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December 19, 2016

Mr. Benjamin Laws
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Office of Protected Resources
Permits and Conservation Division
1315 East-West Highway
Silver Spring, MD 20910

Mr. Laws,

Per our phone conversation, we are providing NOAA with some clarifications and comments regarding the public comment letter NOAA received from Duke Nicholas School of the Environment (Duke) dated August 27, 2015 and signed by Jason Roberts and Patrick Halpin in regard to 80 FR 45195 published on July 29, 2015.

First, Duke's letter mentions that the TGS IHA application provides less detail about acoustic exposure modeling than the other applications published in 80 FR 45195. Duke's presumption that this is related to our decision to use exposure models from the BOEM PEIS (BOEM 2014) is correct.

General Comments on CetMap

Duke's letter goes on to critique our approach to take estimation. As Duke noted, we used CetMap density estimates in cases in which we felt this model was appropriate to the question and the assumptions associated with our exposure model. Even for species for which we chose to use the CetMap model, we have reservations about this model for the purposes of take estimation associated with TGS' proposed activities. As Duke explains in its letter, it has used modeling techniques as applied to survey data to estimate densities of marine mammals in grid squares throughout the U.S. Atlantic Exclusive Economic Zone (EEZ). We agree with Duke that it would be valuable to have "a detailed understanding of the spatiotemporal distributions of these [cetacean] populations." Duke's approach was to combine distance sampling methodology with regression models that incorporate environmental correlates to *predict* occurrence of cetaceans based on habitat suitability. When one looks at the underlying empirical data used to build these predictions, they are very sparse for a number of species (more inform on this is provided below). In addition, Duke has used data collected from 1992-2014, a 22 year time span, to generate these maps. In sparse sighting situations, Duke uses proxy species to help determine distance functions and habitat correlates. Becker et al. (2014) made similar predictive density maps for several Pacific marine mammal species and states "In terms of estimating the total number of animals potentially exposed to a given anthropogenic activity, the model-derived density estimates would need to be applied cautiously on a species-by-species basis, with the recognition that in some cases the out-of-bound predictions could produce unrealistic results." We have evaluated the CetMap models and their limitations for each species/stock under consideration in our IHA application and found that, for some species, these models may have uncertainty that makes point predictions of exposures based on these models likely to be unrealistic. In such cases, we suggest alternative approaches to estimating exposures. We suggest that there are several issues with Duke's approach that introduce considerable uncertainty and need to be considered when evaluating the use of universal application of CetMap data in all cases:

Grid Size

1. First, the grid size is something to consider. If density is being correlated to the habitat in each grid square, then the grid size should be related to the scale of data collection, the number of sightings per square, and the likelihood of habitat parameters being consistent across a grid square. These issues may have been addressed by Duke, but it is difficult to determine this without availability of the full peer-reviewed publication. Duke told us (see TGS IHA application) that the choice of using all 10 X 10 km grid squares in CetMap was based on a request from the Navy, disparate resolutions of environmental datasets, amount of computing power needed and available, and "reasonable detail" at regional scale. Duke stated that previous analyses in the Pacific had not shown sensitivity to spatial scale. However, Becker et al. (2010) found that coarser spatial resolutions resulted in better predictions because of lack of precision in the environmental data and temporal offsets in ship surveys and environmental data acquisition. Becker et al. (2010, 2014) used 25 X 25 km grid squares, and Forney et al (2012) used 100 X 100 km grids for ETP models and 25 X 25 km for California Current models. It also seems unlikely that all species should have the same grid square size if the factors we noted above were considered. Note that if Duke determined there were not enough sightings available, it used uniform density models; however, this approach effectively spreads a density across a large part of the Atlantic EEZ, in which a species has rarely or never been observed (e.g., n < 4) despite almost half a million kilometers (km) of vessel and aerial surveys in just the Mid- and South Atlantic region (not considering the North Atlantic region).

Sample size and detection functions

2. Duke's distance sampling method is based on Buckland et al. (2001), which is the standard for evaluating density and abundance of marine mammals from trackline surveys. Duke's letter correctly asserts that Buckland et al's (2001) recommended 60-80 sightings (quoted by Duke from page 14-15 of Buckland et al. 2001) for distance analyses is just that—a recommendation. It is certainly reasonable to evaluate sample sizes appropriate to analyses on a case-by-case basis. However, we would point out that in the case of evaluating the density in an area approximately 857,558 km^2, it may be that 60-80 is *less* than the number of samples desired for statistical robustness, rather than more than necessary. Becker et al (2014) found that low sample size was problematic for habitat model development in the Pacific and suggested a sufficient sample size was *ideally >80 sightings*. Forney et al. (2012) state that predictive cetacean density models can be a good tool to evaluate anthropogenic impacts *if sufficient observations are available and surveys adequately characterize the full range of oceanographic variability*. Several species for which we determined that sample sizes were lower than we felt was appropriate for our question, take estimate model, and area of interest (Mid- and South Atlantic) had

sample sizes of 2-4 sightings over the 22 years and 490,000 km of surveys. Unless the species are very cryptic or sighting conditions are extremely poor (e.g. Beaufort State 4-5), modeling that spreads these species out to large areas is unrealistic. The species with the most sightings that we considered less than appropriate for us to use CetMap was fin whales with 49 sightings, followed by 19 sightings of *Kogia* spp. (see Table 6-2 of TGS IHA Application). This decision was made based on Buckland et al. (2001)'s recommendation that at least 60 samples would be desirable, other habitat models that suggest higher sample sizes are necessary, and the fact that the amount of effort and size of the area of the region under consideration support 60-80 as a very minimum sample size.

Duke Comment & Our Rebuttal – Sei whales, minke whales, harbor porpoises

3. Duke states that some species we analyzed separately from CetMap densities were sighted over 60 times. These species include minke whales, sei whales, and harbor porpoises. However, Duke in this case is referring to a much larger geographical range, the northern part of which *does not overlap* the TGS proposed project area. Thus, this sample size is not weighted to the smaller TGS project area scale.
    a. To clarify, we have limited our analyses to the area proposed for the TGS survey (which is a fairly large area of the Mid- and South Atlantic, so we are not cherry picking an unsurveyed, small area). Minke whales, sei whales, and harbor porpoises occur mainly north of the survey area. In 490,000 km of survey trackline over a 14-year period in the Mid- and South Atlantic specifically included in CetMap analyses, only 17 minke whales, 4 sei whales, and 0 harbor porpoise sightings occurred.
    b. The more recent AMAPPS 2010-2014 surveys, considering the Mid- and South Atlantic only, resulted in 10 harbor porpoise sightings, 10 minke whale sightings and 0 sei whale sightings in the Mid- and South Atlantic. AMAPPS data are not included in the CetMap analyses. The sightings of harbor porpoise and minke whales occurred in the spring and winter seasons, suggesting possible seasonality; however, all these sightings were in the Maryland/Delaware region at only the very northern end of TGS' proposed survey area.
    c. Data suggest that these three species occur north of the TGS proposed survey area, with some slightly southward movement in winter, but still not far into the Mid- and South Atlantic (e.g. CETAP 1982, AMAPPS 2010-2014). Furthermore, not all individuals would be expected to range that far south, as many individuals continue to be observed in the northern waters outside the TGS proposed project area in all seasons (see AMAPPS 2010-2014 and CETAP 1982 for examples).
    d. Because 10 sightings of harbor porpoises occurred during the AMAPPS surveys, we included harbor porpoise in our alternative analysis of exposures rather than using a mean group size as an estimate. The contention that one can extrapolate a density of harbor porpoise in over half of the U.S. Atlantic EEZ based on zero sightings does not seem like it meets the expectations of Buckland et al. (2001), regardless of sample sizes being only recommendations. To some degree, this is similar to saying that based on sightings of harbor porpoise in the Pacific Northwest, you can extrapolate a harbor porpoise density down through Baja Mexico. NOAA Stock Assessment Reports call the Atlantic-based stock of harbor porpoise a Gulf of Maine/Bay of Fundy Stock because they are mainly found in that region. Furthermore, the map of sightings from 1995-2010 included in the SAR show only one sighting south of offshore New Jersey (off the coast of Maryland/Virginia).

e. Similarly, the SAR for minke whales calls them a Canadian East Coast Stock. The SAR sighting map shows the majority of animals north of 40°N, with only three sightings south of coastal New Jersey in 10 survey years.
f. The sei whale SAR calls this stock the Nova Scotia Stock, and no sei whale sightings are reported south of offshore New Jersey in 10 survey years.
g. Sei whales, minke whales, and harbor porpoises are not so cryptic as to be unlikely to be observed if they occurred in the Mid- and South Atlantic. For example, they have been recorded in reasonably large numbers north of the TGS proposed survey area using the same survey techniques as in the TGS proposed survey area. The CetMap supplementary information indicates that 2,018 harbor porpoise, 1,014 minke whale, and 817 sei whale sightings were made during surveys in the U.S. North Atlantic, suggesting these species are very observable (at least under good sighting conditions) when they are actually present in an area. The amount of survey trackline considered is similar between the North and Mid/South Atlantic, with 549,000 km of trackline in the north and 490,000 in the mid/south used in CetMap analyses. Thus, effort would not be a strong factor in the sighting rate difference for these species between the two regions.
h. Effort is spread across seasons as well, with a total of 316,000 km of winter surveys included in CetMap analyses. In Section 6 of the IHA application, we discuss in depth the sighting information on each species we did not analyze with CetMap models.

Duke Comment & Our Rebuttal – Justification for not Using CetMap for sample sizes <50

4. Regarding species with <50 sightings total throughout the entire U.S. Atlantic EEZ in the 1,039,000 km of trackline used in the CetMap analyses: consideration must be taken with respect to whether these species are *rare and/or cryptic*. If a species is observed easily in other areas where it regularly occurs in similar ocean conditions, a lack of sightings in the Western Mid- and South Atlantic likely suggests that the species is *rare* in that region. If the species is simply hard to see during surveys (e.g. beaked whales or *Kogia* spp.), densities can be calculated under the assumption that they are probably there but the uncertainty in the estimates becomes higher than for abundant, easily observed species.
    a. Duke has increased the complexity of its model from a basic line-transect analysis without necessarily contributing better data to the model. This approach is likely to overfit models unless model assumptions are substantiated and supported by empirical data on the same scale of resolution. For example, the CetMap model extrapolates species presence using proxy species to evaluate detection functions and using habitat preferences based on small sample sizes from rare and cryptic species.
    b. It is possible to create very complex models that handle a variety of parameters. However, if you do not know parameter values, each one added to your model increases rather than decreases overall assumptions and uncertainty. In contrast, data are sufficient, a habitat prediction model can help determine where you might expect animals to be. For instance, if your question is "where can I create a concentrated survey to collect behavioral data on beaked whales that is most likely to result in multiple observations of this cryptic species?" then it makes sense to take the CetMap model and look

for potential hotspots for those species. If your question is “I have two places I could put my windfarm, is one more or less likely to have a high presence of sperm whales?” all other things being equal, a habitat model might be appropriate. However, again, it should be noted that **quality of available data** (i.e. resolution, sample size) regarding habitat preference is an important factor in evaluating *uncertainty and probabilities associated with occurrence predictions*.

c. As we stated in the TGS IHA application, Becker et al (2010) found that, in some cases, predicted habitats were *not occupied* at expected densities. (The latter analysis, as well as Becker et al. (2014), was based on 25 km^2 grids vs. CetMap’s 10 km^2 grids). Forney et al. (2012) reported that models for 3 species in their study (sperm whales, killer whales, and coastal spotted dolphins) failed to converge or produced results inconsistent with known occurrence patterns. Becker et al. (2012) did not create habitat-based predictive models for species with <15 sightings. Becker et al. (2010) reported that model performance was better when there were more sightings, and worst model performance was for Pacific white-sided dolphins with only 25 sightings used in the model. However, CetMap in some cases bases densities on ≤2 sightings in >1 million km of trackline and 22 years of observations. Further, much of the regions CetMap models are meant to cover *have already been surveyed*, so it is unnecessary to *predict* occurrence.

d. Becker et al (2010) further suggest that (1) a minimum number of sightings is required to produce *unbiased* models for a species, and (2) predictive ability of models is relative to habitat complexity, as well as what variables are relevant as species predictors. Forney et al. (2012) state that there are numerous sources of uncertainty in predictive habitat modeling, including survey design, stochasticity in the sighting process, measurement error, model parameter estimation errors, and model selection error.

e. <u>Our overall point</u>: in cases with few sightings, particularly when effort has been reasonably high, creating a predictive model of where animals *could* occur in the region given the environmental conditions is a model. However, *models are just models until they are supported by empirical data*. Thus, models do not necessarily reflect *the actual habitat-use patterns or occurrence of a species in the region of interest*. ***It is more appropriate given sparse data to use less complex models that require less knowledge of habitat preferences and will not over predict occurrence in areas that are suitable but for which there is no indication the species is common (or sometimes even present).***

5. Use of “proxy species” to evaluate distance functions is another source of uncertainty in CetMap estimates. In its letter to NOAA, Duke describes using proxy species to estimate humpback detection functions. This approach does add data to estimation of detection functions, making the outcome appear more certain. However, note that it *relies on the assumption that proxy species are genuinely representing the same behavior and detectability as target species.*

Habitat Prediction

6. Even for species for which there are adequate sample sizes to keep uncertainty at statistically appropriate levels for analyses, using habitat as predictors in areas for which surveys have actually been conducted provides an opportunity to evaluate predictor variables. However, it is potentially prone to predicting higher or lower densities than actually are known to occur based on direct observations. You would expect, when species sample sightings are adequate, the data themselves could

speak to hotspots in occurrence. Predictions based on habitat-based models are valuable in predicting occurrence of species in unsurveyed areas. They can also help with deciding between locations for studies or anthropogenic activities, as described above. *A seismic survey is a transient disturbance*, and in this case, is proposed across multiple habitats for which total numbers of each species expected is more important that density hotspots. However, close attention could be paid to monitoring results from such surveys to help evaluate the quality of habitat-based density predictions.

CetMap does not use AMAPPS data – Impact of AMAPPS data

7. CetMap surveys do not incorporate the latest available science regarding abundance and distribution of cetaceans in the Western Atlantic, namely the AMAPPS surveys. We appreciate that Duke "commends" our use of AMAPPS survey data in our analyses. Duke also acknowledges that we do not require the raw data from AMAPPS surveys to use the alternative analyses we have developed, making it easier for us to incorporate such data in our model. We expect that AMAPPS data will have the most impact on species with <50 sightings used in CetMap models. This is because adding even a few data points to such small datasets can have large impacts on model outcomes.
    a. The reason for this is the uncertainty associated with few data. This problem is acknowledged by other authors who have made habitat prediction models for Pacific cetaceans (e.g. Becker et al. 2010; Forney et al. 2012). It is also evident in abundance estimation of rare and cryptic species in the Stock Assessment Reports (SARs).
    b. For example, the abundance estimate of Longman's beaked whale (*Indopacetus pacificus*) in Hawaiian waters was 1,007 (CV=1.25—an extremely high CV that includes a confidence interval the dips below zero) in 2002 *based on 1 sighting* (Barlow 2006). In the 2013 SAR, this estimate was revised to 4,571 (CV = 0.65) based on *3 sightings* in 2010 (Bradford et al 2013). Bradford et al (submitted) has considerably revised this estimate again using the same 2010 surveys as in Bradford et al (2013), though A. Bradford tells us that the abundance value may change again as part of publication review and so should not be considered final at this time. This further illustrates the uncertainty associated with estimating abundance for small sample sizes.
    c. The trends analysis of Longman's beaked whale in the SAR states that this "increase" in abundance is not related to an actual increase in population size but rather to increased sample sizes as a result of using data in higher Beaufort sea states in the later analysis (Carretta et al 2014), as well as higher mean group sizes in 2010 (Bradford et al 2013). This means there was less extrapolation necessary, and the uncertainty in the estimate was reduced (CV dropped from 1.25 to 0.65). In particular, note that their sample size of three is still well below the recommended 60-80 sightings for distance sampling methods, so uncertainty is high.
    d. Also, note that this is a change of *more than four times* the originally estimated population size is based on a matter of two more sightings being in the analyses. This illustrates that for rare and cryptic species, inclusion of AMAPPS data in CetMap analyses may drastically alter the outcome of the

modeling. Further, it supports the assertion that modeled densities of rare and cryptic species *are not necessarily accurate and include considerable uncertainty.* In particular, *Kogia* spp. densities and distribution may be affected by inclusion of AMAPPS data given that only 19 sightings were used in CetMap but an additional 67 sightings occurred during AMAPPS 2010-2014.

Uncertainty

8. Uncertainty also exists in the density estimates for species with large sample sizes, and *this uncertainty is not reported in the model maps* or in the supplementary information provided (though it is reported as CVs for abundance estimates accompanying the density models). Such uncertainty can be evaluated and reported; for example, Forney et al. (2012) determined the dominant source of uncertainty in their habitat-based density predictions and used this source to produce approximate estimates of variance for the density estimates.

Data >8 years old

9. Another issue is the use of 22 years of data in the CetMap model. NOAA Guidelines for Assessing Marine Mammal Stocks (NMFS 2005) consider abundance estimates to be outdated *if they are based on data more than 8 years old*. Even eight years can be too long if there is any indication that a population is growing or declining.
    a. To use 22 years of data, the CetMap analysis must assume that all Atlantic marine mammal stocks were stable over that time period. The best reason to use 22 years of data is that it increases the sample sizes. Unless there is some reason to believe otherwise, the assumption of stable populations is not necessarily an inappropriate one, though it is possible that some of the large whale species are increasing in numbers (e.g. the SAR for the Gulf of Maine stock of humpback whales indicates population is likely increasing—Waring et al. 2015). The fact that 22 years of data are used should be borne in mind when comparing exposure estimates based on these data to abundance estimates reported in SARs.
    b. NOAA's approach to stock assessment is generally to *use the most recent surveys* to evaluate abundance; for instance, 2011 AMAPPS survey data were recently used to update several of the Atlantic SARs. These abundances become a snapshot in time, and as noted for Longman's beaked whale above, can suffer large uncertainty due to lack of sightings of rare and cryptic species. SARs focus strongly on estimating potential biological removal (PBR). This is lethal rather than behavioral take, and thus the population level risks associated with it are more considerable. The abundance estimate in a SAR is used to evaluate minimum population abundance, which is the value of focus for PBR calculations.
    c. An underestimated abundance, which occurs in the SARs because of low sample sizes and limitations associated with estimating within the U.S. EEZ when stocks often occur outside of that zone, is a conservative value for use in estimating minimum population. This approach ensures meeting the statutory (MMPA) requirement that minimum abundance "provide reasonable assurance that the stock size is equal to or greater than the estimate".
    d. Overall, we do not consider an extended dataset a serious shortcoming of the CetMap analysis. However, we do think it merits consideration when NOAA makes decisions about what types of data and analyses it expects applicants to use with respect to the requirement that NOAA make a "small numbers" finding in order to permit take. CetMap density estimates are not directly mathematically tied to abundance estimates in the SARs. In theory, the

abundance of a stock should be the density multiplied by the area. The abundance that would be estimated this way using CetMap densities, in some cases, differs considerably from the SARs.

e. There is also the problem with extrapolating these densities outside the U.S. EEZ. We have done so for several species, but we have noted the problem of swaths of higher densities being extended outside of surveyed areas, which potentially inflates exposure estimates. Possibly, CetMap habitat-prediction approaches would be more appropriately applied outside of the U.S. EEZ in areas where no surveys have occurred, as there are truly no data to support density estimates in these areas.

Stock boundaries & extrapolations beyond U.S. EEZ

10. As mentioned above, stock boundaries can extend beyond the U.S. EEZ. Seismic surveys also extend beyond this region. This is a problem no matter what approach one uses to evaluate densities and exposures. Some of the stocks under consideration have large concentrations of their populations in Canadian waters. Duke included some Canadian waters in its models, though it is unclear how much survey trackline actually occurred in Canada as the northern surveys included in CetMap were all conducted by NOAA, and so likely focused on U.S. waters. It appears from looking at aerial and shipboard effort maps provided by Duke, that only aerial effort occurred in Canadian waters, and that effort was limited to 0.01-1.00 km/km^2, as opposed to effort as high as 20.36 km/km^2 in some U.S. areas. It is our understanding that Duke is working to get data from the Canadian Trans-North Atlantic Surveys conducted in 2007. This will likely improve density estimation across the whole species range for many of the cetaceans being considered.

Alternative approaches to use of CetMap

To help reduce the assumptions associated with CetMap in estimating exposures of animals to a transient sound source passing through a large area over the course of a year, we have used simplified analyses for rare and cryptic species rather than using the CetMap model. Because the MMPA requires that NOAA issue Incidental Harassment Authorizations based on an estimated number of takes, it is not possible to use an approach like that provided under the Endangered Species Act in which extent of take can be evaluated rather than specific numbers. As such, it is necessary to make a numerical estimate even though the data do not support statistically robust evaluation for some species/stocks.

Based on the issues described in #1-10, we suggest that species for which there are very few sightings should be considered in the context of whether they are rare or cryptic. A cryptic species is likely to have few sightings despite large effort because it is hard to see. A rare species is likely to have few sightings despite large effort because it is not typically there.

Regarding Duke's question about the "magnified error" problem: As you continue to assign point estimates of density to more grid areas, each of which has a large uncertainty surrounding it and a low probability of being accurate (a worse problem for small sample sizes than large), *you compound the error associated with the estimates*.

An example: the density estimates suggest 0.5 individuals will be "taken" while passing through each grid square. For two grid squares, the probability that you will take that number in each square is 0.01%. This makes the probability that you will take 1 individual across two grid squares 0.0001%. This causes your estimate to be considerably less accurate the more grid squares your project includes, and when probability is small to being with, the final probability becomes extremely small, making your outcome very unrealistic.

TGS's proposed survey covers a large area of the Mid- and South Atlantic. Thus, based on the above, making any errors in CetMap (which will affect the probability of outcomes in a predictive model), becomes an even greater issue than if the project were localized in one grid square. We think it is important for NOAA to consider this compounded error in its decisions regarding when CetMap should and should not be applied to exposure estimation. *There is no model that should be applied as a one-size-fits-all solution to estimating exposures*. Each scenario must be considered as an individual project and the validity of assumptions and the effects of uncertainty and probability on the outcome of a model must be taken into account.

For rare species, it is possible that sightings are a result of an unusual occurrence of the species in the area, an extra-limital or out-of-habitat individual or group, or a very small number of the population frequenting the area. In the case of ≤4 sightings in the proposed seismic survey area over 22 years and 490,000 km of surveys, the probability of encountering such a species within the 160 dB (rms) received sound level radius *is extremely low.* The likelihood of exposures is even further reduced when mitigation is considered. CetMap may spread some of these species into the Mid- and South Atlantic region as part of habitat-predictions. However, we suggest that NOAA consider the fact that adding parameters to a model when the data to define those parameters are low quality *will not necessarily result in improved predictions*. In fact, this potentially increases the uncertainty in the model outcome.

Duke has not provided any CVs for its density estimates in CetMap in the pre-publication version; however, it is likely that many densities reported for species with ≤4 sightings have very large CVs and a 95% CI that overlaps zero, which would suggest the potential for negative numbers of the species to occur (which is of course nonsensical). Truly, these species are not expected to be encountered. Thus, NOAA could consider zero take for these species. With so few data, Duke should consider not estimating densities for these species in the Mid- and South Atlantic region at all, similar to choices made by other modelers like Becker et al. (2010) who chose to model only 10 species to maximize sample size and provide a range of known habitat preferences, group size dynamics, and presence in the area. Making estimates in CetMap assumes a level of knowledge of these species numbers and occurrence patterns unsupported by the data.

Use of one mean group size for species seen <4 times in 22 years

We followed NOAA's approach applied in previous IHAs for academic seismic in the Atlantic. In cases data were insufficient to make density estimates, NOAA has permitted take of species by using mean group size as the estimated take for those species (e.g. 79 FR 57512). The Marine Mammal Commission recommended that NOAA use mean group size for species with so few sightings that densities were not evaluated in the U.S. Navy's OPAREA Density Estimates (NODE) model (79 FR 57512). NOAA followed this recommendation using mean group sizes from CeTAP (1982) and AMAPPS (2010-2014) surveys (79 FR 57512). The latter is what we did in our analysis for extremely rare species in the Mid- and South Atlantic. Although CetMap provides estimates for species that have never or very rarely been observed in the Mid- and South Atlantic, these point estimates cannot be considered accurate given so few data in the model. Consequently, they should not be used in analyzing exposure estimates for seismic surveys in the Mid- and South Atlantic region. Mean group sizes of these very rare species most likely overestimate the take, particularly when mitigation is considered as well. In 80 FR 27635, issued in May 2015, NOAA states regarding take estimation of species for which density was not estimated in NODEs due to lack of sightings:

> "NMFS assumed that Lamont-Doherty could potentially encounter one group of each species during the seismic survey. NMFS believes it is reasonable to use the average (mean) groups size (weighted by effort and rounded up) to estimate the take from these potential encounters. Because we believe it is unlikely, we do not think it is necessary to assume that Lamont-Doherty would encounter the largest group size."

Responses to Duke's Discussion of "Method 3" (mean group size)

To directly address Duke's comments on what they refer to as our "Method 3":

1. Duke misstates that our "Method 3" assumes that exactly one group of each of the rarely sighted species will be exposed. Actually, we expect that none will be exposed. Thus, we estimate one mean group size (in keeping with NOAA's authorizations to LDEO) to address the very small possibility of encountering one group of each of these extremely rare species. This is not an assumption of exposure. Rather, it is a conservative estimate when no exposure is expected. It is not an "arbitrary" decision. We based it on prior IHAs issued by NOAA for seismic in the Atlantic.
2. We have already discussed above why Duke's suggestion that some species being common north of the proposed seismic study area does not constitute a reason to assume they are common enough for modeling in the Mid- and South Atlantic. These species have been observed in surveys included in CetMap models ≤4 times, and in some cases, zero times. When there are zero sightings of a species in the Mid- and South Atlantic during 490,000 km of surveys over all seasons of the year, *the density estimate should likely be zero in this region*. It should be noted that Palka (2012) did not attempt to estimate abundance of species seen ≤4 times in AMAPPS 2011 surveys. These 2011 surveys were used to update SARs for the Atlantic and so represent the latest approach to abundance estimation for the species in the region.
3. We respectfully disagree with Duke that we did not raise "compelling arguments vis-à-vis Buckland et al.'s (2001) recommendation for 60-80 sightings..." As stated above, it is unreasonable to assume that in an area as large as the U.S. Atlantic EEZ, with over 1,000,000 km of survey coverage (North, Mid- and South) over 22 years, that Buckland et al. (2001) was implying that ≤60 sightings was an acceptable sample size. Duke is assuming that these species are present in larger densities than indicated by their sample size during surveys. Duke is also using sample sizes lower than those suggested or supported by other habitat-prediction models for cetaceans (e.g. Becker et al. 2010, Forney et al 2012).
4. Furthermore, Duke is incorporating predictions of species occurrence where there may be suitable habitat and spreading occurrence across large areas of ocean using detection factors from proxy species. This approach is not likely to provide accurate estimates of density patterns. In reality, the lack of sightings suggests these animals do not normally occur in the Mid- and South Atlantic. Those seen there may

represent extralimital sightings or unusual movements into the area due to an uncommon environmental event.

5. Generally, scientists consider probability in determining what predictions we will act upon. We acknowledge that if the probability is 0.00001%, that it is not zero. However, our understanding is that NOAA is tasked with determining what it believes to be the *actual amount of take that is likely to occur*, not the worst case scenario of take.
    a. In the recent case of Conservation Council for Hawaii et al. and Natural Resources Defense Council, Inc. et al. vs NMFS et al., in the Amended Order filed 31 March 2015, the court points out a problem with authorizing take. The court states that exceeding anticipated take essentially renders moot the concept of evaluating negligible impacts associated with take, as the law requires an analysis of authorized rather than anticipated take. The court made a hyperbolic example as follows. NOAA anticipates one sperm whale take but would then authorize a hundred takes. The point of this part of the ruling was to support the concept that NOAA must evaluate negligible impacts based on authorized takes. Following this logic, we suggest that this ruling also supports the idea that NOAA should begin to consider authorizing the takes it truly anticipates will occur, rather than worst-case scenarios.
    b. As NOAA examines small numbers and negligible impacts considerations associated with Atlantic seismic and its permitting, it would be appropriate to consider most probable scenarios, and consider these in the context of the actual risk posed to populations. *There is nothing arbitrary about choosing a mean group size to cover the potential risk of encountering a species that effectively does not occur in the region*. It could be argued that it is more arbitrary to assign a point estimate of density and use that to evaluate exposure without consideration of the large uncertainty that must be associated with such a density estimate given such small sample size and the model assumptions.

