of the significant new information.

In order to meet its continuing obligations pursuant to NEPA, BOEM cannot simply rest on the Atlantic G&G PEIS it finalized last year. *See Marsh v. Oregon Natural Res. Council*, 490 U.S. 360, 374 (1989) (an agency must “take a ‘hard look’ at the environmental effects of their planned action, even after a proposal has received initial approval”). As NEPA’s implementing regulations make clear, even after an EIS has been finalized, where there are “significant new circumstances or information relevant to environmental concerns and bearing on the proposed action or its impacts,” a supplemental EIS “shall” be prepared. 40 C.F.R. § 1502.9(c)(1)(ii); *see Friends of the River v. F.E.R.C.*, 720 F.2d 93, 109 (D.C. Cir. 1983).

Furthermore, the “hard look” required in an EIS under NEPA obligates BOEM to obtain high-quality information and accurate scientific analysis, 40 C.F.R. § 1500.1(b), and to include a “full and fair discussion” of the direct and indirect environmental impacts of the proposed activity. 40 C.F.R. § 1502.1. That duty is ongoing. 40 C.F.R. § 1502.9; *see Marsh*, 490 U.S. at 374; *Friends of the Clearwater v. Dombeck*, 222 F.3d 552, 557 (9th Cir. 2000) (explaining that “an agency that has prepared an EIS . . . must be alert to new information that may alter the results of its original environmental analysis”). The current Atlantic G&G PEIS no longer provides a full and fair discussion of significant environmental impacts, informs decision-makers and the public, or adequately minimizes adverse impacts to the environment.

The Atlantic CetMap density models and the Nowacek et al. (2015) recommended threshold constitute new information, which BOEM “must consider” and “evaluate.” *Warm Springs Dam Task Force v. Gribble*, 621 F.2d 1017, 1024 (9th Cir. 1980). The decision whether to supplement “depends on such factors as the environmental significance of the new information, [and] the probable accuracy of the information . . . .” *Id.* In addition to significance and accuracy, in weighing whether supplementation is required, courts consider relevant whether the new information has been recognized by the agency as important, *Friends of the Clearwater*, 222 F.3d at 559; if the new information was produced by the agency itself, *id.*; the predominance in the original EIS of any discussion of impacts of the sort that would be affected by the new information, *Natural Res. Def. Council v. Lujan*, 768 F. Supp. 870, 887 (D.D.C. 1991); the relevance to a central factor weighed in the EIS of the new data, *Davis v. Latschar*, 83 F. Supp.

[16] Citing 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, *Mar. Ecol. Prog. Ser.* 395: 201–22 (2009); Hatch, L.T., Clark, C.W., Van Parijs, S.M., Frankel, A.S., and Ponirakis, D.W., Quantifying loss of acoustic communication space for right whales in and around a U.S. National Marine Sanctuary, *Conserv. Biol.* 26: 983–94 (2012).

2d 1, 9-10 (D.D.C. 1998); common sense, *Lujan*, 768 F. Supp. at 887; and, the "context" and "intensity" of the remaining federal activity in light of the new information as defined by CEQ regulation 40 C.F.R. § 1508.27, *Lemon v. McHugh*, 668 F. Supp. 2d 133, 138-39 (D.D.C. 2009). Each of these factors weighs in favor of supplementation here.

The new information presented in this letter is significant on its face. It suggests that the agency's "take" numbers in the PEIS—which already number in the millions—have been grossly underestimated, by as much as 3-fold based on revised density estimates and roughly 15-fold based on the outdated threshold, possibly more. *Cf. Lujan*, 786 F. Supp. at 887. The Atlantic CetMap information here is from a government-sponsored study, *Friends of the Clearwater*, 222 F.3d at 559 (significant that "information . . . was generated by the Forest Service itself"), which NOAA and BOEM have both acknowledged is highly important, *Lujan*, 786 F. Supp. at 887 (significant that "agency itself obviously considered this new information highly important"); and the Nowacek et al. (2015) study is published in a peer-review journal and relates—as do the CetMap models—directly to inquiries that are central to the principal chapter of the PEIS (Chapter 4), four of its appendices, and its impact analysis. *See id.* (weighing the fact that three chapters of Arctic National Wildlife Refuge EIS were dedicated to impacts from oil and gas as factor in deciding supplementation based on an updated petroleum resource report was required); *cf. Davis*, 83 F. Supp. 2d at 9-10 (explaining that information was not significant where it did not alter the relevant inquiry, namely the population density of deer).