Responses to Duke's Discussion of "Method 2" (line-transect analysis)

With respect to Duke's critique of the approach ("Method 2") we took to model exposures for species with >4 sightings but <50 sightings used for CetMap models, we took an approach that simplified the modeling of density and removed the assumptions regarding habitat preferences.

1. It is extremely difficult to significantly correlate environmental parameters with species occurrence and distribution when so few observations of these species have occurred in the Mid- and South Atlantic region. As mentioned above, other efforts to use predictive habitat mapping to estimate expected occurrence and density of Pacific cetaceans have met with some success and some failure when models are ground-truthed. Overall, these models have consistently performed better when there were higher sample sizes available for creating and testing models (e.g. Becker et al 2010; Forney et al. 2012).
2. Buckland et al.'s (2001) recommendation of 60-80 samples is not an unreasonable one. Duke's contention that because this is a suggestion, it is reasonable to use considerably lower sample sizes to evaluate densities across 10 X 10 km grid squares in an area approximately 857,558 km^2, *is not supported*. Further, the point is to estimate actual expected exposures, not highly inflated, conservative exposures with low probability of occurrence. Note that Buckland et al.'s recommendation on 60-80 sightings as a minimum sample size is really geared towards estimating a value for the detection function. Buckland et al. (2001)'s work has shown that using much

smaller sample sizes than they recommended can lead to inaccurate detection functions, which leads in turn to highly skewed estimates of density and abundance. The rule does not apply as much for group size and sighting rate considerations, which are not modeled, but empirically estimated.

3. Including Duke's assumptions about habitat and spreading of animals across the entire U.S. Atlantic EEZ (though Duke does have "zero" densities in a few locations), does not improve the exposure estimate. Instead, it adds a conservative increase to the estimate in addition to other conservative assumptions, such as no mitigation and 160 dB (rms) received levels resulting in "take" (change in behavior *pattern*) in every case.
4. Our alternative model includes some of the assumptions of Duke's model. If we are going to estimate densities, distance sampling is the best approach we know of to make such estimates given survey data. We fully acknowledge that sample size is lower than it should be to make such estimates with this technique. However, we are unable to address uncertainty in our estimates without the raw data from the surveys to draw upon. Despite this, *our model removes error associated with assumptions about habitat and limits the analysis to just the 160 dB (rms) received level zone around the seismic source, rather than attempting to extrapolate to the entire U.S. Atlantic EEZ.*
5. We also do not have to consider whether density is patchy within the 160 dB (rms) zone. This is because the vessel is moving through this area at approximately the same rate through the year. Thus, an average density will account for exposures in areas of high and low density as the vessel moves. Our alternative model is still likely to overestimate exposures because it assumes the vessel has no shut-downs and is not engaging in any mitigation actions, with the exception of avoiding right whale seasonal closure areas. It also assumes that all cetaceans within the 160 dB (rms) received level zone are "taken." This is unlikely to be the case given the definition of Level B harassment, which focuses on disrupting behavioral *patterns*, such as migration and feeding, which may not always be disrupted. Our model also assumes animals are static in space and not moving away from the vessel as the 160 dB (rms) zone approaches the animals.
6. Our analysis also considered the newest data on Atlantic cetacean populations, the AMAPPS (2010-2014) surveys, which are not included in CetMap.

Overall, our approach ***includes the best available and most current science*** with a simplified model that ***continues to produce a conservative estimate*** of cetacean exposures. In the case that two models would produce overestimates of exposure, it would be most appropriate for NOAA to use the lesser of the two overestimates under the concept that the lesser value is more representative of actual take, though still conservative.

To specifically address Duke's comments on what they refer to as our "Method 2"

1. We agree with Duke's comment that we neglected to use $g(0)$ to correct for bias. We initially included the same $g(0)$ values used in CetMap in our estimates and accidentally missed this in our final iteration of the calculations. We appreciate Duke bringing this to our attention, and we are happy to correct TGS's estimates accordingly.
2. We also are willing to look for additional data in the literature upon which to base the Effective Strip Widths (ESWs) we use. If Duke has reasonable ESW values for these species for vessel and aerial platforms respectively based on additional information

from publications and report authors, we are willing to evaluate specific ESW suggestions to improve our model outcome. If NOAA could share its ESW calculations from Palka (2012), that also would be helpful.

3. With respect to not accounting for habitat, that was purposeful. It is interesting that Duke uses *Kogia* spp. as an example of how it used habitat in its modeling given that this species complex is one that is most likely to have improved model outcomes based on use of AMAPPS data, which are not included in CetMap models.
    a. Only 19 sightings of *Kogia* spp. were included in CetMap, while 67 additional sightings occurred during AMAPPS (2010-2014). If CetMap included the AMAPPS data, this is a species complex that would have been included in our CetMap analysis rather than our alternative analysis, based on sample size.
    b. We understand that it is likely that cetacean distribution will be patchy in space. However, we suggest that trying to evaluate habitat parameters associated with species distribution in the Mid- and South Atlantic is not statistically robust if sample sizes are very small.
    c. Considering habitat preferences results in overfitting of the data to the model in these instances, at least with respect to the model we are using for exposure estimation. By modeling the average density across the area of the 160 dB (rms) received level zone, we account for patchiness in that it is not really important *where* more *Kogia* spp. or other species are encountered as much as it is important *how many* will be encountered. The average accounts for a combination of high and low densities across the area.
    d. Incorporating AMAPPS surveys into our analysis also increases the survey effort by 70,120 km. NOAA based many of its SAR updates, including *Kogia* spp., on 2011 survey effort, which included 13,599 km of aerial surveys on the shelf and 5,013 km of vessel trackline offshore. Palka (2012) indicates that traditional distance sampling methods were used. This means that if NOAA were to compare SAR abundance estimates with exposure estimates, it might be more appropriate to avoid habitat-based models for exposure estimation. The SAR for *Kogia* spp. mentions that abundance is likely 2-4 times higher than reported. Palka (2012) does suggest that future analyses could incorporate habitat methods *in order to conduct trend analyses* over years. However, at this point, we would argue that the sample sizes for some species are not sufficient in the CetMap model to attribute habitat preferences in a statistically robust way.
4. We explained above why minke whales, sei whales, and harbor porpoises were treated under our alternative approach. There were very few sightings of these species in the TGS proposed survey area, despite a large survey effort, and these are not cryptic species (based on high sighting rates in the North Atlantic). Harbor porpoise were not seen at all in the TGS proposed survey area in the CetMap dataset. However, because they were observed during AMAPPS (2010-2014) surveys, we included them in our alternative analysis rather than estimating one group size of this species.
    a. We disagree that there is a likelihood of any major shifting of the density of these three species into the Mid- and South Atlantic on a seasonal basis. Surveys have been conducted in all seasons. The survey effort in the Mid- and South Atlantic was similar to that in the North Atlantic, so there is no reason to believe there are considerably more individuals of these species present in the Mid- and South Atlantic than the surveys suggest. Additional AMAPPS surveys (2010-2014) continue to support the lack of these species in the Mid- and South Atlantic.
    b. We do not suggest that there is no occurrence of these species, *we have just simplified the model to account for the fact that we do not know much about*

habitat preferences for these species in the Mid- and South Atlantic region. Acoustic recordings support the periodic occurrence of minke whales in the Mid-Atlantic. For example Debich et al (2014) reported they recorded minke whale calls with a HARP recorder (Wiggins and Hildebrand 2007) off the Cherry Point Navy OPAREA near North Carolina in winter of 2011, though none were recorded in 2012. However, it is difficult to determine how far whales actually are from a hydrophone, and site-specific characteristics can considerably affect the propagation of sounds (Helble et al 2013). Further, number of whales recorded is unknown. *Our alternative analysis did not discount the occurrence of less common or cryptic species, it focuses on reducing the problem of overfitting the data with respect to both the density modeling and the exposure estimation*.

5. Duke suggests that averaging the aerial- and vessel-based density estimates is problematic because the two platforms generally covered different areas, with most aerial surveys on the shelf and most vessel surveys offshore. As the TGS proposed surveys occur both on the shelf and offshore, this should not unduly influence the overall exposure estimate which relies on an average density, accounting for higher densities and lower densities in different areas (see map of TGS proposed survey area in the IHA application). The purpose of the TGS IHA analysis is to model exposures within the 160 dB (rms) received level zone, not to model fine-scale accurate densities across different ocean regions. Including *g*(0) in our estimates will reduce the influence of different platforms on the outcome, as *g*(0) for vessel surveys differs from *g*(0) for aerial surveys.
    a. Palka (2012) included both aerial and vessel surveys in her analyses of cetacean abundance based on AMAPPS 2011 data, without indicating that data were removed if the species was thought to possibly not occur in an area. It would bias large-scale abundance and density estimates upward to ignore areas where the species may be less common. Further, part of the reason we did not use CetMap densities for uncommon species is because environmental parameters that may correlate to their distribution in the Mid- and South Atlantic are not well understood. For example, if most surveys on the shelf are aerial surveys, and *Kogia* spp. are less likely to be seen in aerial surveys, the lack of sightings in that region may be due to sampling technique rather than a predominantly offshore distribution.
    b. It would be possible to split the TGS survey area into shelf vs offshore trackline distances, but as we have mentioned before, **creating more complicated models does not necessarily improve model outcomes when sample size is low and understanding of model parameters is low**.
    c. There are a variety of assumptions associated with our exposure estimates that cause them to be overestimates, which helps to offset some of the uncertainty associated with density modeling regardless of what model is employed.
6. Duke mentions that minke whales have been recorded by acoustic recorders in the Mid- and South Atlantic region. As we mentioned, Helble et al (2013) points out the difficulty in using acoustical recordings (without an array for triangulation) in localizing whales. The radius of detection is hard to determine and is dependent on a variety of environmental parameters that can change regularly in a region (Helble et al 2013). This makes it difficult to incorporate acoustical recordings into a

meaningful estimation of where any cetacean may be when recorded and does not provide much information about numbers or density. However, with respect to minke whales, *we have not suggested that there are no minke whales* in the Mid- and South Atlantic. We have suggested that there are few data with which to make good density estimates. Thus, it is unlikely that incorporating additional parameters into density modeling is necessarily helpful with respect to exposure estimation in this case. Surveys have occurred in all seasons in the Mid- and South Atlantic, so there is no need to make assumptions regarding distribution of minke whales in the region—the few sightings are not for lack of effort (if sighting conditions were good for a significant portion of the effort). Ten additional groups of minke whales were observed during AMAPPS 2010-2014 in spring and winter, which are considered in our estimates but not in CetMap (which considers only 19 sightings in the Mid- and South Atlantic region). *A general density that pools sightings through the year is reasonable to use for exposure estimates in our case because the seismic vessel will be traveling through the Mid- and South Atlantic region through the entire year, with no particular location of the vessel being more likely than another during a given season.*

Duke finishes its critique of our line-transect density estimation method by comparing it to the values they estimated. Assuming that Duke's estimates are correct and we are somehow striving to match them is not accurate. We would expect our density estimates to differ because we are

1. Using an additional four years and 70,120 km of trackline from the AMAPPS 2010-2014 surveys in our analyses.
2. Not making assumptions about occurrence in habitats where animals have never or rarely been observed.
3. Not using proxy species to evaluate detection functions.
4. Not trying to spread densities across the entire U.S. Atlantic EEZ.
5. Not extrapolating densities in the Mid- and South Atlantic from data collected in the North Atlantic

Both CetMap and our alternative method of density estimation for purposes of exposure estimation lack incorporation of uncertainty and probability. This is a shortcoming that is difficult to overcome without the raw data from all the surveys. Duke has the raw data for the surveys it used in CetMap, so uncertainty could be reported for the densities in each grid square. *Abundance estimates by NOAA do not incorporate the complicated modeling scheme used by CetMap.* Thus, comparing exposure estimates to abundance data is easier when habitat-based prediction models are not used to evaluate densities that are included in exposure models.

We did follow Duke's approach in using multiple years of data rather than a single year (or a few years) as is typical of SAR abundance estimates. In cases in which there are few data (as exemplified by the Longman's beaked whale example above), both abundance and density estimates can be easily influenced by just a few more or less sightings. *This suggests that none of the current methods are likely to produce a high quality, accurate density or abundance estimate.* As we noted before, our exposure model uses conservative assumptions that overestimate the exposure expected. Therefore, if our density estimates were biased low (which there is no reason to believe is more likely that that they are correct or biased high), the conservative nature of the exposure estimation process should help offset the uncertainty in the densities in terms of meeting the letter and spirit of MMPA. For example, effectively, the requirement of shut-down when a marine mammal comes within the 180 dB (rms) radius around the vessel means that exposures estimated between the ship and the 180 dB (rms) radius could be subtracted from the exposures estimated between the ship and the 160 dB (rms) radius, but we have not done so.

Best estimate rather than worst case scenario -- model limitations

We would put forward the following if NOAA wanted to make a best estimate of exposures rather than a worst case scenario estimate of exposures, which is predicated on point estimates of density. NOAA might consider including a range of densities based on the uncertainty in the point estimates to evaluate a range of potential exposures and use a Bayesian framework of likelihood analysis to evaluate the most probable outcome. The acceptable level of probability would most likely vary depending on the context of risk. For example, how likely is the activity to actually affect population parameters like fecundity? How vulnerable is the species or population being considered? At what scale is the activity taking place?

At the end of the day, as George E. Box said, "all models are wrong, but some are useful." Duke's CetMap model is useful for a variety of questions, such as examining the probability that one site may be less disturbing than another for building a structure or determining the most likely area to encounter a rare species for a directed study. It also allows for some ground-truthing of habitat-prediction modeling similar to that conducted on the west coast and Pacific Islands Region, for which some predictions were good and others were not.

We commend Duke for consolidating survey datasets and creating density estimates that can serve a variety of purposes. *We contend that take estimation over a large area for a very short-term Level B disturbance is better suited to less assumptions rather than more for uncommonly observed species.* The risk associated with such a transient disturbance is far less than that associated with activities like lethal interactions with fisheries, long-term decadal sonar activities, and heavy consistent shipping traffic.

Further, it seems arbitrary and capricious for NOAA to require that exposure estimation be conducted using any one particular model/approach. *As long as the model put forward by the applicant meets the requirements of law and is based on the best available science (which ours is and includes more recent science than Duke's), it should be acceptable*. There is no reason to require or expect all models to have identical outcomes in a situation in which so much uncertainty and variation exists. Even when CetMap eventually includes AMAPPS and Trans-Canadian survey data, though it will be improved, it should not be required. This is because it is important to consider the assumptions of a model and whether those assumptions are appropriate to any particular "take" estimation process.

Responses to Duke's Discussion of "Method 1"

With respect to what Duke refers to as our "Method 1," we chose to use CetMap density estimates in our exposure estimation model in cases in which sample sizes were at least the 60-80 recommended by Buckland et al (2001). We do have some reservations about the use of habitat-prediction modeling in exposure estimation in general given the potential to overestimate density in localized areas within the proposed survey area. CetMap's lack of information regarding uncertainty in the estimates is also troubling. We have listed the various concerns with CetMap modeling for use in exposure estimation at the beginning of this letter.

To directly address Duke's comments on what they refer to as our "Method 1"

1. Duke raises concerns that our method does not account for seasonality. Our method *does* account for seasonality by using monthly densities as reported by Duke when available. We average the *exposure estimates* across all seasons, *not the densities*. Because the vessel is moving at a relatively constant rate through space and time over the course of a year, it makes sense to average together the exposure estimates. Each monthly estimate represents the exposures expected in that particular month based on the densities during that month in the proposed survey area. The exception to this is right whales, because there is mitigation associated with seasons for that species.
2. Duke is correct in its statement that it would be logistically difficult to predict weather or other operational issues that would affect which parts of the trackline will be covered in which season of the year. We disagree that NMFS should require the application to specify what months of the year different portions of trackline will be surveyed. Again, we have not averaged the densities across months, we have averaged the exposure estimates. Thus, varying densities throughout the year are considered. It does not make sense to use the maximum exposure estimates rather than the average because that assumes we are conducting our study over one month instead of a year and assumes a different month for each species. Exposure estimates are already conservative in their assumptions (see above for description of these assumptions). Consequently, it is unnecessary to include an additional conservative assumption if evaluating expected exposures is the goal. There is no support for the contention that exposures are underestimated in our approach. The survey is expected to operate for most of the 365 days included in the authorization request, so this is not a case of one month of actual surveys being allowed under a one year authorization; we expect to operate for most of the year, with most weather related stoppages likely to occur in winter, when the species Duke mentions, humpback whales, are most rather than least dense in the proposed survey area.
3. Duke disagrees with our limiting the exposure estimates for right whales to the mean of the estimates associated with May-October.
    a. The fact that CetMap habitat-prediction models were developed independently of Seasonal Management Areas (SMAs) should not negate the value of observing seasonal management areas. NOAA went through a full public process and used the best available science to develop the SMAs.
    b. CetMap, on the other hand, has not been fully vetted by NOAA (as far as we know, NOAA does not have access to more information than we do regarding CetMap) nor has it been published in a peer-reviewed journal.
    c. NOAA has not approved any change to SMAs on the basis of CetMap predictions. NOAA used a wide variety of studies to evaluate right whale hot spots and seasonality in the Atlantic in the course of finalizing seasonal management areas (e.g. 73 FR 60173).
    d. NOAA reviewed the available sighting data in response to comments on the proposed rulemaking and made some modifications to the SMA boundaries to make sure they best reflected what is known about right whale distribution (73 FR 60173).
    e. If there are new data to suggest that right whale SMAs should be altered, NOAA may choose to review those data through its regulatory and public processes. As we have explained above, we do not necessarily think that predictive modeling of where a species *could* occur is tantamount to showing where it *does* occur. In the case of the Mid- and South Atlantic coasts, there were ample surveys upon which for NOAA to base SMAs. Duke effectively has stated that NOAA's SMAs are no longer valid and that IHA applicants should

assume that Duke's map replaces these SMAs with more appropriate areas to avoid.

f. We would expect that NOAA would want to go through the appropriate process for making any changes to SMAs, evaluating the full suite of available science and not just Duke's density predictions. Working under the concept that NOAA is correct in its assessment that the current SMAs reduce ship strike because they are areas in which most right whales occur during certain times of year, then that assumption should hold true for estimating potential sound exposure similar to estimates of potential ship strike.
g. *We do not assume a zero exposure estimate or even a single group size estimate for right whales*; we use CetMap densities provided for the months during which the SMAs are not in effect. If we were to use all months of CetMap densities, without considering the SMAs as suggested by Duke, we would significantly overestimate the potential exposures because we would expect that most right whales will be within the SMA regions during the SMA closure seasons, and these regions will be avoided at those times. It renders moot the mitigation of avoiding SMAs if the permit provides for take as if they were not avoided.
h. If NOAA wants to permit the number of takes necessary for entering SMAs, the applicant might as well conduct surveys within SMAs. This is counter to the spirit of MMPA, ESA, and the SMAs, for which we are trying to minimize impacts to marine mammals while still conducting human activities in the ocean.
i. TGS would prefer to have appropriate mitigations in place and allow NOAA to consider those mitigations as part of permitting and as part of its findings with respect to permitting. NOAA cannot readily consider the value of mitigation if it is ignored in the permitting process. It is already being ignored in the exposure estimates associated with the 180 dB (rms) exclusion zone.
j. Theoretically, the exposures estimated to occur within a 180dB (rms) received sound level exclusion zone should be subtracted from the total estimates within a 160 dB (rms) received sound level disturbance zone to account for the implementation of shut downs in the 180 dB zone. In TGS' published proposal, this was not done, so along with other conservative assumptions, this inflates the exposure estimates, including those for right whales.
k. We note that despite considering NOAA's SMAs inappropriate because they are not mathematically tied to CetMap, Duke suggests comparing exposure estimates with "stock abundance," which we assume means SAR abundances; these are not tied mathematically to CetMap either.

Final Comments

Finally, we should point out that Duke is incorrect in stating that we used the same analysis for considering Level A exposures that could occur without mitigation as we used for analyzing potential exposures associated with species for which few sightings were used in CetMap. As described in the IHA application, we used the values provided in the BOEM PEIS (BOEM 2014) with respect to the *Southall approach* to Level A take estimation. We adjusted these exposure estimates based on the proportion of trackline distance TGS proposes to cover (compared to the BOEM PEIS [BOEM 2014]). Regardless of this approach, we do not expect to have any Level A take because of mitigation, including a shut-down radius based on 180dB (rms) received sound levels, which is a lower level than is likely to induce PTS based on NOAA's recent Draft Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (NOAA 2015), which reports PTS onset threshold levels ranging from 202 to 230 dB_{peak} for cetaceans experiencing impulsive sounds (80 FR 45642). Duke is correct in its assessment that this is a modeling exercise and not a take request for Level A takes.

In summary, we would like to encourage NOAA to continue to allow applicants to apply the most appropriate models and analyses to their particular projects, which differ in scope, equipment, mitigation plans, and other areas that necessitate differences in analyses of exposure. There is no one-size-fits-all approach to modeling exposure estimates. We thus suggest that mandating the use of any particular organization's models in acoustic modeling, density modeling, or exposure modeling would limit applicants in their ability to use models that have the most appropriate assumptions and data requirements for their projects. The "best available science" is, in part, the science most applicable and appropriate to the question being asked. CetMap is a valuable tool in the toolbox, but it is neither the only nor always the most appropriate tool to use. We have enumerated some of the assumptions and data deficiencies of CetMap to illustrate where this model may result in quite a bit of uncertainty in its outputs. Lack of sightings is not due to lack of effort in the Mid- and South Atlantic region. Thus, we suggest that the effort that has been conducted can be directly applied to assess potential exposure without added assumptions associated with environmental parameters. We also suggest that extremely rare species in the region are truly rare, based on hundreds of thousands of km of trackline and other documentation. There is no reason to believe that because suitable habitat exists in the Mid- and South Atlantic that such rarely observed species, particularly when they are not cryptic species, would be present in high enough numbers to estimate more than one very unlikely encounter with a group.

We appreciate Duke pointing out typos in our Tables and will make necessary corrections.

We look forward to more communication with NOAA regarding TGS' application.

Best Regards,

Mari & Sarah

Mari Smultea, M.Sc.
President/Chief Scientist
PO Box 256, Preston, WA 98050
mari@smulteasciences.com
www.smulteasciences.com

Sarah Courbis, Ph.D.
Principle Scientist
Sarah.courbis@smulteasciences.com
www.smulteasciences.com

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Duke | NICHOLAS SCHOOL OF THE ENVIRONMENT

August 27, 2015

Jolie Harrison
Chief, Permits and Conservation Division
Office of Protected Resources
National Marine Fisheries Service (NMFS)
1315 East-West Highway
Silver Spring, MD 20910

RE: Applications for Incidental Take Authorizations for geophysical surveys in the Atlantic Ocean, submitted by Spectrum Geo Inc., TGS-NOPEC Geophysical Company, ION GeoVentures, and TDI-Brooks International, Inc.

Dear Ms. Harrison,

As you know, we at the Duke University Marine Geospatial Ecology Lab have developed a comprehensive set of cetacean density models for the U.S. Atlantic and Gulf of Mexico. These models provide the best density estimates presently available for 28 cetacean taxa that inhabit waters off the U.S. east coast. We made these results available to your office in January 2015 for use in evaluating impacts of proposed activities on cetacean stocks, and have been providing them to applicants for Incidental Take / Incidental Harassment Authorizations since that time, on request by your office.

We are writing in response to NMFS' July 23, 2015 request for comments on four applications for Incidental Take Authorizations or Incidental Harassment Authorizations for geophysical surveys in the Atlantic. In short, we urge that: 1) the three applications that did not utilize our density estimates to estimate marine mammal takes be revised to utilize our density estimates, 2) the fourth application that did utilize our density estimates be revised to correct important technical problems affecting some of its marine mammal take estimates, and 3) you consider the aggregate impact to marine mammal populations resulting from all of these spatiotemporally-overlapping surveys together when deciding to whether to issue authorizations for any of them.

The remainder of this letter is organized into ~~four~~ five sections:

1. Background information about our density models relevant to our comments on the four applications

2. Specific comments on the ION GeoVentures, Spectrum Geo Inc., and TDI-Brooks International, Inc. applications

3. Specific comments on the TGS-NOPEC Geophysical Company application

4. NMFS should require geophysical survey applications to use the same logic when determining whether animal avoidance reactions and mitigation measures require them to request Level A takes

5. NMFS should consider the aggregate impact of overlapping geophysical surveys before deciding to approve any individual survey

Background information about our density models

(Much of the text in this section is adapted from our manuscript, which we are about to submit to a scientific journal for publication.)

Cetaceans are highly-mobile apex predators that respond dynamically to their environment. To evaluate the potential effects of proposed activities on cetacean populations, interested parties require a detailed understanding of the spatiotemporal distributions of these populations. To estimate the abundance of cetacean species in U.S. waters and work out how they are distributed geographically and seasonally, NMFS and other U.S. government organizations have conducted visual line-transect surveys for over 35 years, yielding two parallel modeling efforts. One effort, prompted by the national regulatory framework, applied distance sampling methodology (Buckland et al., 2001) to estimate the abundance of cetacean species within large geographic strata, e.g. (Barlow and Forney, 2007; Fulling et al., 2003; Mullin and Fulling, 2004; Palka, 2012). The other, driven by a desire to describe cetacean habitats at a fine spatiotemporal scale, developed regression models that related the presence of cetacean species to environmental correlates such as sea surface temperature and then predicted the models across the seascape using gridded maps of the correlates, yielding fine-scale maps of habitat suitability, e.g. (Best et al., 2012; Hamazaki, 2002; Waring et al., 2001).

Neither effort has proved entirely satisfactory for managing cetacean populations in the U.S. The regulatory framework requires an estimate of the number of affected individual animals in proposals for actions that could harm or disturb cetaceans. The broad-scale abundance studies, utilized in NMFS Marine Mammal Stock Assessment Reports (SARs), estimated the number of individuals present in large geographic areas but these so-called “stratified models” assumed they were distributed homogeneously within the modeled areas, failing to account for cetaceans’ patchy distributions. In contrast, the habitat suitability studies modeled spatial variability at fine resolutions, but produced estimates that used relative or unit-less scales (e.g. ranging from 0 to 1) that cannot directly be used to estimate counts of affected individuals.

The last decade has seen a unification of these two approaches into a two-stage method known as density surface modeling (Hedley and Buckland, 2004; Miller et al., 2013; Thomas et al., 2010), in which traditional distance sampling is coupled with multivariate regression modeling to produce density maps, giving density as individuals km^{-2}, predicted from fine scale environmental predictors which can vary in space and time (Becker et al., 2014). A challenge with density surface models (DSMs) is that a large number of sightings are needed to fit the regression model. Cetaceans are rare; often many surveys must be aggregated to obtain sufficient sightings. For example, a study of beaked whales in the eastern tropical Pacific aggregated 6 years of surveys to obtain just 90 sightings of Cuvier's beaked whale and 106 of *Mesoplodon* beaked whales (Ferguson et al., 2005). This problem is exacerbated if the modeler desires to fit different models for different regions or seasons under the presumption that different behaviors occur in those places and times, e.g. that whales on summer feeding grounds exhibit different environmental preferences than those on winter calving grounds (Corkeron and Connor, 1999). Finally, some species may be so rare that they cannot be modeled with DSMs—there just aren't enough sightings to fit the regression model, even after many surveys are aggregated—and modelers must resort to traditional stratified models as the fallback alternative.

Pursuant to the need for a comprehensive set of seasonal cetacean density maps for the U.S. east coast and Gulf of Mexico, and to maximize the number of taxa modeled and account for regional and seasonal variability, we established collaborations with 5 institutions that collectively conducted nearly 1.1 million linear km of line-transect surveys for marine mammals in our area of interest, the U.S. waters of the western North Atlantic and Gulf of Mexico, spanning the years 1992-2014 (Fig. 1, Table 1).