In *Natural Res. Def. Council v. Lujan*, the district court reasoned that it was "common sense" that a new petroleum resource report that suggested a "more-than-doubling of the probability of finding oil" in the coastal plain of the Arctic was significant new information that substantially increased the probability of environmental impact to the Arctic National Wildlife Refuge.768 F. Supp. at 887 (requiring supplementation). In that case, the court considered such factors as the resultant likely increase in ship traffic, risk of oil spill, and more extensive exploration in reaching its conclusion. *Id.* Similarly, it is common sense that correcting the PEIS's systematic underestimate of both (1) the number of marine mammals in the area of interest, as well as (2) the sound level at which they are likely to be harmed would substantially increase the estimated impact to marine mammals of the planned Atlantic G&G activity. Just as an increase in petroleum availability in *Lujan* was likely to result in an increase in ship traffic, so too is an increase in the number of cetaceans in the area of interest and radius of harm likely to result in more protected species interactions with seismic airgun noise.

The "intensity" of the new information counsels in favor of supplementation as well. the agency's area of interest includes ecologically critical marine areas; its proposed action is highly controversial; the risks are largely unknown for many species; approval without consideration of the new information sets a dangerous precedent going forward; the new science relates to other reasonably expected actions and cumulative impacts; and the CetMaps and revised threshold could entirely change the agency's impact calculus, especially for those species that are already threatened or endangered. 40 C.F.R. § 1508.27(listing the factors to consider in evaluating "intensity" under NEPA); *see Lemon*, 668 F. Supp. 2d at 138-39 (supplemental EIS was required where a revised plan included a higher density of development and impacts to sensitive resources, factors recognized for their "intensity").

As an overarching consideration, courts across the country have repeatedly recognized that supplementation of an EIS is required where the new information reveals a "seriously different picture of the environmental impact of the proposed project from what was previously envisioned." *Hickory Neighborhood Defense League v. Skinner*, 893 F.2d 58, 63 (4th Cir.1990); *see City of Olmsted Falls, OH v. Fed. Aviation Admin.*, 292 F.3d 261, 274 (D.C. Cir. 2002); *Wisconsin v. Weinberger*, 745 F.2d 412, 418 (7th Cir.1984); *Sierra Club v. Froehlke*, 816 F.2d 205, 210 (5th Cir. 1987); *Friends of the Clearwater*, 222 F.3d at 557. A revised analysis utilizing the Atlantic CetMap density models and the Nowacek et al. (2015) recommended threshold of harm would dramatically alter the agency's assessment of the proposed Atlantic G&G activity, with substantially larger impact areas, numbers of marine mammal takes, and potential for adverse cumulative effects on marine mammal populations. In sum, the CetMap models and revised threshold indicate serious environmental consequences associated with the proposed activity not envisioned by the PEIS, requiring supplementation.

The PEIS offers a critical opportunity to consider the aggregate impact to marine mammal populations from all anticipated G&G surveys prior to permit issuance. *See Nat'l Wildlife Fed'n v. Appalachian Reg'l Comm'n*, 677 F.2d 883, 888 (D.C. Cir. 1981) ("In evaluating a comprehensive program design an agency administrator benefits from a programmatic EIS which indubitably promote(s) better decisionmaking." (internal quotations omitted)). It is at the programmatic level of analysis that BOEM can, as NEPA requires, disclose to decision-makers and the public the total environmental impact of the activity, weigh the relative benefits of alternatives, assess the cumulative impact, and assess the effectiveness of preferred mitigation measures at a program-relevant scale. *See Grand Canyon Trust v. F.A.A.*, 290 F.3d 339, 342 (D.C. Cir. 2002), *as amended* (Aug. 27, 2002) (to satisfy NEPA agency's environmental review must provide a "realistic evaluation of the total impacts and cannot isolate a proposed project, viewing it in a vacuum"); *Klamath-Siskiyou Wildlands Ctr. v. Bureau of Land Mgmt.*, 387 F.3d 989, 997 (9th Cir. 2004) (tiering individual projects impermissible under NEPA where agency failed to conduct cumulative impact analysis that would "reveal the incremental impact" of the four timber sales on the watershed). As BOEM itself has recognized, the proposed G&G activities are "large-scale" and, accordingly, so is their "scope . . . and their potential cumulative impacts," necessitating programmatic-level review. PEIS at 1-5. Again, according to BOEM, coverage of these activities under a programmatic EIS "establishes a framework for subsequent environmental documents for site-specific actions," "will reduce duplication of effort," "provid[es] a format for comprehensive cumulative impacts analysis," aids in "analyzing appropriate mitigation measures by examining G&G activities as a whole," and helps ensure "BOEM is acting consistently with CEQ provisions for applying NEPA early in the decision-making process." PEIS at 1-5, 1-3. The PEIS is also a crucial tool to make sure the analysis is done consistently and correctly across seismic projects. For these reasons, to leave correction of the PEIS's impact analysis to individual project-specific environmental reviews would contradict the PEIS' stated purpose in light of the proposed activity's scope, scale, and environmental risk.