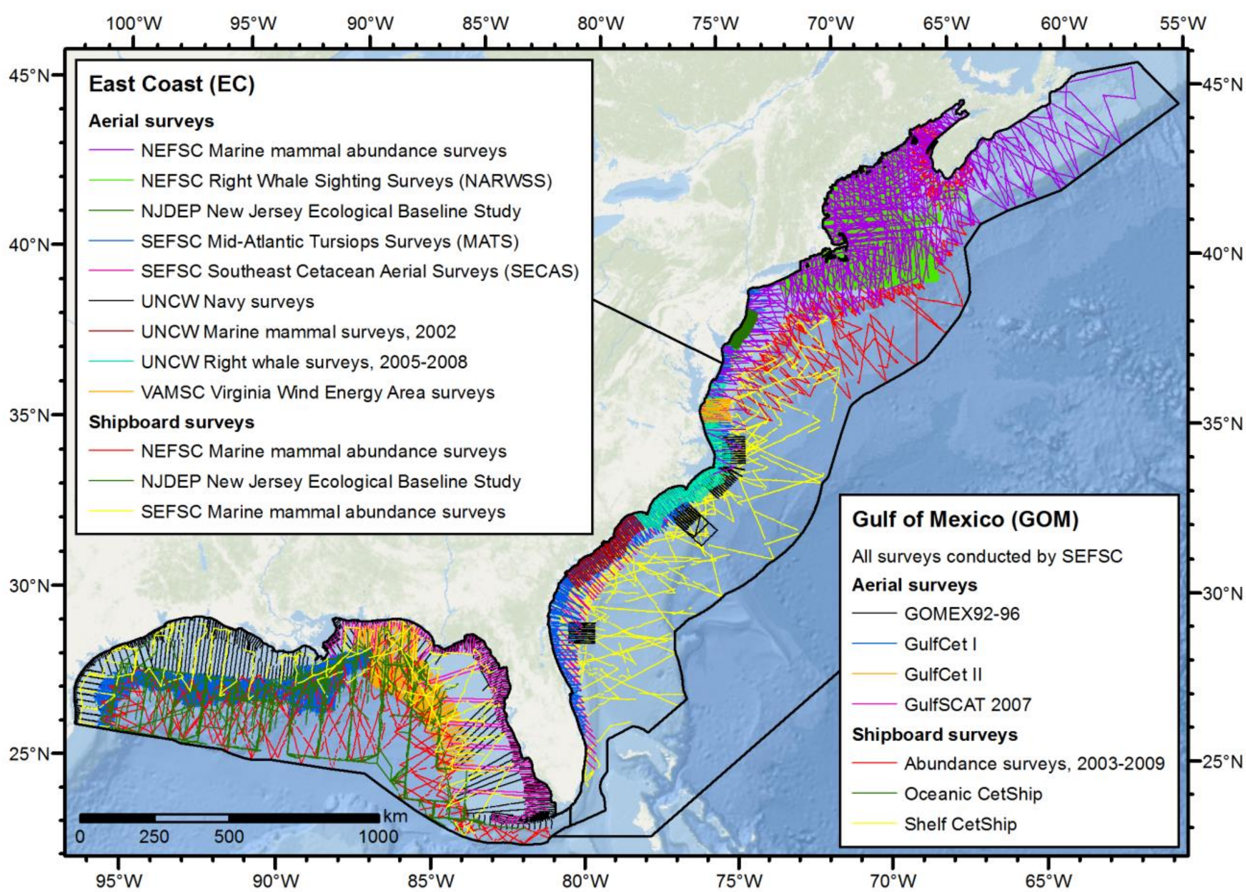

Fig 1. Analysis regions and line transect surveys used in our analysis. See Table 1 for more survey details.

Table 1. Line transect surveys used in our analysis

Region	Platform	Surveyor	Survey program	Years	Length (1000 km)	Hours
EC	Aerial	NEFSC	Marine mammal abundance surveys	1995-2008	70	412
			Right Whale Sighting Survey (NARWSS)	1999-2013	432	2330
			NARWSS harbor porpoise survey	1999	6	36
		NJDEP	New Jersey Ecological Baseline Study	2008-2009	11	60
		SEFSC	Mid-Atlantic Tursiops Surveys (MATS)	1995, 2004-5	35	196
			Southeast Cetacean Aerial Surveys (SECAS)	1992, 1995	8	42
		UNCW	Cape Hatteras Navy surveys	2011-2013	19	125
			Jacksonville Navy surveys	2009-2013	66	402
			Marine mammal surveys, 2002	2002	18	98
			Onslow Bay Navy surveys	2007-2011	49	282
			Right whale surveys, 2005-2008	2005-2008	114	586
		VAMSC	Virginia Wind Energy Area surveys	2012-2014	9	53
			Total:	1992-2014	837	4622
	Shipboard	NEFSC	Marine mammal abundance surveys	1995-2004	16	1143
		NJDEP	New Jersey Ecological Baseline Study	2008-2009	14	836
		SEFSC	Marine mammal abundance surveys	1992-2005	28	1731
			Total:	1992-2009	58	3710
GOM	Aerial	SEFSC	GOMEX92-96	1992-1996	27	152
			GulfCet I	1992-1994	50	257
			GulfCet II	1996-1998	22	124
			GulfSCAT 2007	2007	18	95
			Total:	1992-2007	117	628
	Shipboard	SEFSC	Oceanic CetShip	1992-2001	49	3102
			Shelf CetShip	1994-2001	10	707
			Marine mammal abundance surveys	2003-2009	19	1156
			Total:	1992-2009	78	4965

Length and hours are the cumulative linear distance and duration observers were on effort for each survey program. Surveyors: NOAA NMFS Northeast Fisheries Science Center (NEFSC), New Jersey Department of Environmental Protection (NJDEP), NOAA NMFS Southeast Fisheries Science Center (SEFSC), University of North Carolina at Wilmington (UNCW), Virginia Aquarium and Marine Science Center (VAMSC).

Key aspects of our methodology

(The following is not a complete description of our methodology. It has been abbreviated to key points that are relevant to our comments on the four geophysical survey applications.)

Detection functions: After preparing each taxon's sightings for modeling, we followed the two-stage density surface modeling approach described by Miller et al. (2013). In the first stage, we fitted detection functions that modeled the detectability of the taxon according to distance from the trackline and other observation-level covariates. Buckland et al. (2001) recommended that at least 60-80 sightings be used to fit a detection function. When this methodology has been applied to marine mammal surveys and sufficient sightings were not available to meet this requirement, a typical workaround has been to pool sightings from multiple surveys or species, then apply the fitted detection function to all of them, e.g. (Barlow and Forney, 2007; Becker et al., 2012; Mullin and Fulling, 2004, 2004; Palka, 2012, 2006). With this approach in mind, we arranged our surveys in two hierarchies—aerial and shipboard—that grouped them according to similarity of observation protocol and platform, and used the hierarchies to guide our pooling decisions. The hierarchies are fully documented in our manuscript and were reviewed by coauthors who were leaders of contributing survey programs. They also appear in taxon-specific supplementary reports that accompany our manuscript. These reports were previously provided to your office as well as to any permit applicants that you directed to contact us.

To ease the problem of obtaining sufficient sightings to fit detection functions for species that were rarely sighted from certain platform configurations (e.g. shipboard surveys that relied solely on naked-eye observations) we incorporated additional sightings from surveys conducted in the broader North Atlantic but outside of the U.S. Atlantic and Gulf of Mexico study area. These include the REMMOA (Mannocci et al., 2013) and NOAA surveys of the Caribbean (Swartz et al., 2001), the MAR-ECO survey of the mid-Atlantic ridge (Waring et al., 2008), and the SCANS II and CODA shipboard surveys of the European Atlantic (Hammond et al., 2013). We used these surveys only in fitting detection functions, and only for species that were rarely sighted in specific survey platform configurations; we did not use them in the spatial modeling stage of the analysis. We carefully reviewed survey protocols to ensure compatibility between the within-area and out-of-area surveys.

At each node of the detection hierarchies, we tallied the number of sightings of the modeled taxon reported by all surveys under that node. When a suitable number of sightings existed under a node—typically 70 or more, in accordance with Buckland et al.'s (2001) recommendation of 60-80—we fitted a detection function specific to those surveys. If too few were available, we ascended the hierarchy to the parent node and tried again. If we ascended very high in the hierarchy—typically to child nodes of the "all surveys" node at the top—without obtaining sufficient sightings, we pooled sightings of additional "proxy" species into that branch of the hierarchy and started over. For example, when modeling humpback whales, too few humpback sightings were obtained from shipboard surveys to fit humpback-specific detection functions, despite pooling many years of surveys. To compensate, we added sightings of other baleen whales as proxies for humpbacks. To select proxy species, we consulted the literature and species experts to identify species that displayed similar size, behaviors, and other characteristics that affect detectability. The taxon-specific reports previously provided to your office and to permit applicants on request specify, for each detection function, whether proxy species were used, which ones were used, and how many of each were sighted.

<u>Probability of detection along the trackline</u>: Concluding the first stage of the analysis, we split the survey transects into segments and predicted abundance for each segment. Distance sampling methodology assumes that the probability of detecting objects that lie along the trackline (i.e. at

distance 0) is 1. This is often called the "$g(0)=1$" assumption. Unfortunately this assumption often does not hold for cetacean surveys. Cetaceans dive; while submerged, they are unavailable to be detected at the surface. Cetaceans may also be difficult for observers to perceive, due to their size, coloration, or failure to display obvious visual cues (Kraus et al., 1983). These two problems are known as *availability bias* and *perception bias* respectively and result in an underestimation of abundance unless they are accounted for (Thomas et al., 2013). Historically, abundance estimates published by NOAA NEFSC have addressed these biases, e.g. (Palka, 2012, 2006, 2000), but those produced by NOAA SEFSC have not, e.g. (Mullin, 2007; Mullin et al., 2004; Mullin and Fulling, 2004, 2003).

A recommended solution is to utilize two independent observer teams and perform a mark-recapture distance sampling analysis (Burt et al., 2014). This approach was closed to us, as most of our surveys used a single observer team. Instead, we consulted the literature to obtain estimates of $g(0)$ that incorporated these biases and then, when applying the detection functions to estimate abundance for each survey segment (prior to spatial modeling), we scaled the estimated abundance with the inverse of $g(0)$ (Barlow and Forney, 2007). The taxon-specific reports previously provided to your office and to permit applicants on request document the $g(0)$ estimates we used.

<u>Delineation of seasonal and sub-regional strata</u>: Some cetacean species, particularly baleen whales, migrate between ecoregions as part of their reproductive cycle. Modeling the density of these species from environmental predictors can be problematic, as their environmental preferences may change between times of year—e.g. during summer, baleen whales might prefer cold, productive waters for feeding; during winter, they might prefer warm, calm waters far from predators for calving (Corkeron and Connor, 1999). To address this, we reviewed what was known of the life history of each taxon. If the literature suggested the taxon exhibits seasonality in which its relationship to the environment is expected to be different during different times of year, we split the year into taxon-specific seasons to be modeled with separate spatial models (fitting each seasonal model to the segments from that season), provided that we had sufficient survey coverage and sightings to model at least one of the seasons effectively, and that the spatial pattern in the sightings resembled the expectation described by the literature. We delineated seasons at month boundaries. If the literature offered no conclusive description of seasonality or we lacked the data to reproduce it, we modeled the taxon with a single "year-round" spatial model.

After investigating seasonality and, when appropriate, splitting the segments into seasonal strata, we reviewed what was known about the spatial ecology of the taxon during each season. When the known ecology of the taxon indicated that it either exhibited ecologically different behaviors in different parts of the study area (Fig. 2), was typically absent from an area (Fig. 3), or there was reason to believe a taxon was present but we lacked the survey data to confidently model its density (Fig. 2), we split the study area into sub-regional strata and modeled them separately. The taxon-specific supplementary reports previously provided to your office and to permit applicants on request document the seasonal and sub-regional strata we defined.

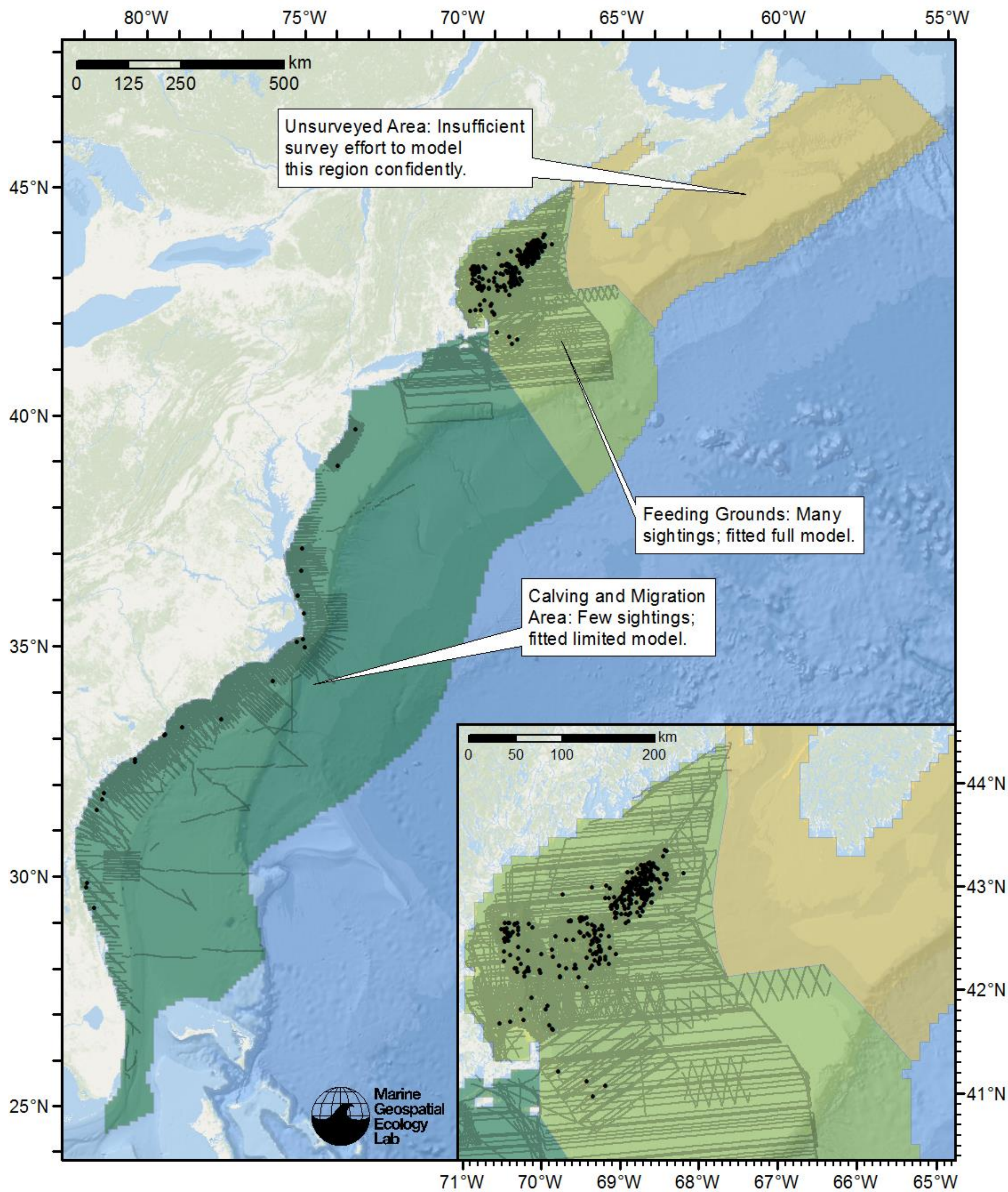

Fig. 2. Schematic for the North Atlantic right whale winter season (November-February) model, showing an example in which we split the study area on the basis of sub-units of the population likely exhibiting different relationships to the environment (right whales overwintering on the feeding grounds vs. those on the calving grounds). This model also shows an example of where we suspected a taxon was present—Canadian waters, in this case—but lacked the survey effort to model it confidently

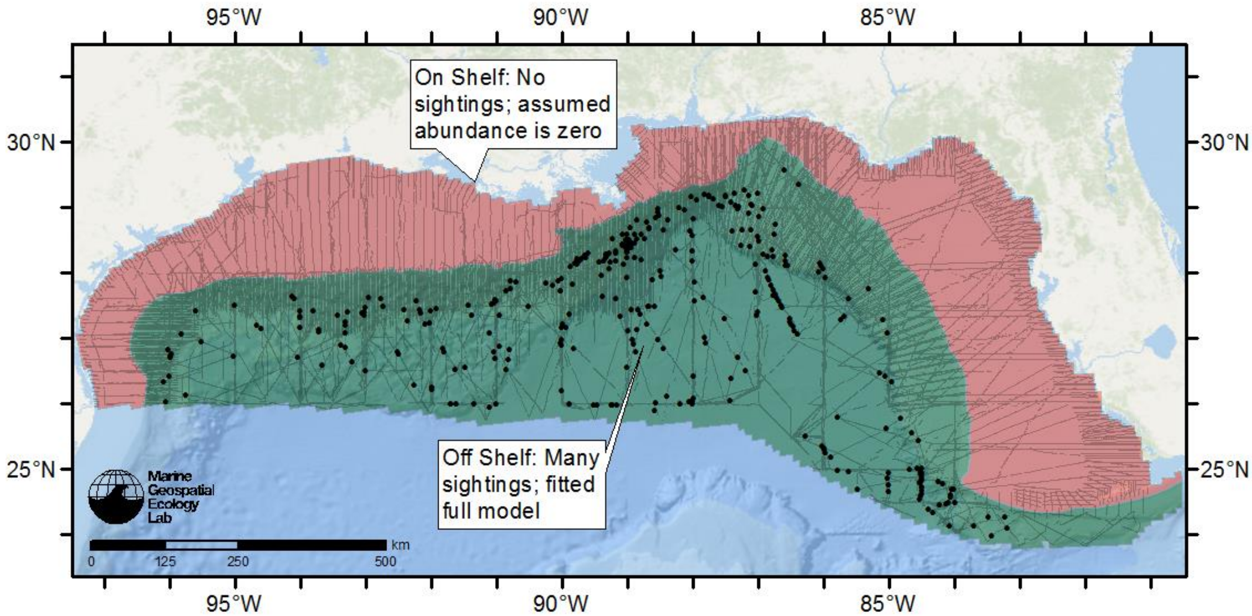

Fig. 3. Schematic for the Gulf of Mexico sperm whale year-round model, showing an example in which we split the study area on the basis of the taxon not occupying part of the area—the continental shelf, in this case. Although this example illustrates a model in the Gulf of Mexico, which is not the area of interest for the four geophysical surveys discussed in this letter, we handled similar situations that occurred in Atlantic waters the same way.

Spatial models: For each taxon, after splitting the data into seasonal and sub-regional strata we fitted GAMs using abundance on the segment as the response variable, surveyed area of the segment as the offset (calculated as $2wL$, where w is the right-truncation distance and L is the segment length), and—when sufficient sightings were available—environmental covariates believed to correlate with cetacean distributions. For strata having more than 40 sightings, we fitted multivariate models. For strata having 20-40 sightings, we fitted univariate models so as to be parsimonious and not risk overfitting the model. For some of these we tested many covariates and selected the one that explained the most deviance; for others, we selected a specific covariate based on the known ecology of the taxon. Finally, when less than 20 sightings were available, we fitted a model with no covariates, resulting in a traditional "stratified model" that assumed a uniform density along the surveyed tracklines.

In all cases, the result was a model that estimated density, that is, the number of individual animals per unit area. For models that utilized covariates, we tested many model formulations with different covariates and selected the best model according to accepted statistical best practices, accounting for the ecology of the taxon. (Our manuscript details this procedure, which we omit here for brevity.) For these models, density varied according to the covariates, which could vary spatially (for physiographic covariates such as ocean depth) or spatially and temporally (for dynamic covariates such as sea surface temperature). For models with no covariates—the traditional "stratified models"—density did not vary in space or time.

After completing the model for each taxon (or *models*, if the taxon was modeled using multiple seasonal or sub-regional strata) we predicted the model (or *models*) across the seascape using gridded images of the covariates (e.g. maps of depth, SST, and so on). When models incorporated dynamic covariates, we predicted them for the duration of the time series of images and averaged the results. Prospective model users, including NMFS, requested that predictions be summarized climatologically at a monthly time step—i.e., for each taxon, they wanted 12 density surfaces, one for each month, with each estimating the mean density of the taxon during that month, averaged over all years of the study. To confidently summarize the predictions at a monthly time step, we required: 1) evidence in the literature of the taxon shifting distribution seasonally, 2) sufficient survey coverage, both spatially and temporally, to detect the shift, and 3) a spatial pattern in the sightings and monthly-summarized predictions that resembled the expectation described by the literature. If all of these conditions were met, we produced monthly maps for model users. If any were not, we produced a single seasonal map that spanned all months of the season. (If a model only had one season—a so called year-round model—there was only a single, year-round map.)

When "stratified model" was fitted—a model that estimated constant density—we predicted it across the modeled season (which was often year-round) and sub-region and produced a single seasonal density surface that had the same uniform value at all locations. Note that this did not necessarily result in a uniform value across our entire study area. As described above, if our literature review suggested the taxon does not occupy the entire study area, we partitioned the data into sub-regions (and/or seasons, if there was a well-known temporal aspect to occupancy) and fitted and predicted the model just in that sub-region (and/or season) it occupied. For example, for *Kogia* whales, which are endemic to deep, offshore waters (Bloodworth and Odell, 2008) and were never sighted over the continental shelf by any survey in our study, we split the study area at the continental shelf break (Fig. 4). For the on-shelf stratum, we assumed Kogia density was zero. For the off-shelf stratum, we fitted a model that utilized no covariates, using just the survey segments conducted in that region, resulting in a uniform estimate of density that applied to the off-shelf region. (As a side note, for this taxon, there were sufficient sightings to attempt a univariate model, but when we tried it, no ~~predictor~~ covariate was selected as being statistically significant, so we reverted to model with no covariates.)

In the Atlantic region, we modeled 28 taxa. Of these, we fitted DSMs for 15 and stratified models for 13. Of the 15 modeled with DSMs, we predicted 11 at monthly and 4 at year-round temporal resolution.

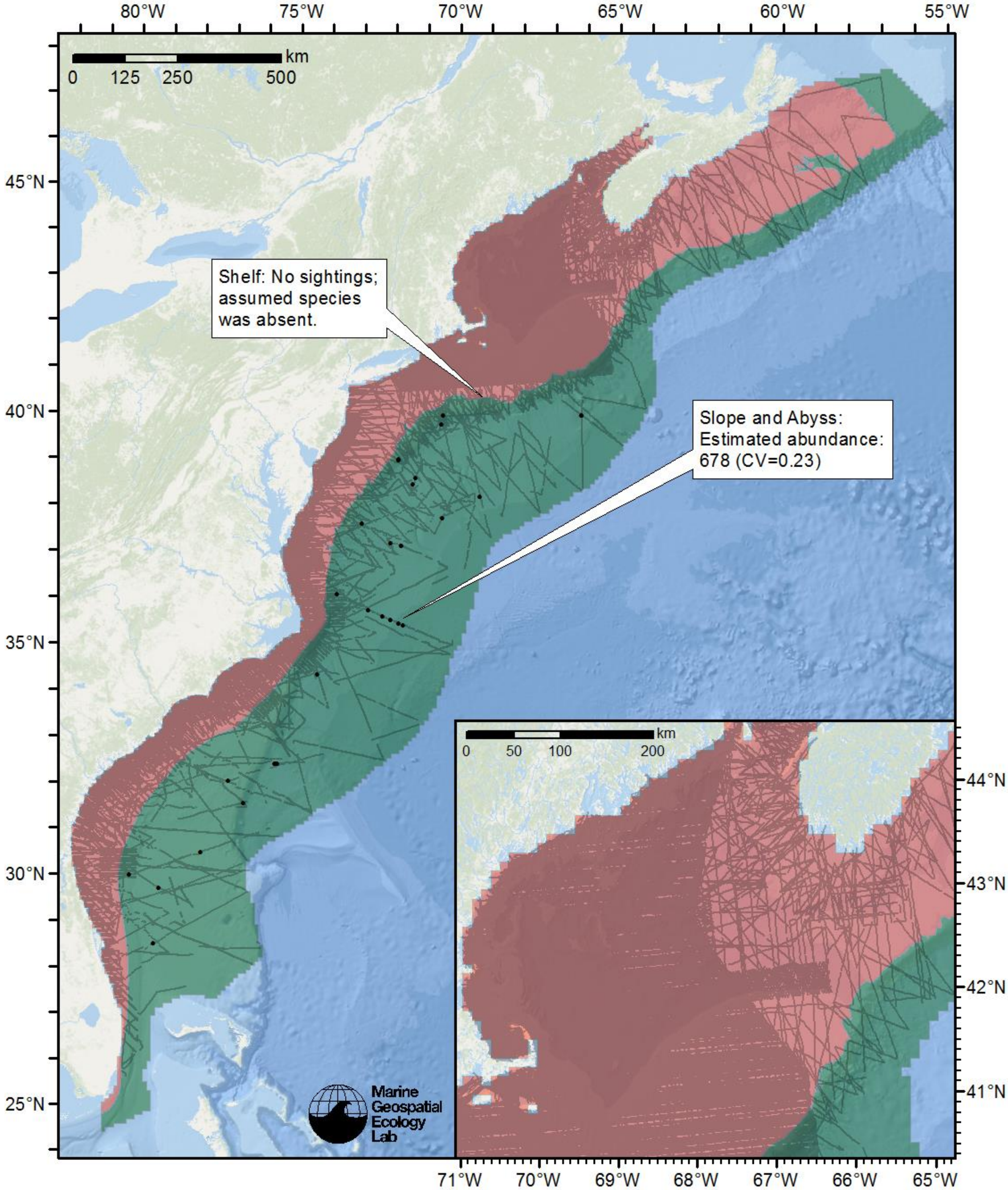

Fig. 4. Schematic for the *Kogia* whales model, showing an example in which we split the study area into a region that was occupied (the "Slope and Abyss") and a region that was not (the "Shelf"), and fitted a model having no covariates to the occupied area. In this example, the density of the "Shelf" region was 0. The density of the "Slope and Abyss" region was 0.000941 individuals km^{-2}. This figure shows the abundance of the sub-region instead.

Application of our models to estimation of cetacean takes

Our models are suitable for use in any problem that requires cetacean density as input, including estimation of takes due to anthropogenic noise or other phenomena. The models were explicitly designed to provide the best possible estimates of density (individuals km^{-2}) at the highest possible taxonomic, spatial, and temporal resolutions, accounting for detectability differences between survey platforms and protocols, species availability and perception biases, spatial and temporal variability in species distributions, and the quantity of available sightings data. As such, they offer the best density estimates presently available for the U.S. Atlantic and Gulf of Mexico for the taxa we modeled.

It is important to note that our modeling strategy was explicitly designed to scale the spatial, temporal, and taxonomical resolution of models according to how frequently taxa were sighted, how easy they were to identify, and what was known of their ecology. At one extreme—species that were frequently sighted, easy for observers to distinguish, and well known in the literature, such as the more common baleen whales—our strategy fitted species-specific DSMs with seasonal and sub-regional strata, allowing seasonal and regional differences in species-environment relationships to be modeled explicitly. When data and knowledge concurred, we made predictions at monthly resolution, to reproduce temporal shifts in density as species migrate. At the other extreme—species that were rarely sighted, hard to identify, and poorly known, such as *Kogia* in the Atlantic—our procedure reverted to traditional stratified models and modeled multiple species together as a guild, reflecting the relative scarcity of information. Where reasonable, we substituted data from other regions to compensate, e.g. by drawing upon sightings from external surveys to improve fits of detection functions, or utilizing g(0) estimates from external studies when none were available from studies in our region. For the middle ground—species that were sighted at modest rates and moderately well known, such as many of the oceanic odontocetes—our procedure fitted single-season DSMs and provided static, year-round predictions, reflecting a modest confidence in what was known of these species' distributions. This scaling of methodology to available data and knowledge made our modeling strategy adaptable to the diversity of cetacean species that inhabit U.S Atlantic and Gulf of Mexico.

Finally we note that prior to finalizing our models, we conducted reviews with experts in density modeling methodology, statistics, cetacean biology, acoustic monitoring of cetaceans in our focal region, and with scientists who lead many of the surveys utilized in our analysis, some of whom are coauthors on our manuscript.

Differences between our models and the Navy NODEs models

In the mid-2000s, the Navy funded the development of density models for the U.S. Atlantic and Gulf of Mexico (Department of the Navy, 2007a, 2007b, 2007c). Commonly referred to as the "NODEs" models, these were first utilized in the preparation of an Environmental Impact Statement for the Navy's Atlantic Fleet Training and Test (AFTT) area, and then in other management processes, including by the U.S. Bureau of Ocean Energy Management (BOEM) in its preparation of the Atlantic Geological and Geophysical (G&G) Activities Programmatic Environmental Impact Statement (PEIS), finalized in 2014.

Our models improve upon NODEs in a number of ways. NODEs only utilized survey data collected by NMFS on broad-scale abundance studies; our multi-institution collaboration incorporated data from three other organizations that surveyed the region and from the NOAA North Atlantic Right Whale Sighting Survey (NARWSS), a regional-scale but very intensive survey, with coverage of all seasons for many years. Several additional groups contributed of sightings data from external regions, used to improve detection functions for taxa that were rarely sighted in specific survey platform configurations. In total, we incorporated 60% more shipboard and 500% more aerial survey hours than NODEs (Table 2). The NODEs surveys spanned the period 1992-2005; the surveys utilized in our models spanned 1992-2014. We 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 (omitted here for brevity).

Table 2. Comparison of the results of this analysis to the U.S. Navy NODE studies

		Survey effort (h)		Taxa with predictions that were:			
Study	Study area	Aerial	Shipboard	Seasonal or monthly	Year-round (DSMs)	Year-round (stratified)	Unmodeled taxa
This analysis	East coast	4622	3710	11	4	13	0
DoN 2007b	East coast north	177	0	1	5	10	5
DoN 2007c	East coast south	159	2352	5	6	7	11
This analysis	Gulf of Mexico	628	4965	0	16	3	0
DoN 2007	Gulf of Mexico	532	3096	4	6	8	0

Thanks to the increased amount of survey data available and a modeling strategy that scaled according to the available data, our project yielded an improvement over NODEs in the number of taxa modeled and the spatiotemporal resolutions of the resulting predictions. For the east coast, we 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. We modeled 15 taxa with DSMs; NODEs modeled 6-11, depending on the region. Finally, we 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).

In the Gulf of Mexico (of less interest for the four applications under consideration here) we produced 16 DSMs and 3 stratified models, while the NODE study there produced 10 DSMs and

8 stratified models. The NODE study did produce seasonal DSMs for 4 taxa while we produced none. Our research suggested that none of the species there were reported to undertake large seasonal movements, and we lacked sufficient survey coverage during different parts of the year to detect more subtle movements. Our philosophy in this situation was to fit year-round DSMs. In contrast, the philosophy of the NODE studies was to fit separate seasonal models whenever sufficient data were available.

Of the many improvements we made relative to NODEs, we call particular attention to our controlling for availability and perception bias. The NODEs studies did not control for these biases in most of their models and thereby underestimated density for most species. Cetacean take estimates based on NODEs density estimates will underestimate takes for all species; the degree of underestimation will be particularly acute for species that exhibit long dive times—such as sperm and beaked whales—or are hard for observers to detect—such as harbor porpoises.

In summary, our models provide numerous improvements over NODEs—in quantity and contemporaneity of data, in methodology, and in spatial and temporal resolution of the results. At this time, the NODEs models should be considered obsolete and no longer be used. Finally, we are in the process of submitting a manuscript for peer review; once this publication process is complete, our models will have been subjected to a higher degree of formal scientific review than the NODEs, which were gray literature reports not subjected to independent peer review.

The Atlantic Marine Assessment Program for Protected Species (AMAPPS) surveys

During the period 2010-2014, NMFS NEFSC and SEFSC, with funding from BOEM and the Navy, conducted a series of joint aerial and shipboard surveys known as the Atlantic Marine Assessment Program for Protected Species (AMAPPS) surveys. It is important to note that while our project includes data from the period of 2010-2014 from several survey providers, it does not include the AMAPPS surveys. Our models were developed in 2013-2014, and we stood ready during this period to incorporate AMAPPS surveys as soon as they became available. NOAA first began to provide them in February 2015, after our models were finalized and delivered to your office. As of the date of this letter, we have received approximately two-thirds of the AMAPPS surveys conducted to date. We have begun the process of integrating these into our modeling workflow and plan to release updated models that utilize these data, as well as updates from other providers in our collaboration, as soon as possible. Please contact us if you have any questions.

Specific comments on the ION GeoVentures, Spectrum Geo Inc., and TDI-Brooks International, Inc. applications

ION GeoVentures

This project proposes to survey most of BOEM's Mid-Atlantic and South Atlantic planning areas, from Delaware to Florida using towed airguns. Characteristics that distinguish it from the two other surveys that would use airguns include: it proposes fewer tracklines, resulting in less surveying, in terms of total linear distance surveyed, and it would occur in summer and fall, rather than spanning an entire year. This would likely result in impacts to a different spread of taxa than the full-year airgun surveys. For example, the density models that we were able to predict at monthly resolution suggest that the overall abundance of many species is higher in the summer, which might result in relatively more takes; on the other hand, many baleen whale species are concentrated north of Delaware at this time, which might result in relatively fewer takes of these species.

The ION GeoVentures application provides extensive detail on acoustic propagation and exposure modeling that was performed to estimate cetacean takes. This level of detail is commendable, however we are not experts in the technical details of these models and therefore cannot evaluate the quality of this part of their analysis, and confine our comments to the cetacean density data that were used. We believe it is vital, however, that NMFS subject the application to independent review by experts in acoustic propagation and exposure modeling and the effects of these exposures on cetaceans, to double-check the modeling that was done.

The take estimates in this application were based on the Navy NODEs density models. As we discussed above, the NODEs models are obsolete and underestimate cetacean density. The cetacean take estimates should therefore be redone using our density model results. This application should be declined at this time and returned to the applicant for revision.

Spectrum Geo Inc.

This project proposes to survey BOEM's Mid-Atlantic and South Atlantic planning areas, from Delaware to Florida, from the 30 m isobath out to roughly the edge of the U.S. Exclusive Economic Zone, using towed airguns. Surveying would occur over an entire year, conducted 24 hours per day, 7 days per week.

As with the ION GeoVentures application, the Spectrum Geo Inc. application provides extensive detail on acoustic propagation and exposure modeling that was performed to estimate cetacean takes. As above, this is commendable, but we lack the expertise to review it thoroughly; we thus confine our comments to the density data that were used, but urge independent review by experts in acoustic propagation and exposure modeling and the effects of these exposures on cetaceans.

As with ION GeoVentures, the Spectrum Geo Inc. take estimates were based on the Navy NODEs density models. As we discussed above, the NODEs models are obsolete and underestimate cetacean density. The cetacean take estimates should therefore be redone using our density model results. This application should be declined at this time and returned to the applicant for revision.

TDI-Brooks International, Inc.

This project differs from the other four in that it proposes to utilize sonars (a multibeam echosounder and a sub-bottom profiler) rather than airguns. It apparently would survey mainly off-shelf waters, offshore of Florida through southern North Carolina. The application describes relatively dense survey line spacing at 2.25 km to 4.5 km and refers to a shapefile that might contain the proposed tracklines, but this was not provided by NMFS for us to examine and the document contains no drawing of the tracklines.

We believe this application is problematic in two critical ways:

1. It does not clearly specify which cetacean density data it relied on, describing the data as "density estimates provided by the NMFS stock assessment of the north Atlantic for 2013 and the model results of the OBIS-SERDP". We surmise this was the Navy NODEs density models. As we discussed above, the NODEs models are obsolete and underestimate cetacean density. The cetacean take estimates should therefore be redone using our density model results.

2. This application provided very little information on the method for estimating cetacean takes. Section 6 consisted of three paragraphs followed by a table of take estimates, versus many pages of detail in the other three applications. This application did not provide a diagram of the tracklines, nor specify the proposed dates of the survey. This is too little information to evaluate the methodology. The application should be amended to provide additional information that describes the details of all steps of the process.

This application should be declined at this time and returned to the applicant for revision.

Specific comments on the TGS-NOPEC Geophysical Company application

This project proposes to survey BOEM's Mid-Atlantic and South Atlantic planning areas and beyond using towed airguns. The surveyed area would extend from Delaware to Florida, from roughly 25 km from shore to 100 km or more beyond the outer limits of BOEM's planning areas. Surveying would occur over an entire year, conducted 24 hours per day, 7 days per week.

The application provides complete detail about the cetacean density estimates that were used—this level of detail is good—but relatively less detail about acoustic exposure modeling than the ION GeoVentures or Spectrum Geo Inc. applications. We presume this relates to TGS-NOPEC's decision to utilize exposure models from the BOEM PEIS, which we presume is documented thoroughly by BOEM. In any case, as with the other applications, we are not experts in the technical details of acoustic exposure analysis and cannot evaluate the quality of this part of the TGS-NOPEC application. We thus confine our comments to the cetacean density estimates that were used, while urging NMGS to undertake independent review of the exposure analysis by experts in the appropriate fields.

Of the four applications under review, this was the only one that used our density estimates in its take analysis. For certain taxa, however, it estimated takes using one of two alternative methods, depending on the taxon.

The three methods for take estimation

Method 1: Exposure modeling using our density estimates: The first method utilized our density surfaces, applying the algorithm described in Appendix C and pp. 58-62 of the application. This method was used to estimate Level B exposures for 10 taxa, listed on p. 58 and again in Table C 4 (p. 187). These were: humpback whale, Atlantic spotted dolphin, bottlenose dolphin, pilot whales, Risso's dolphin, short-beaked common dolphin, sperm whale, striped dolphin, beaked whales, and North Atlantic right whale. These taxa were sighted relatively frequently on the U.S. east coast. From what we could understand from the application, TGS-NOPEC applied this method to taxa that were sighted ~~roughly~~ 60 times or more in the proposed geophysical survey area by the surveys used in our analysis. For taxa sighted less than 60 times in the proposed geophysical survey area by the surveys used in our analysis, TGS-NOPEC used either of their two alternative methods. We critique the reasoning they offered for this decision, as well as the details of their application of all three methods further below, after briefly describing the two other methods.

It appears that this method was also used to estimate "potential Level A exposures" for all taxa; results appear in Table C 3 (pp. 185-6) but this table is not referenced anywhere in the text of the application, and the application declines to request Level A takes, asserting that animal avoidance behavior and mitigation measures make Level A takes unlikely. Therefore it appears that Table C 3 represents ancillary results from a modeling exercise, but not a take request.

Method 2: Exposure modeling using densities estimated by TGS-NOPEC: TGS-NOPEC applied this method to species that were sighted less frequently than those above. Specifically, it appears the criterion might have been 5-59 sightings in an aggregation of:

- All of the sightings reported in the proposed geophysical survey area by a subset of the surveys used in our analysis (listed on p. 68 of the application), plus:
- All of the sightings reported by 2010-2014 AMAPPS surveys that occurred in the southeast U.S., not explicitly bounded by the proposed geophysical survey area, but roughly coincident with it

These species are enumerated in Tables 6-1 through 6-4 of the application. They were: Clymene dolphin, harbor porpoise, Kogia whales, pantropical spotted dolphin, rough-toothed dolphin, minke whale, and fin whale.

In this method, TGS-NOPEC performed their own density analysis using the methodology described on p. 65 of the application. We believe this analysis suffered from several important errors or deficiencies, as discussed in detail below.

<u>Method 3: Assumption that exactly 1 group would be exposed during the geophysical survey</u>: TGS-NOPEC applied this method to the least-frequently sighted species, specifically those that were sighted 0-4 times by the surveys used in our analysis. These were: sei whale, blue whale, pygmy killer whale, northern bottlenose whale, Fraser's dolphin, killer whale, melon-headed whale, false killer whale, spinner dolphin, Bryde's whale, and Atlantic white-sided dolphin.

In this method TGS-NOPEC assumed that exactly one group of each taxon would be exposed during the year-long geophysical survey, and estimated a mean group size for the taxon from a series of surveys (Table C 5, pp. 188-190) to obtain the number of individuals exposed. We agree that most but not all of these taxa are likely to be encountered only rarely in the proposed geophysical survey area, but do not necessarily agree with what was done; see below.

We now turn to discussing each of the three methods TGS-NOPEC employed in more detail.

Discussion of Method 1: Exposure modeling using our density estimates

In general, we find the details Method 1, described in pp. 58-62 and Appendix C, to be satisfactory, except as follows.

<u>Seasonality</u>: The approach used does not account for seasonality. Instead, it assumes 1/12 of every location of the map will be surveyed every month for 12 months. For species for which we produced monthly density estimates, takes are estimated for each month and then averaged together (Table C 4). We surmise this was done to allow flexibility in how the survey will eventually be performed—by not listing the date that each portion of the trackline will be surveyed, TGS-NOPEC would obtain the flexibility to defer this decision until later, allowing constraints such as costs, weather, and other operational issues to ultimately dictate when portions of the trackline are surveyed.

While we sympathize with the desire for this flexibility, this method of estimating takes is not realistic. Tracklines will be surveyed on specific days of the year. Sound exposure will not be distributed uniformly in time, with 1/12 of it occurring every month of the year. Takes could be substantially higher—or lower—depending on when or where surveying actually occurs. For example, if areas of the shelf north of Cape Hatteras end up being surveyed in January, where humpback whales are known to overwinter, many more humpback whales will be exposed vs. if this area were surveyed in August, when most humpbacks are in feeding grounds farther north. The variability in the monthly exposure estimates in Table C 4 reflect this.

NMFS should require the application to specify what months of the year different portions of the trackline will be surveyed. We realize this imposes a substantial burden on the applicant. Most likely, they would prefer that cost and operational issues not related to MMPA compliance dictate survey planning and operations. We sympathize. If it is too burdensome to specify this level of detail in their application, then they should request takes using the highest monthly exposure estimate in Table C 4, rather than the average, as a precautionary measure, given their uncertainty about when they will conduct survey operations. That will ensure that takes are not underestimated.

North Atlantic right whales: TGS-NOPEC treats right whales differently than the other species for which we provided monthly density estimates. Rather than estimating takes for every month of the year, they only estimate takes for the May-October period, when right whales are largely absent from the southeast, and assume takes during November-April will be equal to the average of the May-October period (i.e., 12; see Table 6-5 and Table C 4). In defense of this assumption, they note that they will ensure that survey operations do not result in any ≥160 dB ensonification of seasonal right whale closure areas, as described in section 11.2 (pp. 116-117).

This assumption, that by excluding surveys from the seasonal closure areas the takes during the November-April period will be equal to the average number of takes during the May-October period when surveys are not excluded from the closure areas, makes no sense. At best, this argument would be paraphrased "by staying out of the closure areas, right whale takes will be close to zero."

This argument is not correct, as would be revealed if TGS-NOPEC had produced estimates for the November-April period using the methodology used for the May-October period. The right whale seasonal closure areas and our density models were developed completely independently. It is not the case that right whales remain completely inside the closure areas. Our models predict right whales outside these areas during the closure periods. These results are corroborated by many sightings that occur outside them, as may be viewed by navigating to the NOAA NEFSC Interactive North Atlantic Right Whale Sightings Map (http://www.nefsc.noaa.gov/psb/surveys/) and selecting a winter month. For example, in January, there are multiple sightings near the shelf break. These visual sightings are corroborated by acoustic monitoring. For example, Norris et al. (2014) reported acoustic detections of right whales at the shelf break off Jacksonville, Florida in all four months they monitored: September, November, and December of 2009, and January of 2010. (In passing, we ironically note that some of the authors of that acoustic monitoring study are listed as authors of the TGS-NOPEC application.)

The take analysis for North Atlantic right whales must be redone, applying the same methodology to the November-April period as was applied to the May-October period. We strongly suspect this will result in higher estimated take of right whales. If the resulting estimate proves too high, TGS-NOPEC can avoid the problem by basing their seasonal exclusions not on the extant seasonal right whale closure areas, but on larger areas that avoid locations of high density. This might mean, for example, restricting surveying to areas off the continental shelf in winter months, but we could not say for sure without undertaking the analysis that they must perform.

Discussion of Method 2: Exposure modeling using densities estimated by TGS-NOPEC

TGS-NOPEC's use of this method is highly problematic on multiple levels:

1. The argument for employing this method rather than using our estimates is based on a misunderstanding of what we did and of recommendations made by Buckland et al. (2001).

2. This method, which TGS-NOPEC's application terms Line Transect Theory, is the same as what we called a "stratified model" in our own methodology exposition above. In our exposition, we described how our modeling strategy was explicitly designed to scale according to data availability, utilizing traditional stratified models line-transect models to produce spatially-uniform density estimates when few sightings are available. Why would they produce their own density estimates instead of using ours, unless they identified problems in what we did? They did not raise any compelling arguments that our methodology was flawed.

3. In fact, their own approach contains several important flaws which will lead to inaccurate density estimates that are in many cases too low. The resulting underestimates of ~~abundance~~ density lead to an underestimate of takes.

It is possible that they came to use this approach because they did not fully understand what we had done. Indeed, earlier this year our methodology was not yet documented in a written form that was suitable for external release. If this lack of information was what led them to attempt their own density estimates, we apologize for not having documentation ready at the time. Still, we stood ready to answer any questions and indeed did field some from some of the individuals involved in preparing this application.

In any case, the take estimates developed using Method 2 must be redone. Unless TGS-NOPEC can marshall a compelling argument against using our density estimates, which were developed with a methodology explicitly designed to address sparse data situations, they should produce new take estimates using Method 1 (i.e. they should utilize our density estimates and apply the algorithm described in Appendix C and pp. 58-62 of the application).

We now elaborate on the objections we raised above.

<u>There is no compelling argument raised for employing the TGS-NOPEC method instead of using our density estimates</u>:

One argument put forth for discarding our estimates concerns Buckland et al.'s (2001) recommendation that 60-80 sightings be used. This is raised, for example, in the first paragraph of p. 63 of the application:

> "For line transect analysis, Buckland et al. (2001) recommends at least 60-80 sightings to fit a detection function and provide a moderately robust estimate of density. Detection functions were used by Roberts et al. (2015) in CetMap in density modeling. Some species had ≥4 sightings but did not have the recommended 60-80 sightings, despite 462,000 km of aerial trackline and 28,000 km of shipboard trackline in the general area of the proposed TGS seismic survey (Roberts et al 2015). Although Roberts et al. (2015) chose to use proxy species (other similar species for which there were more sightings) to evaluate the detection function for rarely sighted species, the fact that these species were seen so rarely during so much observation effort suggests that they are not common in the survey area, which includes the proposed seismic survey area."

While we recall seeing this recommendation from Buckland et al. (2001) mentioned occasionally over the years, it is important to bear in mind that it is just a "rule of thumb" and that Buckland et al. (2001) provide no theoretical proof for it. In fact, they say:

> "Sample size n should generally be at least 60-80, although for some purposes, as few as 40 might be accurate. Formulae are available to determine the sample size that one expects to achieve a given level of precision (measured, for example, by the coefficient of variation). A pilot study is valuable in predicting sample sizes required, and will usually show that a sample as small as 40 objects for an entire study is unlikely to achieve the desired precision. Often sample sizes of several hundred are required for effective management." (Buckland et al. 2001, pp. 14-15).

Indeed, in a simulation study Miller and Thomas (2015) provide an example where a detection function fitted to 30 sightings of resulted in a detection function with low bias. On the other hand, Buckland et al.~~'.s~~ (2001) noted that often "several hundred" are required for "effective management", yet line-transect abundance estimates from many NOAA Stock Assessment Reports are based on many fewer sightings; see, for example, stock assessments based on Palka (2012).

The point is, Buckland et al.'s recommendation is just that—a recommendation, not a hard-and-fast theoretical rule—and there are many cases where it has been violated. As an ironic example, many of the density estimates produced by TGS-NOPEC (Table 6-4, Step 2) relied on detection functions from Mullin and Fulling (2003) that used far fewer than 60 sightings. Table 6-3 of TGS-NOPEC's application references Table 2 of Mullin and Fulling (2003). TGS-NOPEC's ~~The~~ "Vessel ESW" from Table 6-3 for the three dolphin taxa comes from Mullin and Fulling's detection function that utilized 20 sightings; TGS-NOPEC's ~~the~~ "Vessel ESW" for the two baleen whale taxa comes from Mullin and Fulling's detection function that utilized 38 sightings. Thus TGS-NOPEC methodology, as implemented, did not meet the 60-80 criterion that they used when arguing that our results should not be used. (Furthermore, our detection functions are much more robust than those TGS-NOPEC took from Mullin and Fulling (2003), making our density results more robust than TGS-NOPEC's (and Mullin and Fulling's), as we discuss further below).

A second argument put forth for discarding our estimates comes in the middle paragraph of p. 63:

> "In the case that a localized activity were being permitted, it may be appropriate to consider such uncommon species and potentially use the densities provided by CetMap to include an exposure estimate in a permit application. Spreading these species across areas where they are never or rarely seen keeps applicants mindful of the possibility that an encounter with these species may occur in those areas. *However, for large-scale vessel-based projects, when the probability of encountering the species is extremely low in each grid square considered, the probability of encountering them in all grid squares becomes the product of those probabilities, which will be approaching zero. As such, assuming the species is in all grid squares for modeling magnifies the error associated with the assumption that these species occur continuously throughout large areas of the EEZ where they are rarely or never seen.* In order to address this, we have used the fact that density estimates are ultimately based on surveys which act in the same manner as a seismic survey, following prescribed tracklines. Therefore, we can use the information available about how many of a species was seen across a given length of trackline and use an effective strip width (ESW) to evaluate the expected number of animals within the ESW transect area and extrapolate that to the 160 db (rms) ensonification zone." (Italics added.)

The crux of this argument is the two italicized sentences (we added the italics). We do not understand what is said here. It is true that the probability of several independent events all occurring is equal to all of the individual probabilities multiplied together. And if those individual probabilities are low, the probability of all of them occurring could approach zero. But we fail to see what bearing that has on density or exposure estimation. We do not understand the discussion about how error is magnified.

We suspect the document is bringing up a problem with their exposure model—that it somehow cannot accept very low density estimates, and they need to switch to a different method for estimating exposure. If that is the case, it does not invalidate our method for estimating density using a traditional stratified line-transect model, or explain why they need to use their method for estimating density instead of ours.

In summary, we see no compelling argument why our density estimates warrant replacement with theirs, and as we will show momentarily, our estimates are more likely to be accurate. Therefore, if NMFS accepts theirs in place of ours, the application must be revised to include a compelling rationale.

The TGS-NOPEC application raises these same critiques of our models in sections 6.3.2-6.3.8, in discussions of individual species. In all of these sections, our same objections apply: they misunderstand the purpose of the 60-80 recommendation, their own methodology relies on detection functions utilize fewer sightings than we did, and the "magnified error" argument is not well articulated.

Flaws and deficiencies in the TGS-NOPEC density estimates proposed as replacements for ours: The methodology proposed by TGS-NOPEC for estimating density in place of our estimates is described on p. 65 of the application. This methodology is flawed or is otherwise deficient relative to the analysis we performed in several ways:

1. *The TGS-NOPEC methodology does not correct for availability or perception bias.* This leads to a substantial underestimation of density, as we described above with the Navy NODEs models. For example, Barlow (1999) estimated the combined biases for *Kogia* to be $g(0)=0.35$. That is, the probability of detecting an animal directly on the trackline is only 0.35. In line transect density estimation, density is scaled by the inverse of this probability. Thus the TGS-NOPEC density estimates underestimate *Kogia* density by 1/0.35, or a factor of 2.86, due to this problem alone.

2. *The TGS-NOPEC methodology applied the wrong effective strip widths (ESWs) for Kogia and rough-toothed dolphin.* For Kogia, they applied 6666 m for ESW Vessel, from Mullin and Fulling (2003). That is Mullin and Fulling's ESW for "large whales". TGS-NOPEC ~~They~~ should have applied Mullin and Fulling's ESW for "cryptic whales", which was 3565 m. For rough-toothed dolphin, TGS-NOPEC ~~they~~ applied Mullin and Fulling's "small dolphins" ESW (5205 m) when they should have applied the "small whales and large dolphins" ESW (4016 m). Both of these mistakes result in an underestimation of density for these species, due to ~~the~~ TGS-NOPEC's analysis assuming that more area was effectively surveyed than it should have assumed.

3. *As noted above, the ESWs used by TGS-NOPEC are were based on detection functions fitted to relatively few sightings (e.g. from Mullin and Fulling 2003).* For example, TGS-NOPEC's ~~the~~ "Vessel ESW" used for minke and fin whales~~,~~ was based ~~a~~ on Mullin and Fulling's pooling of 38 sightings of large whales. By contrast, our analysis used a hierarchical pooling scheme (described above) that fitted two detection functions to all sightings of baleen whales: one for Low Platforms (all vessels other than R/V Gordon Gunter) which used 131 sightings, and the other for all Binocular Surveys (all survey vessels that used 25x binoculars) which used 190 sightings. Our detection functions are much more robust, due to the larger number of sightings, and therefore likely to model a more accurate ESW.

4. *The Vessel ESWs used by TGS-NOPEC for minke and fin whale were derived mostly from sperm whale sightings.* Of the 38 large whale sightings in Mullin and Fulling (2003), 29 were of sperm whales; fin and minke whales had 1 sighting each. Sperm whales are easier to detect than these baleen whales. For example, Barlow and Forney (2007)

estimated ESW for sperm whales at 2.97 km, fin whales at 2.61 km, and minke whales at 2.16 km. We observed similar results in our analysis. By basing minke and fin whale sightings on a detection function fitted to a pool composed mainly to sperm whales, TGS-NOPEC overestimated the area effectively surveyed, leading again to an underestimation of density. By contrast, our analysis fitted a detection function to a pool composed mainly of baleen whales, which are better proxies for fin and minke whales.

5. *The TGS-NOPEC analysis did not take into account what is known about the habitat of the species it modeled using this method.* In our analysis, we fitted models to seasonal and regional strata according to what is known of the ecology of species. For example, as we described previously with *Kogia*, we assumed the density was zero on the continental shelf estimated a traditional line transect model for the surveys conducted off the shelf (see our Fig. 4 above). This resulted in an appropriate estimate of density for the off-shelf area. By contrast TGS-NOPEC assumed that Kogia occupied the entire southeast portion of their study area, both on and off the shelf. Because of this, their estimate incorporated many aerial surveys of the shelf that did not sight any *Kogia*, because *Kogia* do not occupy shelf waters here. As a result, TGS-NOPEC's ~~estimate~~ approach obtained a very low density estimate (by incorporating so much additional effort from the shelf without additional sightings) and then applied it to both the on-shelf and off-shelf areas.

6. *TGS-NOPEC discarded our models for minke whales, sei whales, and harbor porpoises, on the basis of few sightings, but our models were based on many sightings.* Our study utilized hundreds of sightings of these species ~~species~~, allowing it to fit habitat-based models that realistically predicted density shifts of these species on a seasonal basis, in concurrence with what has been reported in the literature. But because these species occur mainly north of Cape Hatteras in summer, and the bulk of survey effort on the east coast has occurred in summer, there were few sightings of these species south of Delaware. TGS-NOPEC used this as justification for discarding our density surface models, claiming, in essence, that because there were few sightings south of Delaware, the models were not appropriate for use there. That is not correct. Because there our models incorporated substantial *survey effort* south of Delaware, our environment-based statistical models were well informed that these species were found less often south of Delaware—or, more precisely, found less often in the environmental conditions prevalent south of Delaware. For TGS-NOPEC to claim our models for these three species do not perform well south of Delaware, their argument must concern the survey effort that occurred there, not the sightings.