Furthermore, the PEIS is intended to satisfy more than just the agency's NEPA requirements, and the other statutory obligations BOEM seeks to meet also require or would substantially benefit from supplementation in light of the new science. Specifically, the PEIS is a critical

document for purposes of compliance with the Endangered Species Act ("ESA") and Marine Mammal Protection Act ("MMPA"). *See* PEIS at viii. Seven marine mammal species that occur in the PEIS area of interest are federally listed as threatened or endangered under the ESA. PEIS Appendix A at A-27. Accordingly, the PEIS includes a Biological Assessment prepared by BOEM in consultation with NMFS that concludes that there will be no significant impact to any listed species resulting from the proposed activity. PEIS Appendix A at A-255. That Biological Assessment, however, is based on the abundance, density, and harm estimates presented in the PEIS, each of which is called into question by the Atlantic CetMap density estimates and Nowacek et al. (2015) paper. *See* 50 C.F.R. § 402.16(b) (a federal agency must reinitiate consultation if "new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered").[17]

All of the marine mammal species known to occur in the area of interest—seven listed and 32 nonlisted species—are federally protected under the MMPA. The MMPA has certain limited exceptions whereby an applicant can incidentally harm or "take" marine mammals; however, in order to obtain authorization to do so, the permittee must first demonstrate, among other requirements, that only small numbers of animals will be harmed and there will be no more than a negligible impact to the species or stock. *See* 16 U.S.C. 1371(a)(5)(A)(i). Although an individual Atlantic G&G applicant cannot rely solely on the PEIS's analysis, the PEIS includes detailed calculations of estimated "take" relevant for purposes of MMPA take authorization. *See* PEIS Appendix D, Appendix E, 1-14 (explaining that the PEIS "contains extensive information about the [area of interest] relevant to an application [for a permit under the MMPA]").

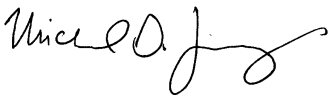
Conclusion

For all of the above reasons, we sincerely urge BOEM to supplement the Atlantic G&G PEIS and to do so before any permits for seismic airgun operations in the Atlantic study area are issued. It is essential that the agency's assessment of impacts, alternatives, and mitigation measures take place at a scale that more accurately reflects the environmental effect of the activity.

As always, we would welcome the opportunity to meet with you, your staff, and other relevant offices at any time to discuss these matters. For further discussion, please contact Michael Jasny of NRDC (mjasny@nrdc.org).

[17] *See* Center for Biological Diversity et al. Comments to NMFS RE: Notice of Receipt of Applications for Incidental Harassment Authorization Activities (Aug. 28, 2015) (requesting that NMFS reinitiate formal consultation under Section 7 of the ESA).

Very truly yours,



Michael Jasny
Director, Marine Mammal Protection
NRDC

Kemp Burdette
Cape Fear Riverkeeper
Cape Fear River Watch

Miyo Sakashita
Oceans Director
Center for Biological Diversity

Cindy Zipf
Executive Director
Clean Ocean Action

Steve Mashuda
Managing Attorney for Oceans
Earthjustice

Jane Preyer
Director, Southeast Office
Environmental Defense Fund

David Rogers
State Director
Environment North Carolina

Todd Miller
Executive Director
North Carolina Coastal Federation

Brian Buzby
Executive Director
North Carolina Conservation Network

Carrie Clark
Executive Director
North Carolina League of Conservation Voters

Jackie Savitz
Vice President, U.S. Oceans
Oceana

Michael Stocker
Director
Ocean Conservation Research

Travis Graves
Lower Neuse Riverkeeper
Sound Rivers

Heather Deck
Pamlico-Tar Riverkeeper
Sound Rivers

Matthew Starr
Upper Neuse Riverkeeper
Sound Rivers

Hamilton Davis
Energy and Climate Director
South Carolina Coastal Conservation League

Ben Gregg
Executive Director
South Carolina Wildlife Federation

Catherine Wannamaker
Senior Attorney
Southern Environmental Law Center

Howard C. Rosenbaum
Director, Ocean Giants Program
Global Conservation Programs
Wildlife Conservation Society

Encl.

Cc: Dr. Bill Brown (BOEM)
Ms. Renee Orr (BOEM)
Mr. Michael Celata (BOEM)
Ms. Jill Lewandowski (BOEM)
Ms. Eileen Sobeck (NMFS)
Mr. Samuel Rauch III (NMFS)
Ms. Donna Wieting (NMFS)
Ms. Jolie Harrison (NMFS)
Ms. Rebecca Lent (MMC)
Mr. Mike Gosliner (MMC)
Ms. Vicki Cornish (MMC)