7. *The TGS-NOPEC analysis combined aerial and vessel-based densities in an inappropriate manner.* To combine results from the two platforms, TGS-NOPEC first computed independent aerial and vessel-based density estimates, then combined them by taking the simple mean of the two estimates (see Table 6-4, Step 2). This is inappropriate, because there were substantial biases in the spatial distribution of effort. Aerial surveys occurred mainly on the shelf, while vessel-based surveys occurred mainly off the shelf. The danger of this approach is revealed in the large difference between TGS-NOPEC's

~~the~~ density estimates for aerial and vessel surveys show in Table 6-4, Step 2. Clymene dolphin, *Kogia*, and pantropical spotted dolphin are all oceanic species that occur mainly off the shelf; thus the density obtained from vessel surveys, which occurred mainly off-shelf, is substantially higher than for aerial surveys, which mainly occurred on-shelf. The opposite situation occurs for harbor porpoise, minke whale, and fin whale. In contrast, rough-toothed dolphin occurs both on and off the shelf (our density models reflect this as well), so it showed more equal density in TGS-NOPEC's analysis. By failing to account for these spatial biases in density and combining density from the two platforms with a simple mean, the final mean density estimates are biased in an inscrutable way. (I.e., it is hard to say whether they are biased high or low, and to what degree.) By contrast, our methodology used conventional means to combine density estimates: it divided survey transects into segments, estimated density for each, and produced a combined estimate that accounted for the area effectively surveyed by each.

8. *TGS-NOPEC's discussion of minke whales (section 6.3.7) ignores results suggesting that minke whales are present in winter in the southeast off the shelf.* Acoustic monitoring detected minkes close to the deep side of the continental shelf break in Jacksonville, Florida in December-March (Debich et al., 2013; Norris et al., 2014) with a single pulse train detected in June. A similar study detected minkes close to the deep side of the shelf break near Onslow Bay, North Carolina in November-April (Hodge and Read 2014) and at a more distant site September-November, with substantially more detections in November, and no monitoring performed in December-June (Debich et al. 2014). Finally, a similar study detected minkes close to the deep side of the shelf break near Cape Hatteras in March and April, the only months that were monitored (Stanistreet et al. 2013). Risch et al. (2014) synthesized these acoustic monitoring results into a summary view of the temporal dynamics of minke whale migrations on the east coast, hypothesizing that minkes could be following the Gulf Stream during their northward spring migration. Aerial sightings of mother-calf pairs between North Carolina and Florida, as well as stranding records of calves, suggest the off-shelf southeast region may be a breeding and calving area for minke whales (Risch et al. 2014). Our minke whale modeling choices and results are consistent with these various findings that minkes occupy the off-shelf area of the southeast in winter. TGS-NOPEC's approach for minke whales does not consider any of this information in the modeling approach that they utilized.

Due to all of these problems with TGS-NOPEC's density estimates, the take estimates that are based on TGS-NOPEC's density estimates must not be used. In our examination, we believe the TGS-NOPEC's density estimates are much too low. For example, TGS-NOPEC's mean estimate of *Kogia* density was 0.000161, and it was 0.000316 for vessel surveys, reflecting the off-shelf distribution of both *Kogia* and vessel survey effort. Our density estimate for Kogia was 0.000941 for the off-shelf region, roughly 6x and 3x higher than TGS-NOPEC's estimates. For their part, Mullin and Fulling (2003) estimated a density of 0.00101 for *Kogia*, fairly close to our estimate. It should be noted however, that there are substantial differences in both methodology and data between our estimate and theirs. Still, it is suggestive that TGS-NOPEC underestimated density.

As another example, TGS-NOPEC's mean estimate of rough-toothed dolphin was 0.000028, with similar results for aerial and vessel-based (0.000025 and 0.000031). This species occurs both on and off the shelf. Our density estimate was 0.00069, while Mullin and Fulling's was 0.00048. Again, TGS-NOPEC's estimate was substantially lower than the other two.

Discussion of Method 3: Assumption that exactly 1 group would be exposed during the geophysical survey

This method was applied to species that were rarely sighted in the proposed geophysical survey area. It assumed that exactly 1 group of each of these species would be exposed during the geophysical survey, and computed the exposure estimate using the mean group size of each species.

We believe this approach is flawed on several counts:

1. *TGS-NOPEC discarded our models for sei whales and Atlantic white-sided dolphins on the basis of few sightings, but our models were based on many sightings.* This is the same situation as point #6 immediately above about minke whales, sei whales, and harbor porpoises. But in the case of sei whales and Atlantic white-sided dolphins, fewer sightings occurred in the geophysical survey area than the other three whales, prompting TGS-NOPEC to use Method 3 for them instead of Method 2. But, for the same reasons we outlined for the three whales, Method 1 should have been used.

2. *The assumption that exactly one group would be encountered is arbitrary.* We understand why it was made—because these species are rare (except for sei whales and Atlantic white-sided dolphins—but, as we argued above, TGS-NOPEC did not raise compelling arguments vis-à-vis Buckland et al.'s (2001) recommendation for 60-80 sightings or the purported "magnified error" problem. Therefore we see no reason why our density estimates, which used a methodology specifically designed to deal with a low number of sightings, should be discarded in favor of this arbitrary assumption that one group would be encountered.

TGS-NOPEC's use of the AMAPPS surveys

We do commend TGS-NOPEC for attempting to utilize the AMAPPS surveys. Because NOAA had not released the raw AMAPPS data when TGS-NOPEC developed their estimates, TGS-NOPEC had to base their analysis on summary data reported in the AMAPPS annual reports. An advantage of their Methods 2 and 3 was that they were able to ingest this summary data, rather than requiring the raw data, as our approach requires. Nonetheless, the use of AMAPPS data did not mitigate against all of the other problems we noted above, and the fact that AMAPPS was used is not a compelling reason to discard our density estimates in favor of TGS-NOPEC's problematic density estimates.

Other errors in TGS-NOPEC's take estimates

In passing, we note a likely copy/paste error in TGS-NOPEC's Table 6-5: 48 Level B takes are requested for Atlantic spotted dolphin. This is likely a copy/paste error from Table C 4: the number should probably be 45,594 requested takes.

Summary

In light of the many problems we noted above, NMFS should decline the TGS-NOPEC at this time and request that the problematic portions of the analysis be redone as we describe above. If any of these points require further clarification, we would be happy to consult with NMFS or TGS-NOPEC about them.

NMFS should require geophysical survey applications to use the same logic when determining whether animal avoidance reactions and mitigation measures require them to request Level A takes

We are not experts on acoustic exposure modeling and the effects of acoustic exposures on cetaceans. However, we noted inconsistency between the four applications in whether they believed their proposed activities, which were quite similar in nature, required them to request both Level A takes. Spectrum Geo Inc. was the only to request Level A takes. ION GeoVentures admitted that modeling indicated that Level A takes were possible, but claimed that avoidance reactions by animals and planned mitigation measures would prevent Level A takes from occurring. TGS-NOPEC Geophysical Company essentially made the same admission and claim. TDI-Brooks International, Inc. was quite vague (which must be corrected in their revised application), but seemed to say that no Level A takes would occur.

NMFS must provide clear and consistent rules to geophysical survey applicants regarding what constitutes a Level A take, and whether factors such as animal avoidance behavior and the mitigation measures proscribed for geophysical surveys by NMFS or BOEM obviate the need to request Level A takes when acoustic exposure modeling predicts that they would occur. If this is not done, the estimated combined impact of all of these surveys will be a hodgepodge of inconsistent estimates and likely not reflect the true impact on cetacean populations.

Furthermore, the lack of clear rules would raise the possibility of one survey applicant obtaining a competitive advantage over another by declining to estimate Level A takes. For example, the Spectrum Geo Inc. application requests 14 Level A takes of North Atlantic right whales, which greatly exceeds the Potential Biological Removal (PBR) of 0.9 for this stock. The other applicants do not request any Level A takes of North Atlantic right whales. All of the applicants would perform similar mitigation measures and benefit from the same presumed avoidance behaviors by the animals. Would the Spectrum Geo Inc. application be denied and the others accepted, merely on the basis that the others were bold enough to argue that the mitigation and avoidance would nullify the Level A takes that would otherwise occur?

Before accepting or declining any applications, NMFS should clarify the rules regarding estimation and requesting of Level A takes, give all applicants the opportunity to revise their applications accordingly, then reevaluate the revised applications together.

NMFS should consider the aggregate impact of overlapping geophysical surveys before deciding to approve any individual survey

An important aspect of the proposed geophysical surveys is that they all significantly overlap in both space and time. Thus cetacean stocks of the southeast U.S. will experience the combined effects of all of these surveys. This situation is unusual in MMPA permitting decisions and requires more study by NMFS. At minimum, before any permits are granted, the combined takes of all surveys should be tallied and assessed against stock abundances and PBRs. If the aggregate proposed geophysical activity yields too many takes for approval of it all, NMFS must reject enough surveys to bring the takes down to an acceptable level. One way would be to reject all proposed surveys. If NMFS chooses to reject some surveys but not others, the decision about which to reject and which to accept must not be arbitrary, and the reason must be established and articulated.

Conclusion

There are deficiencies in all four applications that require them to be declined, but we see nothing that would preclude them from being revised and resubmitted. That said, we can offer no opinion at this time about whether or not these particular surveys, or surveys of this kind in general, would be ultimately be approvable under the rules of the Marine Mammal Protection Act. That will have to wait until the take estimates are corrected.

Thank you for the opportunity to comment on these proposed geophysical surveys. We hope our comments have been informative and helpful. Please do not hesitate to contact us if you have questions.

Sincerely,

Jason J. Roberts, Research Associate

Patrick N. Halpin, Associate Professor of Marine Geospatial Ecology

Marine Geospatial Ecology Lab
Nicholas School of the Environment & Duke Marine Lab
Duke University

A324 LSRC Building
Durham, NC 27708 USA

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1 September 2015

Ms. Jolie Harrison, Chief
Permits and Conservation Division
Office of Protected Resources
National Marine Fisheries Service
1315 East-West Highway
Silver Spring, Maryland 20910-3226

Dear Ms. Harrison:

The Marine Mammal Commission (the Commission), in consultation with its Committee of Scientific Advisors on Marine Mammals, has reviewed the applications submitted by Spectrum Geo Inc. (Spectrum), TGS-NOPEC Geophysical Company (TGS), ION GeoVentures (ION), and TDI-Brooks International Inc. (TDI-Brooks) seeking incidental harassment authorizations under section 101(a)(5)(D) of the Marine Mammal Protection Act (MMPA) to take small numbers of marine mammals by harassment incidental to geophysical surveys conducted for the oil and gas industry in the Atlantic Ocean. The Commission also has reviewed the National Marine Fisheries Service's (NMFS) 29 July 2015 notice (80 Fed. Reg. 45195) announcing receipt of the applications and requesting comments and information.

Background

The applicants are proposing to conduct geophysical surveys beginning in 2016 in the Mid- and South-Atlantic planning areas[1] of the Atlantic Ocean. Three of the applicants are proposing to conduct seismic surveys, and the fourth, TDI-Brooks, is proposing to conduct a high-resolution geophysical survey that would use only a multibeam echosounder and sub-bottom profilers. The three seismic surveys would be conducted in an area extending from Delaware to Florida; the high-resolution geophysical survey would be conducted in a smaller area extending from North Carolina to Florida. The outer boundaries of each of these surveys are illustrated in Figure 1[2] (see enclosure). The proposed survey duration, total trackline distance, spacing of the survey tracklines, and survey equipment for the applicants are as follows—

- Spectrum is proposing to conduct a year-long two-dimensional (2D) seismic survey beginning in February 2016. The survey would consist of approximately 67,591 km of tracklines, including turns at the end of each line. Spectrum has proposed to survey two different grid configurations. Its "regional" survey would extend beyond the continental shelf in the South- and Mid-Atlantic planning areas and include 21,534 km of tracklines to survey 25 x 32-km grids, whereas, its "detailed" survey would begin at the 30-m isobath and

[1] Planning areas as defined by the Bureau of Ocean Energy Management (BOEM; http://www.boem.gov/Atlantic-Oil-and-Gas-Information/).
[2] Figure 1 was generated using a map of all geological and geophysical (G&G) applications received by BOEM for the Atlantic Outer Continental Shelf (OCS) region and displays only the boundaries for the four applications reviewed herein. GXTechnology is a division of ION.

extend offshore within the Mid-Atlantic planning area and include 46,047 km of tracklines to survey either 4 x 4-km or 8 x 8-km grids. Spectrum would tow a 32-airgun array with a total volume of 4,920 in^3 behind each of two source vessels.

- TGS also is proposing to conduct a year-long 2D seismic survey beginning in February 2016. The survey would extend beyond the continental shelf in the South- and Mid-Atlantic planning areas and consist of approximately 62,845 km of tracklines, including turns, transits between lines, and operations at the start (run in/ramp up) and end (run out) of lines. The survey grid would consist of tracklines spaced 6–100 km apart. TGS would tow a 48-airgun array with a total volume of 4,808 in^3 behind each of two source vessels.
- ION is proposing to conduct a 100-day 2D seismic survey in the summer and fall of 2016. The survey would extend beyond the continental shelf in the South- and Mid-Atlantic planning areas and consists of approximately 13,062 km of tracklines to survey gridlines that vary in spacing (20–190 km x 30–220 km apart). ION would tow a 36-airgun array with a total volume of 6,420 in^3 behind a single source vessel.
- TDI-Brooks is proposing to conduct a high-resolution geophysical survey—the proposed start date and survey duration were not specified in the application. The survey would occur only in the South-Atlantic planning area in an approximate 234,223-km^2 area, with 2.25-km spacing between lines in shallow water and 4.5-km in deeper water. TDI-Brooks would use a multibeam echosounder and sub-bottom profilers on a single source vessel.

Consistent with BOEM's 2014 Record of Decision (ROD) on Atlantic proposed geological and geophysical (G&G) activities, the three applicants conducting seismic surveys indicated they would comply with the following mitigation measures—

(1) using vessel strike avoidance measures while in transit and speed restrictions in designated time-area restriction areas[3] for North Atlantic right whales or when female-calf pairs, pods, or large groups of cetaceans are observed nearby;
(2) maintaining a minimum distance of 500 m from any North Atlantic right whale, 100 m from other whale species listed under the Endangered Species Act (ESA), and 50 m from all other marine mammals;
(3) refraining from conducting seismic surveys in designated time-area restriction areas for North Atlantic right whales;
(4) using trained protected species observers on survey vessels to monitor an exclusion zone[4] around each vessel;
(5) using ramp-up, delay, power-down, and shut-down procedures;
(6) imposing sound limits to ensure that sound levels outside of the designated time-area restriction areas do not exceed 160 dB re 1 μPa at the boundaries of those areas;
(7) using passive acoustic monitoring to supplement visual monitoring; and
(8) maintaining a minimum 40-km separation distance between vessels conducting simultaneous seismic surveys.

[3] Time-area restriction areas identified in the ROD for North Atlantic right whales include NMFS-designated critical habitat areas off Florida and Georgia, all-coast seasonal management areas in the Mid-Atlantic from the Delaware Bay to Cape Canaveral, and active dynamic management areas (http://www.boem.gov/Record-of-Decision/).
[4] The proposed size of each applicant's exclusion and disturbance zones (based on Level A and B harassment, respectively) varies and in at least one case does not comply with the ROD protocol; see text for further discussion.

The fourth applicant (TDI-Brooks) stated that it would comply with the following mitigation measures—

(1) using vessel strike avoidance measures and speed restrictions in areas where North Atlantic right whales or female-calf pairs are observed nearby;
(2) refraining from conducting high-resolution geophysical surveys in North Atlantic right whale critical habitat;
(3) using trained protected species observers on survey vessels to monitor an exclusion zone around each vessel (the size of the exclusion zone to be monitored was not specified);
(4) using ramp-up, delay, and shut-down procedures; and
(5) using passive acoustic monitoring to supplement visual monitoring.

Reducing the potential for duplicative or overlapping seismic surveys

Seismic airguns emit high energy, low-frequency impulsive sound that travels long distances. Marine mammal response to seismic surveys can cause disruption of important marine mammal behaviors. Sound from airguns also can mask biologically important sounds, including communication calls between individuals of the same species. It is not clear how sound from seismic surveys conducted in the U.S. Atlantic or elsewhere will impact marine mammals. Airgun sounds produced in coastal waters of the Atlantic are capable of traveling nearly 4,000 km and have been detected at the mid-Atlantic ridge (Nieukirk et al. 2012). Studies have indicated that fin whales in the Mediterranean Sea alter their vocalizations and avoid areas of seismic activity, which can affect and chronically increase the energetic costs critical for life functions (e.g., communication; Castellote et al. 2012). Reducing sound generated by potentially duplicative or overlapping seismic surveys in U.S. Atlantic waters therefore should be considered a high-priority mitigation measure.

In addition to the three incidental take applications associated with seismic surveys that are the subject of this letter, BOEM is reviewing at least four other applications[5] for seismic surveys in the Mid- and South-Atlantic planning areas. All of those surveys overlap to a large degree[6] and could be considered duplicative as they are collecting similar data. If surveys that overlap in space and/or time are allowed to proceed, it would increase the numbers of marine mammals authorized to be taken and potentially expose them to unnecessary risks.

The Commission repeatedly has emphasized the need to minimize duplicative or overlapping seismic surveys in all areas of oil and gas exploration (see the Commission's 20 April 2015 letter). BOEM recently started requiring G&G permit applicants in the Gulf of Mexico to include a "Non-Duplicative Statement" certifying that a proposed survey would not be duplicative (R. Brinkman, BOEM, personal communication). BOEM also is in the process of developing criteria to evaluate those statements based on the applicant's proposed survey design and data acquisition parameters[7] in comparison to previous surveys conducted by the same company or others in the same area. However, information on whether a proposed survey is duplicative of other proposed surveys has yet to be required of applicants proposing to conduct seismic surveys in the Atlantic.

[5] http://www.boem.gov/Currently-submitted-Atlantic-OCS-Region-Permits/.
[6] http://www.boem.gov/Atlantic-Permit-Applications/.
[7] Acquisition parameters may include, but are not limited to, survey geometry, source array composition and configuration, spatial sampling, and sampling rate (Brinkman, pers. comm.).

Based on the information provided in the three incidental take applications for the proposed seismic surveys, the applicants are proposing to conduct seismic surveys in the same general areas using essentially the same data acquisition parameters, including potential ensonification of the same areas based on overlapping tracklines. Hence, the Commission considers these surveys to be duplicative, in whole or in part.

NMFS's regulatory authority to minimize duplicative surveys is provided in section 101(a)(5)(A)(i)(II)(aa) of the MMPA, which directs NMFS to structure incidental take authorizations so that they prescribe "other means of effecting the least practicable adverse impact on such species or stock and its habitat…." NMFS has had some success in the past in having applicants collaborate on seismic surveys in the Arctic and should be working closely with BOEM on parallel measures to reduce the number of incidental take authorizations and G&G permits issued for potentially duplicative surveys in the Atlantic. The Commission continues to believe that BOEM's issuance of G&G permits for potentially duplicative seismic surveys would be inconsistent with the mandates of the Outer Continental Shelf Lands Act to balance resource development with environmental harm. <u>The Commission therefore recommends</u> that NMFS work with BOEM to require all applicants proposing to conduct seismic surveys in the Mid- and South-Atlantic planning areas to collaborate or devise other means for minimizing the potential for duplicative or overlapping surveys.

Inconsistencies in take estimation methods

It is difficult to evaluate the potential impact of the proposed surveys, both individually and cumulatively, due to the lack of consistency among applicants regarding their take estimation methods. Major inconsistencies include (1) the sources used for density data to estimate takes and for abundance data to aid in assessing small numbers and negligible impact, (2) the acoustic thresholds used to determine Level A and B harassment zones and estimate associated numbers of takes, and (3) the assumptions regarding the effectiveness of mitigation in reducing the numbers of estimated Level A harassment takes.

Regarding sources used for density data, the applicants used at least four different sources—Navy OPAREA Density Estimates data[8], National Oceanic and Atmospheric Adminstration Cetacean Density and Distribution Mapping Working Group data[9], Ocean Biogeographic Information System-Strategic Environmental Research and Development Program data[10], and Atlantic Marine Assessment Program for Protected Species data[11]. Some of those sources reflect more recent information on marine mammal densities and abundance than others. The Commission understands that NMFS considers the CetMap data to be the best available information at present[12] regarding density estimates for the Atlantic planning areas. Therefore, it is unclear why NMFS did not direct all applicants to use the CetMap data. In addition, abundance estimates from NMFS's stock assessment reports, CetMap, and various other references were used as the basis for species-specific regional or best population estimates. Rather than allowing each of the applicants to determine what data source(s) it would use, NMFS should have specified the preferred data

[8] NODEs (Department of Navy 2007).
[9] CetMap (http://cetsound.noaa.gov/cda-index).
[10] OBIS-SERDP (http://seamap.env.duke.edu/search/?app=serdp).
[11] AMAPPS data from 2010-2014.
[12] The results of the AMAPPS surveys, including results from offshore ship surveys, have yet to be made available publicly or incorporated into CetMap.

source(s) for each species. That guidance would ensure consistent density and population estimates are used to inform small numbers and negligible impact determinations, particularly in light of the overlapping nature of the surveys being considered for authorization.

Regarding determination of Level A and B harassment zones, the applicants used both the current NMFS guidance for acoustic thresholds (based on 180- and 160-dB re 1 μPa for Level A and B harassment, respectively) and various interpretations of the dual criteria of sound exposure levels (SELs) and peak sound pressure levels (SPLs)[13] from Southall et al. (2007) and/or NMFS's draft guidance on acoustic thresholds for permanent threshold shift (PTS)[14] for impulsive and non-impulsive sources. Until NMFS revises its acoustic thresholds for Level A harassment, current policy is for applicants to provide estimates of both the Level A and B harassment zones[15] and the associated numbers of takes based on the 180- and 160-dB re 1 μPa thresholds for Level A and B harassment, respectively.

To estimate numbers of takes, the applicants used both animat modeling and simple area x density calculations [16]. The applicants provided take estimates based on numbers of exposures, and in at least one case also provided the numbers of individual animals that might be exposed. However, it was not clear how those two estimates would be reconciled to determine the numbers of takes to authorize.

Three of the four applicants requested authorizations for Level A harassment takes. The fourth applicant did not request Level A take authorization based on the assumption that mitigation measures would prevent all Level A harassment takes. The Commission generally does not agree with reducing take estimates based on assumptions of presumed mitigation effectiveness unless empirical studies have been conducted under the same or similar circumstances as the proposed activities that support such assumptions.

The lack of consistency among applications appears to be the result of inadequate or inconsistent guidance provided to the applicants by NMFS. To address these inconsistencies, the Commission recommends that NMFS work with the applicants and provide clear guidance on recommended sources of density and abundance data, the appropriate thresholds to determine the relevant Level A and B harassment zones and the associated numbers of takes, and whether requested Level A harassment takes should be reduced based on presumed mitigation effectiveness. Unless and until this guidance is provided to achieve consistency amongst the applications, the Commission believes it is not possible to determine the numbers of takes to authorize. The Commission further recommends that NMFS develop criteria and provide guidance to applicants regarding the circumstances under which it will consider requests for Level A harassment takes under section 101(a)(5)(D) of the MMPA.

In addition, it is not clear what types of takes TDI-Brooks is proposing to be authorized and what guidance it received from NMFS regarding estimation of the Level B harassment zone. With

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[13] Applicants confused SELs with SPLs in several instances.
[14] PTS equates to Level A harassment.
[15] The Commission does note that the distances to the various isopleths in shallow water are less than those isopleths in intermediate and deep water in the ION application, a trend not observed in the Spectrum application.
[16] In addition, one applicant used sightings data and line-transect theory (including effective strip width) to estimate takes for rare species that did not have reliable density data.

respect to types of takes, the applicant indicated that it did not anticipate any Level A harassment to occur based on the proposed sound sources (a multibeam echosounder and sub-bottom profilers) and additional mitigation procedures. However, in calculating the numbers of animals that could be taken by harassment, the applicant referred to numbers of marine mammals that could be exposed to acoustic levels defined by NMFS as capable of producing a temporary threshold shift (TTS). The applicant then appears to have calculated the total ensonified area based on the 180-dB re 1 μPa threshold (i.e., the threshold for Level A harassment). NMFS (and the Commission) generally believes that the sources proposed to be used by the applicant would not be expected to result in Level A harassment takes. Unfortunately the applicant did not provide information on the size of the harassment zone used to estimate the take numbers listed in Table 2 of its application, so it is unclear whether those takes represent Level A or B harassment takes. The Commission recommends that NMFS work with TDI-Brooks to clarify the type and numbers of harassment takes proposed for authorization.

Regarding the calculation of Level B harassment takes by TDI-Brooks, the Commission has argued on several occasions that for the proposed types of sources, a Level B harassment threshold of 120 dB re 1 μPa should be used[17] (rather than the 160-dB re 1 μPa threshold used by NMFS for impulsive sources). Therefore, the Commission recommends that NMFS require that TDI-Brooks estimate the numbers of marine mammals taken by non-impulsive acoustic sources (i.e., echosounders and sub-bottom profilers) based on the 120- rather than the 160-dB re 1 μPa threshold.

Mitigation and monitoring measures

NMFS is required by regulation to prescribe measures that set forth permissible methods of taking and other means of effecting the least practicable adverse impact on the species or stock of marine mammal, paying particular attention to rookeries, mating grounds, and areas of similar significance. However, beyond the designated time-area restrictions for North Atlantic right whales, it is not clear whether NMFS has directed the applicants to identify and avoid conducting surveys in any other areas where or times when other marine mammal species are known to concentrate.

The lack of baseline information regarding the abundance and distribution of marine mammals in Atlantic offshore waters (BOEM 2014, Waring et al. 2015) will make it challenging to implement meaningful and effective time-area restrictions. There are some known areas of high biological productivity, such as the shelf edge off Cape Hatteras, which should be avoided as they are likely to attract large aggregations of marine mammals. However, information is lacking on the extent to which predictable spatio-temporal aggregations of marine mammals occur in relation to particular oceanographic or habitat features in offshore waters of the Atlantic Ocean (Rickard 2015). Such information, if available, could be used to identify additional biologically important areas that should be avoided.

As already noted, the proposed mitigation measures differ among applicants and, in some cases, do not conform with measures required in other planning areas or the minimum measures specified in BOEM's ROD. Mitigation measures should be consistent among applicants conducting

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[17] See the Commission's letter from 24 August 2015 regarding the proposed rule for fisheries research activities conducted by the NMFS Northeast Fisheries Science Center.

the same types of surveys and revised to reflect any additional guidance that NMFS has provided to certain applicants. To ensure consistency in mitigation and monitoring requirements, the Commission recommends that NMFS provide additional guidance to the applicants regarding—

- Time-area restrictions—In addition to the designated time-area restrictions for North Atlantic right whales, known areas of high biological productivity should be identified and avoided.
- The size of the exclusion and buffer zones to be monitored—Each applicant should establish source- and site-specific Level A and B harassment zones, based on acoustic modeling and/or empirical data. If zones are based on modeling, applicants should conduct in-situ sound propagation measurements for each airgun array (including the mitigation airgun) at the beginning of the survey at representative depths and adjust the Level A and B harassment zones, as necessary.
- Use of the mitigation gun—The mitigation gun should not be used for longer than 1 hour and should be fired only once every minute instead of every few seconds. These recommendations are based on requirements imposed recently by NMFS on seismic surveys in the Arctic (80 Fed. Reg. 40016) and would ensure that use of the mitigation gun is minimized without compromising its (presumed) effectiveness.
- The number of protected species observers—Given the size of the exclusion zone for seismic surveys (greater than 1 km), at least two observers should monitor at all times during seismic operations to increase the likelihood of detecting marine mammals and implementing mitigation measures. The use of a second observer also would allow for the collection of additional data on marine mammal behavior and on movements in response to the source.
- Monitoring periods—Applicants should be required to monitor the exclusion zone for marine mammals for 30 minutes before the proposed activities begin, during the proposed activities, and for 30 minutes after the proposed activities have ceased.
- Use of passive acoustic monitoring—Passive acoustic monitoring should be required to increase detection probability for real-time mitigation and monitoring of exclusion and disturbance zones, especially when visibility is obscured by darkness, sea state, or other factors.

As noted above, assumptions should not be made regarding the effectiveness of mitigation measures until they have been fully evaluated, preferably under the environmental conditions in which the seismic surveys would be conducted. The Commission recommends that NMFS require the applicants to include in their final report empirical data in support of determining the probability of detecting marine mammals under the different sea states, weather conditions, and light levels that would be encountered during the seismic surveys. In addition, the Commission recommends that NMFS require the applicants to make all visual and acoustic monitoring data publicly available in a timely manner. Those data will contribute to the limited data currently available on marine mammal presence and behavior in the Atlantic offshore area and can be used to develop, adapt, or refine mitigation measures over time. One platform for posting data collected during monitoring would be the Ocean Biogeographic Information System-Spatial Ecological Analysis of Megavertebrate Populations (OBIS-SEAMAP) website.

Large-scale monitoring plan

As previously noted, baseline information is lacking regarding marine mammal abundance, distribution, and habitat use in some of the proposed offshore survey areas. Baseline information on the environmental characteristics of an area and the natural variability of those environmental characteristics is a fundamental requirement for assessing impacts resulting from seismic activities (Nowacek et al. 2013). However, it does not appear that NMFS or BOEM will require applicants to collect that information prior to authorizing those activities.

Of even greater concern is the apparent lack of large-scale monitoring associated with the proposed surveys. MMPA incidental take provisions require that requests for incidental take authorizations include “monitoring and reporting measures that will result in increased knowledge of the species, [and] the level of taking or impacts on populations of marine mammals that are expected to be present while conducting activities…” (50 CFR § 216.104(a)(13)). NMFS and BOEM have implemented large-scale biological monitoring programs in the Arctic and in more coastal waters of the Atlantic (AMAPPS). It is the Commission’s understanding that NMFS and BOEM also are working to expand the scope of AMAPPS into more offshore waters and establish similar monitoring programs in other areas where significant seismic activity occurs (i.e., the Gulf of Mexico and Cook Inlet).

If NMFS proceeds in the short-term with the authorization of seismic surveys in the Atlantic, the lack of baseline information necessitates a go-slow approach that limits unnecessary overlap or duplication of seismic activities (as recommended herein), coupled with intensive data collection (e.g., aerial and ship surveys, tagging and telemetry, analysis of data from stranded animals) to better understand what species and stocks are being taken, the effects of such taking, and measures needed to mitigate adverse effects. Monitoring to better understand and mitigate adverse effects of proposed activities should be a required component of any large-scale project, but it does not appear that NMFS or BOEM would require the current applicants to conduct any large-scale monitoring in the Atlantic once the survey activities are authorized to complement data being collected under the AMAPPS program. This is particularly important as the U.S. Atlantic is a relatively new area for seismic activities and the effects of seismic surveys on marine mammal species in this area has yet to be determined.

Addressing large-scale monitoring goals up-front with each applicant and encouraging a cooperative monitoring effort would ensure that the MMPA mandates with regard to monitoring are being met. The Commission therefore recommends that NMFS require the applicants to work with BOEM and NMFS, prior to the initiation of survey activities, to develop a large-scale monitoring program to better understand what species and stocks would be taken, the effects of such taking, and the measures needed to mitigate any adverse effects.

The Commission hopes you find its letter useful. Please contact me if you have questions regarding these recommendations.

Sincerely,

Rebecca J. Lent, Ph.D.
Executive Director

Enclosure

cc: William Brown, BOEM Chief Environmental Officer

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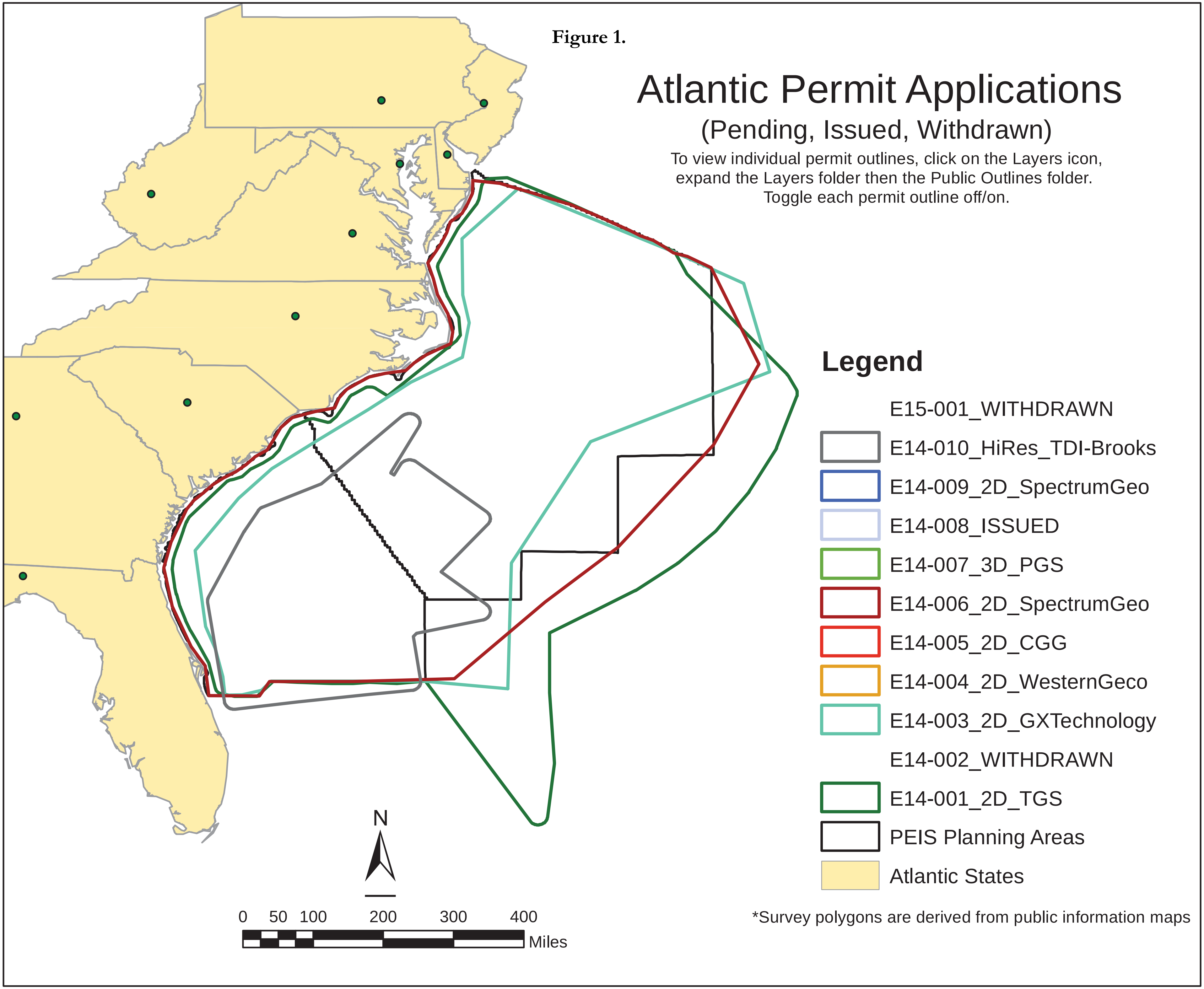
Figure 1.



Atlantic Permit Applications
(Pending, Issued, Withdrawn)
To view individual permit outlines, click on the Layers icon, expand the Layers folder then the Public Outlines folder. Toggle each permit outline off/on.
Legend
E15-001_WITHDRAWN
E14-010_HiRes_TDI-Brooks
E14-009_2D_SpectrumGeo
E14-008_ISSUED
E14-007_3D_PGS
E14-006_2D_SpectrumGeo
E14-005_2D_CGG
E14-004_2D_WesternGeco
E14-003_2D_GXTechnology
E14-002_WITHDRAWN
E14-001_2D_TGS
PEIS Planning Areas
Atlantic States
N
0 50 100 200 300 400
Miles
*Survey polygons are derived from public information maps

Clean Ocean Action www.CleanOceanAction.org

Ocean Advocacy
Since 1984

18 Hartshorne Drive, Suite 2
Highlands, NJ 07732-0505
T (732) 872 - 0111
F (732) 872 - 8041
Info@CleanOceanAction.org
Tax ID: 22-2897204

August 28, 2015

Via electronic mail sent to ITP.Laws@noaa.gov
Ms. Jolie Harrison
Chief, Permits and Conservation Division
Office of Protected Resources
National Marine Fisheries Service
1315 East-West Highway
Silver Spring, MD 20910

RE: Comments on the National Marine Fisheries Service Incidental Harassment Authorization for the Takes of Marine Mammals Incidental to Specified Activities; Seismic Surveying in the Northwest Atlantic Ocean within the Mid- and South Atlantic Outer Continental Shelf (OCS) Planning Areas, scheduled to occur between February 2015 and February 2016.

Dear Ms. Harrison:

On behalf of the undersigned organizations, Clean Ocean Action (COA) submits the following comments in response to the National Marine Fisheries Service (NMFS) request for comments for the four Incidental Harassment Authorizations (IHA) applications related to seismic surveying for oil and gas exploration in the Mid-Atlantic that the NMFS is presently considering.

According to the Department of the Interior's own estimates, seismic surveying off the United States East Coast could injure and disrupt up to 138,000 marine mammals.[1] These impacts would include injuries and disturbances to marine mammals species that depend on hearing to feed, communicate, mate and thrive. Proposed seismic surveying would also threaten critically endangered species, like the North Atlantic right whale, of which there are less than 500 left.[2] Additionally, coastal economies, dependent on an intact

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[1] 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.

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

marine environment, could lose essential revenue and jobs from declining fish stocks and a degraded ecosystem.

It is NMFS' responsibility to ensure the health of the United States' marine environment. Therefore COA urges NMFS to deny the pending IHA applications. This oil and gas exploration stampede, in a massive area from Delaware to Cape Canaveral, is unprecedented, and will have species and ecosystem-wide impacts.

Scientific evidence supports marine mammal harassment below the 160-dB Level B threshold

The proposed IHA uses the single sound pressure level of 160 dB re 1 μPa (RMS) as a threshold for behavioral, sub-lethal take in all marine mammal species affected by the proposed survey.[3] This approach does not reflect the best available science, and the choice of threshold is not sufficiently conservative in several important respects. In fact, five of the world's leading biologists and bioacousticians working in this field recently characterized the 160-dB threshold as "overly simplified, scientifically outdated, and artificially rigid."[4] Therefore, the best available science indicates that NMFS must use a more conservative threshold.
Using a single sound pressure level of 160-dB for harassment represents a major step backward from recent programmatic authorizations. For Navy sonar activity, for example, NMFS has incorporated linear risk functions into its analysis, which endeavor to account for risk and individual variability and to reflect the potential for take at relatively low source levels.[5]

Furthermore, current scientific literature establishes that behavioral disruption can occur at substantially lower received levels for some marine mammal species, including these that will be impacted by the Proposed Project. For example, the startup of a seismic survey has been shown to cause endangered fin and humpback whales to stop vocalizing – a behavior essential to breeding and foraging.[6] Similarly, a low-frequency, high-amplitude fish shoal imaging device was recently found to silence humpback whales at a distance of up to 200 kilometers, where received levels ranged from 5 to 22 dB above ambient noise levels.[7] Groups of humpback whales in the wild have been observed to exhibit avoidance behaviors at a distance of two kilometers from a small airgun array; the received levels in these trials were 159 dB re: 1 μPa^2 peak-to-peak.[8] Blue whale behavioral changes in response to a small airgun array have also been monitored. Researchers tracked a blue whale traveling and vocalizing in the vicinity of a vessel

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[3] 80 Fed. Reg. 145, at .
[4] Clark, C., Mann, D., Miller, P., Nowacek, D., and Southall, B., Comments on Arctic Ocean Draft Environmental Impact Statement at 2 (Feb. 28, 2012); *see* 40 C.F.R. § 1502.22.
[5] *See, e.g.*, 74 Fed. Reg. 4844, 4844-4885 (Jan. 27, 2009).
[6] 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); *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] 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).
[8] McCauley, R.D., Jenner, M.N., Jenner, C., McCabe, K.A., and Murdoch, J. 1998. The response of humpback whales (*Megaptera novaeangliae*) to offshore seismic survey: Preliminary results of observations above a working seismic vessel and experimental exposures. *Appea Journal*: 692-706.

firing a four-gun array with a source level of 215 dB re: 1 μPa^2 peak-to-peak and noted that at a distance of 10 kilometers from the vessel (where the received level was estimated to be 143 dB re: 1 μPa^2 peak-to-peak), the whale ceased vocalizations for an hour and changed course significantly.[9] The literature also shows that harbor porpoises are acutely sensitive to a range of anthropogenic sounds, including airguns. They have been observed to engage in avoidance responses 50 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 dB.[10] Cuvier's beaked whales exhibited alarming behavioral impacts when exposed to sonar at low received levels of 89-127dB re: 1 μPa.[11]

Although the proposed IHA NMFS cites many studies that show low-frequency sounds in general and seismic surveys in particular can have significant behavioral impacts to marine mammals well below 160 dB,[12] NMFS nonetheless irrationally continues to rely upon a Level B harassment threshold of 160 dB. NMFS should modify its threshold estimates, as they must be based on the best available science; this would in turn likely significantly increase the estimated number of marine mammal takes incidental to the Proposed Project.

NMFS must apply the best available science and the precautionary principle as directed by the National Ocean Policy into account.

Several experts in marine mammal bioacoustics have underscored our extremely limited understanding of the potential auditory and behavioral impacts to marine mammals from the use of seismic airguns and other sound-producing technologies. Darlene R. Ketten, a marine biologist and neuro-anatomist at the Woods Hole Oceanographic Institution, has written, "[a]t this time we have insufficient data to accurately predetermine the underwater acoustic impact for anthropogenic sources."[13] Other published scientists have noted, "[g]iven the current state of knowledge…the risk of seismic sources causing hearing damage to marine mammals cannot be dismissed as negligible."[14] Scientists have also commented on the variability in how a seismic source could affect a marine mammal based on the orientation of the source relative to the animal, which is not considered in the Proposed Project. A 2004 review paper on the effects of seismic surveys on marine mammals stated, "[m]arine mammals will be distributed in a variety of positions relative to a seismic array and the signal they receive may have a complicated and variable nature."[15] A study of the environmental implications of marine seismic surveys conducted in Australia published in 2000 concluded, "[i]t was believed slight differences in the

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[9] McDonald, M.A., Hildebrand, J.A., and Webb, S.C. 1995. Blue and fin whale observed on a seafloor array in the Northeast Pacific. *Journal of the Acoustical Society of America* **98**: 712-721.
[10] *See, 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).
[11] DeRuiter, S.L., Southall, B.L., Calambokidis, J., Zimmer, W.M.X., Sadykova, D., Falcone, E.A., Friedlaender, A.S., Joseph, J.E., Moretti, D., Schoor, G.S., Thomas, L., and Tyack, P.L. 2013. First Direct Measurements of behavioural responses by Cuvier's beaked whales to mid-frequency active sonar. *Biology Letters* **9**: 20130223 1 (2013).
[12] 79 Fed. Reg. at 14787.
[13] Ketten, D.R. Marine Mammal Auditory Systems: A Summary of Audiometric and Anatomical Data and Implications for Underwater Acoustic Impacts. Polarforschung, 72. Jahrgung, Nr. 2/3, pp. 79-92.
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[15] Id.

orientations of receivers to each array, alignments and depths of array components and of functioning air guns within each array contributed to the measured differences. Again this exemplified the difficulty of predicting the received air gun level for a specific air gun array."[16] Because of this high degree of uncertainty in our understanding of impacts to marine mammals from airgun sources, compounded by the variability in the level of impact based on the position of the source relative to a marine mammal, NMFS should be precautionary in its assessment of incidental takes. One of the Principles in the 2010 Final Recommendations of the Interagency Ocean Policy Task Force report urges the use of best available science: "Decisions affecting the ocean…should be informed by and consistent with the best available science."[17]

Moreover, On July 19, 2010, President Obama issued an Executive Order (E.O. 13366) establishing a new Ocean Policy Council and new Ocean Policy for the United States, and at the same time, released a final report elaborating on the Policy and creating a comprehensive regional structure and process for Coastal and Marine Spatial Planning. In the *Final Recommendations of the Interagency Ocean Policy* report, the White House Council on Environmental Quality enshrined the precautionary principle, as laid out in the Rio Declaration of 1992, as one of the essential guiding principles of the policy, stating "In order to achieve the national goals of the [National Ocean Policy], planning efforts are to be guided by the following principles. . ."[18]

The sheer area and extent of this survey area necessitates the use of the best available science and a precautionary approach. Four different companies with at least two surveying ships each, along with many other ships as support vessels, would be ensonifying an area that stretches from Delaware to Florida, for over a year. There has been no study done which contemplates the potential effects of a seismic operation this immense. The responsible application of the precautionary principle to the NMFS IHAs would lead to the denial of marine mammal takes incidental to the Proposed Project.

Separation Distances and Cumulative Effects

The Bureau of Ocean Energy Management estimates that the proposed activities could cause up to ***13.5 million*** behavioral disturbances to marine mammals[19] Yet none of the IHA applications consider or address the cumulative short and long-range impacts that will result from this seismic stampede. With four different companies each proposing to use two seismic

[16] McCauley, R.D., Fewtrell, J., Duncan, A.J., Jenner, C., Jenner, M-N., Penrose, J.P., Prince, R.I.T., Adhitya, A., Murdoch, J., and McCabe, K. 2000. Marine seismic surveys – A study of environmental implications. *Appea Journal* 692-708.

[17] The White House Council on Environmental Quality. Final Recommendations Of The Interagency Ocean Policy, *The National Guiding Principles for Coastal and Marine Spatial* Planning, pages 15 and 48. (Principle 15 of the Rio Declaration 1992 reads, "in order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall be not used as a reason for postponing cost-effective measures to prevent environmental degradation.")

[18] *Id*.

[19] 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.

survey vessels, and numerous other ships to support these expeditions, NMFS should require that each IHA application contemplate the cumulative effects of these surveying activities in relation to each other, including the possibility of an animal being exposed to seismic activity from several different expeditions in the same day. This would increase the estimated number of takes drastically, and could potentially lead to more serious injury due to repeated exposure, increased stress levels, or widespread behavioral interruptions.

Only a "minimum separation distance between simultaneously operating deep-penetration seismic airgun surveys (which would maintain corridors of lower sound levels (<160dB) between survey vessels for animals to pass during the survey period" have been contemplated as mitigation measures on a cumulative basis.[20] "TGS plans to operate their seismic vessels at least 100 km apart or farther, depending on where they are working. TGS will also coordinate with other seismic operators that may be in the region to maintain spacing of at least the minimum 40 km spacing suggested by the ROD between other operating seismic vessels."[21]

A minimum separation distance of 40 km has not been vetted scientifically by any IHA applicant. There is no evidence that a 40km separation distance would allow enough space and sound dissipation to allow marine mammals to pass between surveying vessels unharmed. For these reasons alone, NMFS should reject these IHA applications until true cumulative effects analysis is done, and the evidence supporting a minimum separation distance of 40km is put forth and properly vetted.

The North Atlantic Right Whale

The critically endangered North Atlantic Right Whale will face species wide impacts if NMFS approves of the IHAs. In the Programmatic Environmental Impact Statement ("PEIS") for these seismic surveys, the Bureau of Ocean Energy Management concedes that these activities risk non-acoustic interactions, such as ship strikes, that could ***seriously injure or kill*** marine mammals.[22] As the Fisheries Service explained in its Programmatic Biological Opinion for this activity, "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***."[23]

BOEM has estimated that the seismic impacts will result in up to ***9 injuries*** and ***up to 950*** behavioral disturbances to right whales,[24] whose population is approximately 455 individuals.[25]

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[20] From IHA application of TGS-NOPEC, Section 11.3:
[21] *Id*.
[22] BOEM, *Atlantic OCS Proposed Geological and Geophysical Activities Mid-Atlantic and South Atlantic Planning Areas Final Programmatic Environmental Impact Statement, Vol. I*, at 2-40 ("There is a potential risk that survey vessels could strike and injure or kill marine mammals.").
[23] 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 (emphasis added).
[24] BOEM, *FPEIS*, at tbl. 42, 44.
[25] NMFS, *North Atlantic Right Whale: Western Atlantic Stock* (Dec. 2012), *available at* http://www.nmfs.noaa.gov/pr/pdfs/sars/ao2012whnr-w.pdf.

Where, as here, the number of potential behavioral disturbances is more than double the number of individuals in a population, the Fisheries Service should recognize the real and present threat of population-level effects from the proposed activity. Furthermore, there was no analysis done on the non-seismic impacts to right whales, and therefore, no accurate calculation of the combined seismic and non-seismic impacts (such as ship strikes) that will occur from the approval of these IHAs. 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."[26]

It is unlikely that for any other industrial or commercial activity that NMFS would authorize such a large percentage of an endangered species to be threatened by take. Indeed, commercial fishing operations have no margin for error in their interactions with the North Atlantic Right Whale.[27]

To comply with the requirements of the MMPA, the Fisheries Service may issue an IHA only if an activity takes a "small number" of marine mammals and will have only a "negligible impact on the species or stock."[28] If an activity could cause serious injuries or mortalities for marine mammals, then the Fisheries Service cannot issue an IHA.[29] In no way can ***9 injuries*** and ***up to 950*** behavioral disturbances to right whales,[30] whose population is approximately 455 individuals[31] be construed to represent "a negligible impact on the species or stock."

COA's Past Experience with Seismic Surveying

For over two years, Clean Ocean Action has campaigned against the use of seismic surveying technology in relation to a small scale (relative to the mid-Atlantic) expedition off of the coast of New Jersey. From these campaigns, COA has gained valuable insight into some of the deficiencies in the permitting process of seismic surveying

COA learned that a pre and post survey assessment of the marine habitat, including indexing key health and stock markers in the area to provide a baseline ***before*** surveying commences, is critical in understanding potential impacts from seismic surveying. For the New Jersey seismic expedition, no pre survey baseline studies were performed, and therefore no scientific studies on the impacts of that survey were viable. All that remained were anecdotal evidence such as the death of three whales during the survey, and anomalies in the local absence of bluefish, squid, and other fisheries. NMFS, coastal communities, the marine environment, and these surveying companies would all benefit from a transparent before and after study of the areas in which seismic technology has been used, in order to gain a clear understanding of these impacts.

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[26] BOEM, *FPEIS, Vol. I*, at 283
[27] *See* National Marine Fisheries Service, *Zero Mortality Rate Goal*, available at http://www.nmfs.noaa.gov/pr/interactions/zmrg/.
[28] *Id.* § 1371(a)(5), (a)(3)(A).
[29] 50 C.F.R. § 216.106.
[30] BOEM, *FPEIS*, at tbl. 42, 44.
[31] NMFS, *North Atlantic Right Whale: Western Atlantic Stock* (Dec. 2012), *available at* http://www.nmfs.noaa.gov/pr/pdfs/sars/ao2012whnr-w.pdf.

The seismic survey off the coast of New Jersey was completed despite widespread public opposition and political pressure, as well as direct opposition from the State of New Jersey on behalf of its' coastal interests. This illustrates the troubling facts that the States and communities adjacent to these seismic surveying areas have little influence over activities which will impact their coastal interests. NMFS should engage these communities and States in a collaborative process, so as to ensure that state coastal economies are not disrupted or destroyed by NMFS permitted activities.

Again, COA urges NMFS to deny the pending IHA applications. Thank you for the opportunity to comment, and we await your written reply.

Respectfully,

Cindy Zipf
Executive Director
Clean Ocean Action

August 28, 2015

via electronic mail

Ms. Jolie Harrison
Chief, Permits and Conservation Division
Office of Protected Resources
National Marine Fisheries Service.
1315 East-West Highway
Silver Spring, MD 20910

RE: Notice of Receipt of Applications for Incidental Harassment Authorization ("IHA") for Geophysical Surveys in the Atlantic Ocean, 80 Fed. Reg. 45,195 (July 29, 2015).

Dear Ms. Harrison:

Thank you for the opportunity to comment on the Notice of Receipt of Applications for Incidental Harassment Authorizations ("IHA") for geophysical surveys in the Atlantic Ocean. 80 Fed. Reg. 45,195 (July 29, 2015) ("Notice"). On behalf of the Center for Biological Diversity, Natural Resources Defense Council, Oceana, and Southern Environmental Law Center, we write to emphasize the need to comply with the Endangered Species Act before proceeding with the issuance of any IHA for these activities.[1]

The IHA applications in the Notice are among those included in NMFS's July 19, 2013 Biological Opinion on the Bureau of Ocean Energy Management's Programmatic Geological and Geophysical Activities in the Mid- and South Atlantic Planning Areas from 2013 to 2020 ("Programmatic BiOp"). That Programmatic BiOp concluded that the combined effects and collective take resulting from all of the permit applications included in the Bureau's Programmatic Environmental Impact Statement would not jeopardize the continued existence of six threatened and endangered marine mammal species and therefore authorized a collective level of incidental take for those species through 2020.[2]

On April 10, 2015, these organizations petitioned NMFS and the Bureau to: (1) reinitiate formal consultation immediately under Section 7 of the Endangered Species Act ("ESA"), 16 U.S.C. § 1536(a)(2), on the Programmatic BiOp; and (2) withdraw the Programmatic BiOp.[3]

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[1] These organizations are also submitting comments on other aspects of the Notice. This letter supplements those comments.
[2] *See* Programmatic BiOp at 296-297.
[3] A copy of the petition is appended as Attachment 1.

The petition detailed new information and activities that undermine NMFS's analysis of the effects of the proposed seismic survey activities on Endangered Species Act-listed marine mammals and other species, including a final critical habitat designation for the Northwest Atlantic Ocean Distinct Population Segment of loggerhead sea turtles, 79 Fed. Reg. 39,856 (July 10, 2014); a proposed rule to revise and greatly expand designated critical habitat for endangered North Atlantic right whales 80 Fed. Reg. 9,314, 9,343 (Feb. 20, 2015); and the initiation of the U.S. Navy's Atlantic Fleet Training and Testing activities that will results in tens of thousands of instances of take of the same marine mammals and within many of the same areas covered by the seismic survey permit applications.

On July 1, 2015, the Bureau notified these organizations that it "was currently discussing these issues [presented in the petition] with NMFS and [is] committed to making decisions based on the best available science."[4] The Bureau further noted that the Programmatic BiOp did not address the issuance of individual permits "whose potential review under the ESA will be considered individually."[5]

We are concerned that while these discussions continue, NMFS may be moving ahead with a process for the IHAs included in the Notice – and thus could be allocating some amount of the overall take considered and permitted in the Programmatic BiOp – without an accurate picture of the comprehensive effects of all proposed seismic activities on these listed species and their critical habitat. NMFS should defer the issuance of any IHA until after reconsultation with the Bureau on the entire program has been completed and the agency has fully considered the total effects of the seismic program combined with other activities simultaneously affecting the same species and critical habitat.

The Bureau's letter indicates that the agencies may attempt to address the deficiencies identified in the petition through consultation on individual permits. While it is true that a revised analysis must occur *somewhere*, a complete and comprehensive programmatic consultation is necessary in this context. NMFS needs a full picture of all the relevant impacts to determine whether the seismic testing activities will collectively avoid jeopardy and, if so, to develop the measures necessary to minimize the combined amount of incidental take. These determinations should be made at the programmatic level, where NMFS should look at the cumulative impacts of all of the permits and other activities in the same area and set an overall level of allowable take that cannot be collectively exceeded by the individual permits. Deferring this analysis to future project-specific consultations risks masking or missing these collective, cumulative impacts. Indeed, courts have rejected agencies' attempts to "defer [programmatic-level] analysis to future site-specific consultations" for precisely these reasons.[6]

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[4] Letter from Abigail Hopper, Director, Bureau of Ocean Energy Management, to Stephen Roady, Earthjustice (July 1, 2015). A copy of that letter is appended as Attachment 2.
[5] *Id.*
[6] *Pac. Coast Fed'n. of Fishermen's Ass'ns v. Nat. Marine Fisheries Serv.*, 482 F.Supp.2d 1248, 1268 (W.D. Wash. 2007). In that case, the court rejected the agencies' attempt to defer analysis of the relevant "sideboards" necessary for individual projects to avoid collective harm because those "site-specific § 7 consultations will focus on a smaller area than the entire [plan] and, based on the ESA's definition of

For these reasons and those outlined in the April 10, 2015 petition, we urge NMFS to withdraw the Programmatic BiOp, reinitiate consultation with the Bureau, and correct the deficiencies in the Programmatic BiOp *before* it moves forward to conduct project-specific formal consultations or to issue any IHA for seismic activities that may kill, harm, injure, harass, or otherwise take any listed species.

Sincerely,

Stephen D. Mashuda

Stephen E. Roady
Stephen D. Mashuda
Earthjustice

1625 Massachusetts Ave., N.W., Suite 702
Washington, DC 20036
Telephone: (202) 667-4500
sroady@earthjustice.org

705 Second Avenue, Suite 203
Seattle, WA 98104
Telephone: (206) 343-6340
smashuda@earthjustice.org

cc:

Ms. Angela Somma
Chief, Endangered Species Conservation Division
Office of Protected Resources (F/PR)
National Marine Fisheries Service
1315 East-West Highway
Silver Spring, MD 20910

Ms. Abigail Ross Hopper
Director
Bureau of Ocean Energy Management
1849 C Street, NW
Washington, DC 20240

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cumulative effects, assess only those prior federal projects that have undergone consultation…. Deferral, therefore, also necessarily improperly curtails the discussion of cumulative effects." *Id*.

Honorable Lois J. Schiffer
General Counsel
National Oceanic and Atmospheric Administration
Herbert C. Hoover Building
14th Street and Constitution Avenue, N.W.
Washington, DC 20230

Honorable Hilary Tompkins
Solicitor
United States Department of the Interior
1849 C Street, N.W.
Washington, DC 20240

ATTACHMENT 1

EARTHJUSTICE

ALASKA CALIFORNIA FLORIDA MID-PACIFIC NORTHEAST NORTHERN ROCKIES
NORTHWEST ROCKY MOUNTAIN WASHINGTON, D.C. INTERNATIONAL

April 10, 2015

Via Federal Express

Ms. Angela Somma
Chief, Endangered Species Conservation Division
Office of Protected Resources (F/PR)
National Marine Fisheries Service
1315 East-West Highway
Silver Spring, MD 20910

Ms. Abigail Ross Hopper
Director
Bureau of Ocean Energy Management
1849 C Street, NW
Washington, DC 20240

Re: Petition to Reinitiate Consultation on the Bureau of Ocean Energy Management's Programmatic Geological and Geophysical Activities in the Mid- and South Atlantic Planning Areas from 2013 to 2020

Dear Ms. Somma and Ms. Hopper:

Pursuant to 5 U.S.C. § 555(b) and 50 C.F.R. § 402.16, Earthjustice, the Southern Environmental Law Center, the Natural Resources Defense Council, the Center for Biological Diversity, and Oceana petition the National Marine Fisheries Service and the Bureau of Ocean Energy Management to: (1) reinitiate formal consultation immediately under Section 7 of the Endangered Species Act ("ESA"), 16 U.S.C. § 1536(a)(2), on the Bureau's Programmatic Geological and Geophysical Activities in the Mid- and South Atlantic Planning Areas from 2013 to 2020; and (2) withdraw the July 19, 2013 Programmatic Biological Opinion regarding these activities. New information and activities undermine the National Marine Fisheries Service's existing analysis of the effects of the proposed seismic survey activities on Endangered Species Act-listed marine mammals and other species.

I. BACKGROUND

On July 19, 2013, the National Marine Fisheries Service ("NMFS") issued a Programmatic Biological Opinion for the Bureau of Ocean Energy Management's ("BOEM") proposal to issue nine permits for seismic exploration and mapping along the Atlantic coast from Delaware to central Florida. Biological Opinion: Programmatic Geological and Geophysical Activities in the Mid- and South Atlantic Planning Areas from 2013 to 2020 ("G&G BiOp"). Seismic exploration activities would flood a vast swath of these biologically rich coastal waters with unprecedented levels of intensive industrial noise, and would include airgun arrays that produce repeated blasts of sounds up to 230 decibels. G&G BiOp at 6. Airgun arrays and other equipment would be towed along a predetermined trackline for 12–20 hours, firing every 12–16 seconds, after which the ship would turn and start the next track line. *Id.* at 6–7. These activities would continue up to 24 hours a day until the survey grid is complete. *Id.*

By any measure, this action would represent a massive increase in industrial activity in these waters. During the 35 years from 1968–2003, a total of 212,967 line miles of two-dimensional seismic data were collected in the Atlantic region. By contrast, the applications currently pending for activities in just the next five years total 317,494 line miles. Many of the applications seek permission to conduct overlapping seismic testing in the same areas, resulting in some areas that would be surveyed up to nine different times. In its G&G BiOp, NMFS estimates that these activities will add 90,000 hours of seismic testing and transmissions to this area by 2020 (a substantial portion of which will come from airguns). G&G BiOp at 269.

The surveys will affect tens of thousands of threatened and endangered marine mammals, including blue, humpback, sei, fin, and sperm whales, as well as critically endangered North Atlantic right whales and other, more abundant (but no less sensitive) marine life. The impacts to these animals range from repeated behavioral harassment to physical injury. NOAA in the G&G BiOp authorizes the following total instances of take of threatened and endangered whale species by 2020:

Species	Takes	Notes
North Atlantic Right Whale	851	including 8-9 injuries (Level A harassment)
Blue Whale	1,274	including 14-15 injuries (Level A harassment)
Fin Whale	2,688	including 27-30 injuries (Level A harassment)
Sei Whale	1,175	including 13-14 injuries (Level A harassment)
Humpback Whale	3,402	including 34-38 injuries (Level A harassment)
Sperm Whale	85,281	including 872-979 injuries (Level A harassment)

G&G BiOp at 297 (total take); 203–207, 209 (potential Level A harassment estimates using NMFS's current thresholds). These numbers likely underestimate the total instances of take.

All of this activity would take place within many of the same areas along the Atlantic Coast, and at the same time, as the U.S. Navy's Atlantic Fleet training and testing activities.[1]

[1] The overlap with the Navy's training in these areas is highlighted in both BOEM's 2012–2017 Program and 2017–2022 Draft Program. *See, e.g.*, 2012–2017 Program at 13, *available at* http://www.boem.gov/uploadedFiles/BOEM/Oil_and_Gas_Energy_Program/Leasing/Five_Year_Program/2012-2017_Five_Year_Program/PFP%2012-17.pdf (noting conflicts between oil and gas development and Naval activities off Virginia coast); 2017–2022 Outer Continental Shelf ("OCS") Oil and Gas Leasing Draft Proposed Program at S-9 to S-10, *available at* http://www.boem.gov/2017-2022-DPP (noting conflicts with Naval activities and including 50-mile coastal buffer, in part, to avoid or minimize those conflicts).

The Navy's activities—including the use of tens of thousands of hours of mid-frequency active sonar and hundreds of thousands of explosive detonations—are currently permitted through the end of 2018. *See* Biological Opinion for the Navy's 2013–2018 Atlantic Fleet Training and Testing (Nov. 14, 2013) ("AFTT BiOp") at 52–55. NOAA in the AFTT BiOp has authorized the following total instances of take from the Navy's activities within Atlantic and Gulf of Mexico whale populations by 2018:

Species	Takes	Notes
North Atlantic Right Whale	955	
Blue Whale	817	and up to 20 mortalities from vessel strikes
Fin Whale	25,234	including 5 instances of permanent hearing loss and up to 20 mortalities from vessel strikes
Sei Whale	54,761	including 5 instances of permanent hearing loss and up to 20 mortalities from vessel strikes
Humpback Whale	9,191	including 5 instances of permanent hearing loss and up to 20 mortalities from vessel strike
Sperm Whale	82,276	including 6 instances of physical injury and up to 20 mortalities from vessel strikes[2]

AFTT BiOp at 502–505.

NMFS was consulting with BOEM and the Navy concerning both seismic testing and Navy training activities during directly overlapping time periods. BOEM initiated consultation with NMFS on its G&G activities on May 29, 2012. G&G BiOp at 2. NMFS issued its draft BiOp on February 12, 2013 and a final BiOp on July 19, 2013. *Id.* at 3. The Navy initiated consultation on its AFTT activities on September 21, 2012. AFTT BiOp at 2. NMFS's permit division issued a proposed five-year rule under the Marine Mammal Protection Act for these activities on February 6, 2013. *Id.* at 3. NMFS issued the draft AFTT BiOp on August 16, 2013 and a final BiOp on November 14, 2013. *Id.* Despite the substantial overlap between these two consultation processes, however, the G&G BiOp does not consider or discuss the impacts of the Navy's 2013–2018 Atlantic Fleet Training and Testing. Moreover, the AFTT BiOp, issued just four months later than the G&G BiOp, does not include any analysis of the effects of the activities analyzed and permitted in the G&G BiOp.[3]

The seismic testing activities (including issuance of permits) evaluated in the G&G BiOp have not yet begun. Indeed, BOEM did not sign a Record of Decision adopting an alternative

[2] Total mortalities over the five-year period are limited to twenty whales of any combination of species. AFTT BiOp at 503, 505, tbls. 150 and 151.

[3] The discussion of G&G activities in the AFTT BiOp notes only that BOEM had received applications for several seismic testing permits; it does not discuss the issue further, mention its predicted impacts, or consider them together with the impacts from the Navy's proposed activities during this same time period. *See* AFTT BiOp at 276. Indeed, the AFTT BiOp does not identify or cite to the G&G BiOp in its list of references.

from its Final Environmental Impact Statement until July 11, 2014. *See* Notice of Availability for Record of Decision on Atlantic OCS G&G Activities, 79 Fed. Reg. 42,815 (Jul. 23, 2014).[4] The Navy's activities evaluated in the AFTT BiOp began in November 2013. 50 C.F.R. § 218.81(a).

In addition, on July 10, 2014—before BOEM signed its Record of Decision on Atlantic G&G Activities—NMFS issued a final rule designating critical habitat for the Northwest Atlantic Ocean Distinct Population Segment of loggerhead sea turtles. 79 Fed. Reg. 39,856 (July 10, 2014). Relevant to the permits evaluated in the G&G BiOp, NMFS designated as critical habitat multiple marine areas from Cape Hatteras, North Carolina to the Florida Keys that provide for migration, winter use, and nearshore (within 1 mile) reproductive habitat for adult females and juveniles transiting to and from nesting beaches.[5] The areas designated as critical habitat appear to overlap with at least seven of the seismic permits discussed in the G&G BiOp. *Compare id.* at 39,893–902 (maps showing specific designated areas) and 50 C.F.R. § 226.223(a) (narrative description of designated areas) *with* http://www.boem.gov/Atlantic-Pending-Permit-Map (map of currently pending permits).

Similarly, on February 20, 2015, NMFS issued a proposed rule to revise and greatly expand designated critical habitat for endangered North Atlantic right whales to include waters within approximately 40 miles of the coastline stretching from Cape Fear, North Carolina to 43 miles north of Cape Canaveral, Florida. 80 Fed. Reg. 9,314, 9,343 (Feb. 20, 2015). The proposed designation would protect these waters (designated as "Unit 2") for right whale calving, nursing, and rearing. *Id.* at 9,342; *see also id.* at 9,319/3 ("[W]e conclude that facilitating successful calving by protecting the species' calving area is a key conservation objective"). The proposed right whale critical habitat overlaps substantially with the footprint of at least five of the seismic permits discussed in the G&G BiOp. *Compare id.* at 9,345 (map of proposed Unit 2) *with* http://www.boem.gov/Atlantic-Pending-Permit-Map (map of currently pending permits).

II. THE AGENCIES MUST REINITIATE CONSULTATION

These events—together and by themselves—trigger NMFS's and BOEM's mandatory duties to reinitiate consultation on BOEM's proposal to issue permits for seismic exploration in the Atlantic OCS. *See Environmental Protection Information Center v. Simpson Timber Co.*, 255 F.3d 1073, 1076 (9th Cir. 2001) (duty to reinitiate consultation lies with both the action agency and the consulting agency); 50 C.F.R. § 402.16 ("[r]einitiation . . . is required and shall be requested by the Federal agency or by the Service" when triggering event occurs).

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[4] *See also* Record of Decision at 7 (dated July 11, 2014), available at http://www.boem.gov/Record-of-Decision-Atlantic-G-G.

[5] The U.S. Fish and Wildlife Service simultaneously designated "extra-tidal or dry sandy beaches" suitable for nesting in multiple areas along this same stretch of the Atlantic coast. 50 C.F.R. § 17.95(c)(2); 79 Fed. Reg. 39,756, 39,821-40 (July 10, 2014) (maps).

A. The Identification of New Critical Habitat Triggers the Duty to Reinitiate Consultation.

The ESA's implementing regulations require that federal agencies reinitiate consultation if "a new species is listed or critical habitat designated that may be affected by the identified action." 50 C.F.R. § 402.16(d). As detailed above, NMFS has designated new critical habitat for loggerhead sea turtles in the same areas covered by the seismic exploration activities evaluated in the G&G BiOp. In doing so, NMFS also found that "[o]il and gas exploration and alternative energy projects may affect the essential features of critical habitat for the loggerhead sea turtle." 79 Fed. Reg. at 39,889/2. *See also id.* at 39,884/2 (noting that oil and gas exploration and development may affect migratory habitat by, among other things, producing "noise that alter[s] habitat conditions needed for efficient passage"). Although NMFS was working on the proposed rule for this critical habitat designation at the same time that it conducted its consultation with BOEM on the seismic permits—and published a proposed rule for comment prior to issuing the G&G BiOp[6]—NMFS did not consider *any* impacts to loggerhead critical habitat in the G&G BiOp. *See* G&G BiOp at 63 (listing critical habitat likely affected and considered in the consultation).[7]

NMFS's recently proposed revisions to North Atlantic right whale critical habitat similarly overlap with the areas covered by the seismic permits evaluated in the G&G BiOp. *See supra* at 3–4. As NMFS recognized in the proposed rule, oil and gas exploration activities in this area are likely to have impacts on this critical habitat and may require relocation, modification, timing or area restrictions, and other mitigation to prevent destruction or adverse modification of critical habitat. 80 Fed. Reg. at 9,338. Even though NMFS in the G&G BiOp outlined BOEM's proposed 20-nautical mile ("nm") (23-mile) time and area restrictions for some portions of this newly proposed habitat, these restricted areas are not coextensive with the proposed critical habitat, which extends in places to approximately 35 nms (40 miles) from shore. *Compare* G&G BiOp at 33, tbl.7 *with* 80 Fed. Reg. at 9,343.

The designation of loggerhead sea turtle critical habitat and the proposed expansion of right whale critical habitat unquestionably trigger NMFS's and BOEM's duties to reinitiate consultation under 50 C.F.R. § 402.16(d).

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[6] *See* 78 Fed. Reg. 43,006 (July 18, 2013) (proposed critical habitat designation).

[7] Moreover, the ESA's implementing regulations require agencies to confer with NMFS on any action likely to adversely modify proposed critical habitat. 50 C.F.R. § 402.10(a). Even though petitioners and others urged BOEM to consult with NMFS on the forthcoming loggerhead critical habitat designation and to incorporate time-area closures to avoid conflicts with critical habitat, the agencies did not confer or consider those impacts in the G&G BiOp. *See* Non-Governmental Interest Groups' Comments at 158 (July 2, 2012 letter from petitioners and others on the Draft PEIS for Atlantic G&G Activities at 22), *available at* http://www.boem.gov/uploadedFiles/BOEM/Oil_and_Gas_Energy_Program/GOMR/AtlGGCommentsNGOSpecialinterestGroups.pdf.

B. <u>The Navy's Increased Training Activities and New Information Regarding Marine Mammal Densities Trigger the Duty to Reinitiate Consultation.</u>

The ESA's implementing regulations also require that the federal agencies 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." 50 C.F.R. § 402.16(b). The impacts of the Navy's ongoing 2013–2018 training and testing activities on the same populations and species affected by the proposed seismic testing represent precisely the kind of new information or unanticipated effects that trigger the duty to reinitiate consultation. Although NMFS and the Navy had issued proposed rules for take from the Navy's 2013–2018 activities and had initiated consultation *before* NMFS issued the G&G BiOp, *see* AFTT BiOp at 2–4, the impacts from the Navy's 2013–2018 activities were completely ignored and left unmentioned in the G&G BiOp. The Navy's activities under the new rule began on November 14, 2013. 50 C.F.R. § 218.81(a). No permits for seismic testing under the framework of BOEM's program evaluated in the BiOp have been issued since that time. To the contrary, each of the applications that were the subject of BOEM's Environmental Impact Statement and which NMFS examined in the G&G BiOp have been revised and resubmitted to BOEM since the Navy's training began. *See* http://www.boem.gov/Currently-submitted-Atlantic-OCS-Region-Permits (all permit applications dated between March 21, 2014 and March 16, 2015). *See also* 2017–2022 Outer Continental Shelf Oil and Gas Leasing Draft Proposed Program (Jan. 2015) at 3-8 ("Following completion of the Seismic PEIS, BOEM requested that the applicants update and resubmit their permits as they had been submitted several years earlier to verify that the applicants still wanted to conduct G&G activities and to provide any new information. As of December 2014, nine applications were deemed complete and are pending. . . . ").

The Navy's action therefore commenced before any seismic activities analyzed in the G&G BiOp began and before the revised applications for those actions were deemed complete. Under these circumstances, the Navy's training activities—and the harm and take associated with them—are now part of the baseline to which NMFS must add the effects of G&G activities and analyze the combined impacts. 50 C.F.R § 402.02 (definition of environmental baseline). Performing a comprehensive evaluation that includes all of the impacts of baseline activities in this area is especially important here because NMFS failed otherwise to consider the combined impacts of these activities in either the G&G BiOp or the AFTT BiOp.[8]

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[8] In its discussion of the environmental baseline in the G&G BiOp, NMFS did note the take associated with the Navy's previous training and testing through the end of 2013, but did not address in any way the training scheduled to occur over the 2013–2018 period. G&G BiOp at 170. NMFS's disclosure of the Navy's *past* activities in the G&G BiOp cannot substitute for an analysis of the baseline impacts of the Navy's contemporary actions. Indeed, the impacts of past Navy training are completely dwarfed by the much higher-magnitude impacts associated with current levels of training and testing. *Compare* G&G BiOp at 170 (noting Navy's past annual take of 970 fin whales, 1,163 sei whales, and 10,734 sperm whales) *with* AFTT BiOp at 503 (estimating annual take of 4,490 fin whales, 10,188 sei whales, and 14,749 sperm whales).

C. There is Additional New Information About the Effects of the Action.

In the G&G BiOp, NMFS emphasized that both its analysis and the Incidental Take Statement were based on then-current marine mammal density estimates. G&G BiOp at 321. As NMFS noted, however, "[n]ew density estimates are expected in the near future through the Cetacean Sound Mapping Program" that may "constitute significant new information that would require reinitiation of consultation." G&G BiOp at 321. Those density estimates, as well as new information about biologically important regions within the action area, are now available to both NMFS and BOEM and also constitute new information showing that the action "may affect listed species or critical habitat in a manner or to an extent not previously considered." 50 C.F.R. § 402.16(b). *See, e.g.*, http://cetsound.noaa.gov/important (identification of biologically important areas for Northern Right whales).

D. The Agencies Should Consider Other New Information.

Finally, we note that in reinitiating consultation, NMFS and BOEM must account for the fact that the current permit applications were submitted under the 2012–2017 five-year program, which did not include any proposed lease sale in the Atlantic. G&G BiOp at 5. Instead, according to the agency's recently released 2017–2022 Draft Program, any lease sale in the Atlantic would not occur until at least 2021, in part to allow for "additional analysis, including collection of seismic and environmental information." 2017–2022 Draft Program at 9-8. The areas included in the 2017–2022 Draft Program limit the area of any lease sale to "at least 50 miles offshore the coasts of Virginia, North Carolina, South Carolina, and Georgia in the Mid-Atlantic and South Atlantic Planning Areas." *Id.* at S-9. Because the Draft Program excludes these areas from potential future leasing, there is no need or justification to conduct seismic exploration in those areas. *See, e.g.*, *id.* (noting that pending permits may provide "new information to inform *potential future leasing decisions*" (emphasis added)). While it is unclear at present whether the permit applications will be modified or limited to be coextensive with the areas that could potentially be leased, it is clear that BOEM and/or NMFS could limit the area surveyed as a mitigation measure to avoid unnecessary harm to marine mammals or sea turtles from seismic activities in sensitive coastal habitat. The agencies should immediately apply that authority to exclude harmful seismic testing from areas that will not be leased in any event.

III. CONCLUSION

For the foregoing reasons, petitioners request that NMFS and BOEM immediately reinitiate consultation concerning the impacts of the proposed G&G activities on threatened and endangered marine life, and that NMFS immediately withdraw its July 2013 G&G BiOp.

Because the G&G BiOp relates to pending applications for permits to conduct seismic testing in these sensitive coastal waters, please advise undersigned counsel as soon as possible of your response to this petition. In the meantime, we would welcome the opportunity to meet with you and provide further details or to discuss the information and actions outlined above.

Sincerely,

Stephen E. Roady
Stephen D. Mashuda
Earthjustice

1625 Massachusetts Ave., N.W., Suite 702
Washington, DC 20036
Telephone: (202) 667-4500
sroady@earthjustice.org

705 Second Avenue, Suite 203
Seattle, WA 98104
Telephone: (206) 343-6340
smashuda@earthjustice.org

cc:

Mr. John Bullard, Regional Director
NOAA Fisheries Service
Greater Atlantic Regional Fisheries Office
55 Great Republic Drive
Gloucester, MA 01930-2276

Mr. John Rodi
Gulf of Mexico Region Director
Gulf of Mexico OCS Region & Atlantic Activities
Bureau of Ocean Energy Management
1201 Elmwood Park Blvd.
New Orleans, LA 70123-2394

Honorable Sally Jewell
Secretary of the Interior
1849 C Street, N.W.
Washington, DC 20240

Honorable Penny Pritzker
Secretary of Commerce
1401 Constitution Ave., NW
Washington, DC 20230

Honorable Lois J. Schiffer
General Counsel
National Oceanic and Atmospheric Administration
Herbert C. Hoover Building
14th Street and Constitution Avenue, N.W.
Washington, DC 20230

Honorable Hilary Tompkins
Solicitor
United States Department of the Interior
1849 C Street, N.W.
Washington, DC 20240

ATTACHMENT 2

United States Department of the Interior

BUREAU OF OCEAN ENERGY MANAGEMENT
WASHINGTON, DC 20240-0001

JUL - 1 2015

Mr. Stephen E. Roady
Earth Justice
1625 Massachusetts Avenue, Suite 702
Washington, D.C. 20036

Dear Mr. Roady

Thank you for your April 10, 2015, petition requesting that the Bureau of Ocean Energy Management (BOEM) and the National Marine Fisheries Service (NMFS) reinitiate Endangered Species Act (ESA) consultation under a programmatic biological opinion issued by NMFS on July 19, 2013. The 2013 Biological Opinion addresses geological and geophysical activities that may be authorized by BOEM in the future in its Mid- and South Atlantic Planning Areas. A similar letter is being sent to Mr. Stephen D. Mashuda.

BOEM is currently discussing these issues with NMFS and we are committed to making decisions based on the best available science. Please note that the 2013 Biological Opinion does not address particular permits, whose potential review under the ESA will be considered individually.

BOEM appreciates your comments and concern for the marine environment and your efforts to provide information and data you feel is relevant. We will be in touch once we have made a final decision on reinitiation of this consultation.

Sincerely,

Abigail Hopper
Director

Center for Biological Diversity – Coastal Conservation League – Earthjustice – Environment North Carolina – Natural Resources Defense Council – North Carolina League of Conservation Voters – North Carolina Coastal Federation – North Carolina Conservation Network – Ocean Conservation Research – Oceana – One Hundred Miles – South Carolina Wildlife Federation – Southern Environmental Law Center

August 28, 2015

Jolie Harrison
Chief, Permits and Conservation Division
Office of Protected Resources
National Marine Fisheries Service
1315 East-West Highway
Silver Spring, MD 20910
ITP.Laws@noaa.gov

RE: *Notice of Receipt of Applications for Incidental Harassment Authorization ("IHA") for Geophysical Surveys in the Atlantic Ocean, 80 Fed. Reg. 45,195 (July 29, 2015)*

Dear Ms. Harrison:

On behalf of the Center for Biological Diversity, Earthjustice, Natural Resources Defense Council, Oceana, Ocean Conservation Research, Southern Environmental Law Center, and our Coalition partners, we welcome the opportunity to comment on the Notice of Receipt of Applications for Incidental Harassment Authorizations ("IHA") for geophysical surveys in the Atlantic Ocean, specifically on the "[b]est available scientific information and appropriate use of such information in assessing potential effects of the specified activities on marine mammals and their habitat; [a]pplication approaches to estimating acoustic exposure and take of marine mammals; [and] [a]ppropriate mitigation measures and monitoring requirements for these activities."[1]

As you are aware, our organizations are profoundly concerned about the harm to marine mammals, including critically endangered North Atlantic right whales (*Eubalaena glacialis*) ("right whales"), from these proposed high-energy seismic surveys in the Atlantic Ocean. These extensive activities will have serious impacts including from ship strikes and sound. The best available science demonstrates that airgun blasts disrupt baleen whale behavior and impair their communication on a vast scale; affect vital behavior in a wide range of other marine mammal species, also at great distances; and can undermine fundamental behaviors in fish and other marine mammal prey species. 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 entire migratory range of the endangered right whale. And the degree of activity proposed by the pending applications is enormous. Collectively, three of the applicants (Spectrum Geo ("Spectrum"), TGS-NOPEC ("TGS"), and ION GeoVentures ("ION")) have proposed to run very high-powered seismic airgun arrays over more than 93,000 miles of trackline over the next year alone, with as many as five seismic vessels operating at any one

[1] 80 Fed. Reg. at 45,195.

time. The Bureau of Ocean Energy Management ("the Bureau") anticipates that hundreds of thousands of miles of survey lines will be run over the next several years. It is no exaggeration to say that the proposed activity, beginning with the four applications pending here, will significantly degrade the acoustic environment of the Atlantic region.

For these and other reasons, seventy-five leading marine scientists, including leading biologists and bioacousticians from Duke University, Cornell University, the New England Aquarium, and other respected institutions, submitted a letter to President Obama, in March, expressing concern that Atlantic seismic surveys could compromise the health and habitat of marine mammals and other species.[2] The scientists rejected the premise that the proposed surveys would have only a "negligible impact" on marine species and populations. On the contrary, they concluded that the 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."[3] "Opening the U.S. east coast to seismic airgun exploration," they wrote, "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."[4]

And yet, remarkably, none of the applications that the Fisheries Service has received addresses the large-scale biological impacts that the scientific community has identified. Among other faults, they fail to base their take estimates on best available science, ignoring the behavioral disruptions that have been documented at vastly greater distances than they analyze; they fail to adequately describe the cumulative impacts of their activities on marine mammal species and stock and their habitat; and they fail to adequately describe the availability of equipment, methods, and other means of effecting the least practicable adverse impact on marine mammals, as the agency's regulations require. Furthermore, they are inconsistent in their use of impact assessment models and methodologies, even while they propose using similar equipment in the same regions, affecting the same populations of animals. Surely these applications cannot be deemed adequate and complete, as the agency's regulations demand.

As an initial matter, we therefore urge the Fisheries Service to clarify that the applications are not adequate or complete for purposes of issuance of a proposed rule. To proceed otherwise would violate the agency's regulations; would effectively shift the burden of quantitative modeling and analysis to the agency, as it supplements what is missing from the applications; and would leave the Fisheries Service with insufficient time to consider these and other comments submitted by the public, including the interested scientific community, at the agency's request.[5] Indeed, the Fisheries Services aims to issue proposed IHAs in September 2015—

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[2] 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 12) [hereinafter Scientists' Letter].
[3] *Id.*
[4] *Id.*
[5] *See, e.g.*, *Western Coal Traffic League v. United States*, 677 F.2d 915, 927 (D.C. Cir. 1982) ("An agency decision may not be reasoned if the agency ignores vital comments regarding relevant factors, rather than providing an adequate rebuttal."), *cert. denied* 459 U.S. 1086 (1982); *Home Box Office v. FCC*, 567 F.2d 9, 35 (D.C. Cir. 1977) ("The opportunity to comment is

[6]allowing at most a couple of weeks to read, incorporate, and modify its analyses on the basis of public comment. The agency should simply, and correctly, deem the applications inadequate and incomplete.

Where an activity could harass or injure marine mammals, the actor—here, the seismic surveying companies—must obtain an IHA from the Fisheries Service under Section 101 of the Marine Mammal Protection Act ("MMPA").[7] However, if the activity could seriously injure or kill a marine mammal, then the seismic surveying companies must obtain a Letter of Authorization ("LOA") and an IHA is not appropriate.[8] The information before the agency is already sufficient for the agency to determine that increased risk of ship strike and predation, and other direct and indirect effects resulting from these activities, have the potential to seriously injure or kill marine mammals. Accordingly, the applications must also be rejected because the regulations do not allow the agency to issue an IHA for such activities.

Even if the Fisheries Service were to consider these IHA applications, the Fisheries Service may issue an IHA only if the activity takes a "small number" of marine mammals and will have only a "negligible impact on the species or stock."[9] When issuing an IHA, the agency must use "the best scientific evidence available."[10] When authorizing take under the MMPA, the Fisheries Service must prescribe "methods" and "means of effecting the least practicable impact" on protected species and their habitat, as well as "requirements pertaining to the monitoring and reporting of such taking."[11] Complying with these requirements requires the agency to substantially revise the impact analysis presented in the pending applications, and to consider mitigation that matches the true scale of impact of the activities under review.

BACKGROUND

The Atlantic Ocean is a rich and important coastal environment that supports threatened and endangered species, marine mammals, commercial and recreational fisheries, and other recreational activities. The applicants' plans put this coastal environment at risk. This section briefly provides information about the MMPA and the potential harms of seismic airgun testing, from both acoustic and non-acoustic sources.

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meaningless unless the agency responds to significant points raised by the public."), *cert. denied*, 434 U.S. 829 (1977).

[6] Email from Craig Woolcott, Congressional Affairs Specialist, NOAA, to Congressional Offices, July 25, 2015 (attached as Exhibit 5).

[7] 16 U.S.C. § 1371.

[8] 50 C.F.R. § 216.106.

[9] 16 U.S.C. § 1371(a)(5).

[10] *Id.* § 1371(a)(3)(A).

[11] *Id.* § 1371(a)(5)(A)(ii), (D)(iv).

I. THE MARINE MAMMAL PROTECTION ACT.

The MMPA was adopted more than thirty years ago to ameliorate the consequences of human impacts on marine mammals. Its goal is to protect and promote the growth of marine mammal populations "to the greatest extent feasible commensurate with sound policies of resource management" and to "maintain the health and stability of the marine ecosystem."[12] A careful approach to management was necessary given the vulnerable status of many of these populations as well as the difficulty of measuring the impacts of human activities on marine mammals in the wild.[13] "[I]t seems elementary common sense," the House Committee on Merchant Marine and Fisheries observed in sending the bill to the floor, "that legislation should be adopted to require that we act conservatively—that no steps should be taken regarding these animals that might prove to be adverse or even irreversible in their effects until more is known. As far as could be done, we have endeavored to build such a conservative bias into the [MMPA]."[14]

The heart of the MMPA is its so-called "take" provision, a moratorium on the harassing, hunting, or killing of marine mammals.[15] Under the law, the Fisheries Service may grant exceptions to the take prohibition, provided it determines, among other things that such take would (a) take only small numbers of marine mammals and (b) have only a negligible impact on marine mammal species and stocks.[16] The "small numbers" and "negligible impact" determinations are legally separate and distinct requirements of the MMPA and may not be conflated.[17] Finally, in authorizing take under the MMPA, the Fisheries Service must prescribe "methods" and "means of effecting the least practicable impact" on protected species as well as "requirements pertaining to the monitoring and reporting of such taking."[18]

II. POTENTIAL HARMS FROM SEISMIC AIRGUN TESTING.

Sound is a fundamental element of the marine environment. Whales, fish, and other wildlife depend on it as a component of essential behaviors, such as breeding, feeding, navigating, and avoiding predators—in short, for their survival and reproduction. It is no exaggeration to say that the IHA applicants' proposed surveys would significantly degrade the acoustic environment of the Atlantic region. Additionally, the proposed surveys would increase the risk of serious injury or mortality from ship strikes and other direct and indirect effects resulting from the activity.

To survey for oil and gas, industry tows arrays of high-powered airguns behind ships, firing intense pulses of compressed air roughly every ten to twelve seconds, twenty-four hours per day, for days, weeks, or months on end. A large seismic airgun array can produce effective peak

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[12] *Id.* § 1361(6).
[13] *Id.* § 1361(l), (3).
[14] Report of the House Committee on Merchant Marines and Fisheries, *reprinted in* 1972 U.S. Code Cong. & Admin. News 4148.
[15] 16 U.S.C. § 1362(13).
[16] *Id.* § 1371(a)(5).
[17] *NRDC v. Evans*, 279 F.Supp.2d 1129, 1150–53 (N.D. Cal. 2003).
[18] 16 U.S.C. § 1371(a)(5)(A)(ii), (D)(vi).

sound pressures higher than those of virtually any other man-made source save explosives;[19] and although airguns sit vertically in the water column, their noise can propagate horizontally thousands of miles from any given survey,[20] making them significant contributors to low-frequency ambient noise in the ocean.

It is well established that the high-intensity pulses produced by airguns can cause a range of impacts on marine mammals, including broad habitat displacement, disruption of vital behaviors essential to foraging and breeding, loss of biological diversity, and, in some circumstances, injuries and mortalities. For example, scientists have shown that a single seismic survey can cause endangered fin and humpback whales to stop vocalizing—an essential behavior for breeding and foraging—and can cause baleen whales to abandon their habitat.[21] Sperm whale foraging success can decline significantly after exposure to airguns, with potentially serious long-term consequences.[22] Harbor porpoises are acutely sensitive to human sound sources and have been observed engaging in avoidance responses fifty miles from a seismic airgun array; harbor porpoises that remain closer to seismic arrays have been shown to suffer decrements in foraging success, even at relatively moderate levels of exposure.[23] Bowhead whales migrating through the Beaufort Sea have almost completely avoided areas where airguns were used and

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[19] Nat'l Research Council, *Ocean Noise and Marine Mammals* (2003). For a sample of some man-made noises in the ocean, see Emily Anthes, *When Fish Shout*, New Yorker, Nov. 10, 2014, http://www.newyorker.com/tech/elements/when-fish-shout.

[20] *See, e.g.*, S.L. Nieukirk et. al., *Low-Frequency Whale and Seismic Airgun Sounds Recorded in the Mid-Atlantic Ocean*, 115 J. Acoustical Soc'y *A*. 1832–43 (2004).

[21] *See*, e.g., Manuel Castellote et al., *Acoustic and Behavioral Changes by Fin Whales (*Balaenoptera physalus*) in Response to Shipping and Airgun Noise*, 147 Biological Conservation 115 (2012); S. Cerchio et al., *Seismic Surveys Negatively Affect Humpback Whale Singing Activity off Northern Angola*, 9 PLoS ONE e86464 (2014).C.W. Clark & G.C. Gagnon, *Considering the Temporal and Spatial Scales of Noise Exposures from Seismic Surveys on Baleen Whales* (IWC Sci. Comm. Doc. IWC/SC/58/E9) (2006); Correspondence from C.W. Clark to Michael Jasny, NRDC, (Apr. 2010); *see also* K. MacLeod. et al., *Abundance of Fin (Balaenoptera physalus) and Sei Whales (B. Borealis) Amid Oil Exploration and Development off Northwest Scotland*, 8 J. Cetacean Research & Mgmt. 247–54 (2006).

[22] P.J.O. Miller et al., *Using At-Sea Experiments to Study the Effects of Airguns on the Foraging Behavior of Sperm Whales in the Gulf of Mexico*, 56 Deep-Sea Research I 1168–81 (2009).

[23] *E.g.*, D.E. Bain & R. Williams, *Long-Range Effects of Airgun Noise on Marine Mammals: Responses as a Function of Received Sound Level and Distance* (IWC Sci. Comm. Doc. IWC/SC/58/E35) (2006); R.A. Kastelein et al., *Behavioral Avoidance Threshold Level of a Harbor Porpoise (Phocoena Phocoena) for a Continuous 50 kHz Pure Tone*, 123 J. Acoustical Soc'y Am. 1858–61 (2008); R.A. Kastelein, *The Influence of Acoustic Emissions for Underwater Data Transmission on the Behavior of Harbour Porpoises (Phocoena Phocoena) in a Floating Pen*, 59 Mar. Enviro. Res. 287–307 (2005); P.F. Olesiuk et al., *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*, 18 Mar. Mamm. Sci. 843–62 (2002).

have had their vocalizations disrupted.[24] 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 IHA applications that are now before you for review.

Similarly, airgun noise can also mask the calls of vocalizing whales over vast distances, substantially compromising their ability to communicate, feed, find mates, and engage in other vital behavior.[25] 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.[26] Indeed, the enormous scale of this acoustic footprint has been confirmed by studies in many regions of the globe, including the Arctic, the northeast Atlantic, Greenland, and Australia.[27] According to modeling from Cornell and NOAA, the highly endangered right whale is particularly vulnerable to masking effects from low-frequency sources given the acoustic and behavioral characteristics of its calls.[28] Repeated insult from airgun surveys, over months and seasons, would come on top of already urbanized levels of background noise and pose a threat to marine mammals at the population scale.

As discussed below, noise from the acoustic sources proposed by applicants can also injure and kill marine mammals, by causing injury close to the array or by inducing adverse secondary effects, such as increasing the risk of ship strike, stranding, or predation. Moreover, the Bureau and the Fisheries Service have recognized in each of their independent programmatic analyses,

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[24] G.W. Miller et al., *Whales, in Marine Mammal and Acoustical Monitoring of Western Geophysical's Open-Water Seismic Program in the Alaskan Beaufort Sea, 1998* (W.J. Richardson, ed.) (1999); W.J. Richardson et al., *Displacement of Migrating Bowhead Whales by Sounds from Seismic Surveys in Shallow Waters of the Beaufort Sea*, 106 *J. Acoustical Soc'y Am.* 2281 (1999).

[25] 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).

[26] *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.okeanos-stiftung.org/okeanos/download.php?id=19).

[27] S.L. Nieukirk et al., *Sounds from Airguns and Fin Whales Recorded in the Mid-Atlantic Ocean, 1999–2009*, 131 J. Acoustical Soc'y of America 1102 (2012); S.L. Nieukirk et al., *Low-frequency Whale and Seismic Airgun Sounds Recorded in the Mid-Atlantic Ocean*, 115 J. Acoustical Soc'y of America 1832 (2004); E.H. Roth et al., *Underwater Ambient Noise on the Chukchi Sea Continental Slope*, 131 J. Acoustical Soc'y of America 104 (2012); J. Gedamke, 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 (abstract).

[28] 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).

the "potential risk that survey vessels could strike and injure or kill marine mammals."[29] For example, the Programmatic Biological Opinion recognizes that Atlantic seismic surveying activities could cause injuries and mortalities to marine mammals, including critically endangered right whales, through non-acoustic sources, such as ship strikes.[30] And right whales are particularly prone to ship strikes.[31] Even one right whale death caused by humans would have adverse population-level effects, jeopardizing the survival of the species. Current anthropogenic activities already cause more than one right whale death per year: From 2008 through 2012, a minimum of 4.75 right whales were killed each year, including 3.85 deaths from fishery entanglement and 0.9 deaths from ship strikes.[32]

The same high-intensity pulses can also adversely affect marine mammal prey species. For example, airguns can dramatically decrease fisheries catch rates of various commercial and recreational fish species (by 40–80%) over thousands of square kilometers around a single array, indicative of substantial horizontal or vertical displacement.[33] One study found higher fish populations outside a seismic shooting area, indicating a long-term effect of seismic activity displacing fish away from these sound sources.[34] Decreased catch rates have led fishers in British Columbia, Norway, Namibia, and other jurisdictions to seek compensation for their losses from the industry.[35] Other effects on fish, derived largely from tests on other low-frequency noise

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[29] BOEM, Atlantic OCS Proposed Geological and Geophysical Activities Mid-Atlantic and South Atlantic Planning Areas Final Programmatic Environmental Impact Statement, Vol. I, at 2-40 ("There is a potential risk that survey vessels could strike and injure or kill marine mammals."); *see also* Fisheries Service, 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. ("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."); *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).

[30] Fisheries Service, *supra* note 28 at 158, 188 (2013), available at http://www.boem.gov/Final-Biological-Opinion-19-July-2013.

[31] Fisheries Service, *Recovery Plan for the North Atlantic Right Whale* IG-1 (August 2004).

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

[33] A. Engås et al., *Effects of Seismic Shooting on Local Abundance and Catch Rates of Cod (Gadus Morhua) and Haddock (Melanogrammus Aeglefinus)*, 53 Canadian J. Fisheries &Aquatic Sciences 2238–49 (1996); *see also* J.R. Skalski et al., *Effects of Sounds from a Geophysical Survey Device on Catch-per-Unit-Effort in a Hook-and-Line Fishery for Rockfish (Sebastes Ssp.)*, 49 Canadian J. Fisheries & Aquatic Sciences 1357–65 (1992).

[34] A. Slotte et al., *Acoustic Mapping of Pelagic Fish Distribution and Abundance in Relation to a Seismic Shooting Area off the Norwegian West Coast*.67 Fisheries Research 143–50 (2004).

[35] *See, e.g.*, British Columbia Seafood Alliance, *Fisheries and Offshore Seismic Operations: Interaction, Laison, and Mitigation: The East Coast Experience* (2004), *available at*

sources, include habitat abandonment, chronic stress, reduced reproductive performance, and hearing loss.[36]

DISCUSSION AND RECOMMENDATIONS

I. AS A THRESHOLD MATTER, THESE IHA APPLICATIONS SHOULD BE REJECTED BECAUSE THEY ARE INSUFFICIENT, AND IF THE FISHERIES SERVICE CONSIDERS THESE APPLICATIONS MORE TIME IS NEEDED FOR REVIEW.

A. The IHA Applications Should Be Rejected Because They Do Not Contain Sufficient Information For Evaluation.

For the many reasons described in these comments, the applications now under review are inadequate and incomplete. They fail, for example, to base their take estimate on best available science; fail to adequately describe the impact of the activity on marine mammal species and stock and their habitat; and fail to adequately describe the availability of equipment, methods, and other means of effecting the least practicable adverse impact on marine mammals, as the agency's regulations require. What is more, they are inconsistent in their use of models and methodologies, even while they propose using similar equipment in the same regions, affecting the same populations of animals. Proceeding would violate the agency's regulations; would effectively shift the burden of quantitative modeling and analysis to the agency, as it supplements what is missing from the applications; and would leave the Fisheries Service with plainly insufficient time to consider these and other comments submitted by the public, including the interested scientific community, at the agency's request.[37] Until the applicants have corrected these deficiencies, the Fisheries Service should deem the four pending applications inadequate and incomplete for purposes of further review.

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http://www.bcseafoodalliance.com/documents/Canpitt.pdf; Anonymous, Key issues and possible impacts of seismic activities on tunas, for the Large Pelagic and Hake Longlining Association in Namibia, presentation given at the Benguela Current Commission 5th Annual Science Forum, Sept. 24, 2013 (2013) (provided to NRDC by the Namibian Ministry of Fisheries and Marine Resources)

[36] R.D. McCauley et al., *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); R. McCauley et al., *High Intensity Anthropogenic Sound Damages Fish Ears*, 113 J. Acoustical Soc'y America 638–42 (2003); A.R. Scholik et al., *Effects of Boat Engine Noise on the Auditory Sensitivity of the Fathead Minnow, Pimephales promelas*, 63 Envt. Biology Fishes 203–09 (2002).

[37] *See, e.g.*, *Western Coal Traffic League v. United States*, 677 F.2d 915, 927 (D.C. Cir. 1982) ("An agency decision may not be reasoned if the agency ignores vital comments regarding relevant factors, rather than providing an adequate rebuttal."), *cert. denied* 459 U.S. 1086 (1982); *Home Box Office v. FCC*, 567 F.2d 9, 35 (D.C. Cir. 1977) ("The opportunity to comment is meaningless unless the agency responds to significant points raised by the public."), *cert. denied*, 434 U.S. 829 (1977).

B. The IHA Applications Should Be Rejected And LOA Applications Should Be Required.

Under the MMPA, the Fisheries Service may issue an IHA only if a proposed activity takes a "small number" of marine mammals and will have only a "negligible impact on the species or stock."[38] However, if a proposed activity could cause serious injuries or deaths to marine mammals, then the Fisheries Service must require a letter of authorization ("LOA") based on rule-making.[39] Given the risks of serious injury or mortality from direct and indirect effects of the proposed activities, including by the TDI-Brooks high-resolution survey, as described below, the Fisheries Service should carefully consider whether the proposed activities could cause marine mammal serious injuries or deaths. If an activity has the potential to seriously injure or kill marine mammals, then the seismic surveying companies must obtain a LOA.[40]

Seismic survey vessels moving to and from their surveying areas, and potentially during surveying, may strike, injure, and/or kill marine mammals. The agency's Programmatic Biological Opinion recognizes the potential for survey boats to strike whales, including critically endangered right whales: "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."[41] Additionally, airguns have the potential to displace marine mammals into areas where they stand a higher risk of ship-strike or predation; or to cause stranding (as the echosounder system proposed by TDI-Brooks is likely to have done off Madagascar, *see infra* under "Mitigation"); or to induce other behavioral effects that compromise an animal's survival. For example, airgun noise could disrupt or mask the low-amplitude contact calls that right whale mother-calf pairs use during the mother's foraging dives, leading potentially to separation. Accordingly, the applications must also be rejected because the MMPA does not allow the agency to issue an IHA for such activities.

C. More Time Should Be Granted For Review

The Fisheries Service's aims to review the and publish proposed IHAs in September 2015,[42] allowing at most a couple of weeks to read, incorporate, and modify its analyses on the basis of public comment. The agency must ensure sufficient time to incorporate these comments into its analyses for the draft IHAs for these activities. The Administrative Procedure Act ("APA") requires an agency to "give interested persons an opportunity to participate in [a] rule making through submission of written data, views, or arguments with or without opportunity for oral

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[38] 16 U.S.C. § 1371(a)(5).
[39] 50 C.F.R. § 216.106.
[40] 50 C.F.R. § 216.106. Because the activity could seriously harm or kill marine mammals, through ship strikes or entanglement, the Fisheries Service should consider requiring the companies to obtain LOAs instead of IHAs.
[41] Fisheries Service, *supra* note 41, at 158.
[42] Email from Craig Woolcott, Congressional Affairs Specialist, NOAA, to Congressional Offices, July 25, 2015 (attached as Exhibit 5).

presentation."[43] "After *consideration* of the relevant matter presented, the agency shall incorporate in the rules adopted a concise general statement of their basis and purpose."[44] Thus, the Fisheries Service must give the public the opportunity to comment, and the agency must consider the public's comments.[45] We urge the agency to take the time it needs to consider fully these comments and its analyses before issuing draft IHAs for these applications.

II. BEST AVAILABLE SCIENTIFIC INFORMATION AND APPROPRIATE USE OF SUCH INFORMATION.

Under separate cover, we have submitted documents that we believe represent best available scientific information on the impacts of seismic airguns, and other relevant acoustic sources, on marine mammals and marine mammal prey species, including those cited in this letter.[46] These documents are not intended to be comprehensive. Nonetheless, they represent a considerable body of evidence establishing the nature and magnitude of harms that can be caused by seismic airguns. We request that the Fisheries Service carefully consider these documents and take all of this evidence into account when reviewing the pending IHA applications. Any failure to do so would be arbitrary and capricious.

III. MODELING AND ANALYZING TAKES OF MARINE MAMMALS.

To ensure compliance with the MMPA, the Fisheries Service must carefully consider the potential takes of marine mammals before issuing a draft IHA. The issues listed here are essential to an accurate assessment of impacts from the proposed activities:

- Propagation Modeling
- Density Modeling
- Behavioral Take Thresholds

[43] 5 U.S.C. § 553(c).
[44] *Id.*
[45] *See, e.g., Western Coal Traffic League v. United States*, 677 F.2d 915, 927 (D.C. Cir. 1982) ("An agency decision may not be reasoned if the agency ignores vital comments regarding relevant factors, rather than providing an adequate rebuttal."), *cert. denied* 459 U.S. 1086 (1982); *Home Box Office v. FCC*, 567 F.2d 9, 35 (D.C. Cir. 1977) ("The opportunity to comment is meaningless unless the agency responds to significant points raised by the public."), *cert. denied,* 434 U.S. 829 (1977); *Lloyd Noland Hospital & Clinic v. Heckler,* 619 F. Supp. 1, 7 (N.D. Ala. 1984) ("This statute requires the agency to consider relevant comments and then incorporate a 'concise general statement' of the rule's 'basis and purpose.' The courts have interpreted this 'basis and purpose' requirement to mean that the agency must address, and if necessary rebut, significant comments made regarding a proposed rule.").
[46] The documents cited in Exhibit 11, except for *Nowacek et al. (in press),* which is not yet published, were compiled on a thumb drive and were delivered by mail to Jolie Harrison, Chief, Permits and Conservation Division, Office of Protected Resources, National Marine Fisheries Service, 1315 East-West Highway, Silver Spring, MD 20910.

- Auditory Thresholds
- Take Analysis for Other Acoustic Sources
- Masking Effects
- Impact Analysis for Right Whales
- Cumulative Impacts
- Serious Injuries and Mortalities, and
- Use of the Same Models for All Four IHA Applications.

A. Propagation Modeling

Sound propagation and noise attenuation in the ocean is a complex topic. In lieu of comprehensive regional and temporal sound propagation models, the Fisheries Service is likely to rely on some simple assumptions. Unfortunately, the assumptions made in the PEIS and applications fail to capture the spatial and temporal extent of airgun noise propagation and do not represent best available science.

First, the Fisheries Service, in modeling propagation loss, cannot assume that sound from the applicants' acoustic sources will spread spherically across the entire sound field. The PEIS and applicants assume that sound will indeed propagate spherically, i.e., in a hemispherical pattern away from the source as it would in an unbounded medium. Accordingly, they determine propagation loss by using the simple formula of 20log10 (r1/r2), where r1 is the reference distance (usually 1 meter) and r2 is the subject distance for evaluation. But this simplistic model falls far short of capturing even the basic propagation characteristics found in the sea, which presents at least five distinct propagation characteristics: Sagittal relative to the first incident wave, surface ducting, variable propagation in the mixed layer, cylindrical propagation in the SOFAR (Sound Fixing and Ranging) channel, and planar propagation along the seafloor.

For example, once the acoustical energy hits a boundary such as a thermocline or the seafloor, acoustic energy tends to spread in a cylindrical pattern wherein the attenuation formula is a more gradual 10log10 (r1/r2). In fact, there is some continuum between these attenuation conditions, so depending on the distance between the receiver and the source the attenuation formula may be closer to 17 dB to 13 dB as the sound spreads outwards. Additionally, noise may be concentrated within the water column through surface ducting, a secondary transmission path in the top boundary of the "mixed layer" above the marine thermocline. Although 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 within a surface duct are more consistent with the cylindrical model of 10log10r.

Additionally low-frequency propagation along the seabed can spread in a planar manner where attenuation over distance is even less than the cylindrical propagation model and, depending on benthic profile and composition, can propagate with significantly greater efficiently than cylindrical propagation would indicate.

The choice of spreading formula can have significant consequences for the Fisheries Service's take estimation, as can be seen from a simple propagation analysis. Transmission in the surface

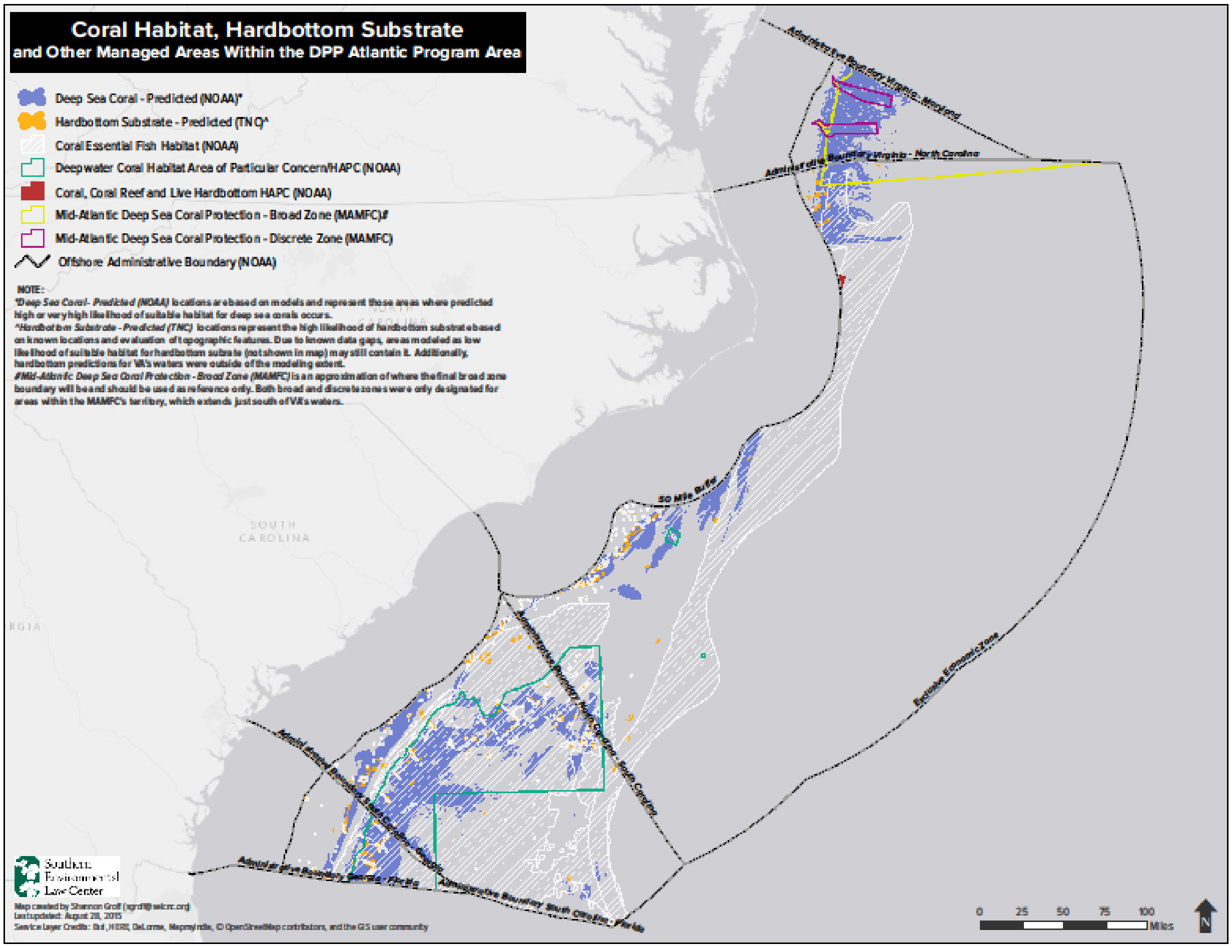

Fig. 1. A map of the Interior Department's Draft Proposed Program for offshore oil and gas development, as defined by the Bureau in January. Blue areas are highly or very highly likely to contain habitat suitable to deep-sea coral, according to NOAA modeling. The map does not include coral habitat outside the defined Draft Proposed Program area or off Virginia, so should be regarded as a conservative representation. (SELC, based on NOAA, TNC, and MAFMC data)

duct, along with the far-field cylindrical propagation, would require more than thirteen kilometers to attenuate to 180dB re:1μPa exposure level for cylindrical propagation:

229dB – 180dB = 41dB → 10log10 (1/13000) = -41dB

Or 1425 meters would be required given spherical to cylindrical spreading in the near-field mixed layer:

229dB – 180dB = 41dB → 13log10 (1/1425) = -41dB

Observer effectiveness over these ranges is not just impractical, it is improbable, especially in the low-visibility conditions in which the seismic vessels would often operate. It is clear that, in most situations, a large capacity survey cannot avoid subjecting marine mammals to Level A harassment exposures from either the surface ducting or the cylindrical propagation of acoustical energy, or from spherical to cylindrical spreading in the mixed layer.

Second, the Fisheries Service must not assume, as do at least some of the present applications (see TGS application at 7), that the proposed surveys will take place entirely in areas with soft or sandy bottoms. On the contrary, recent modeling of offshore areas by NOAA indicates a high likelihood of coral bottom habitat through a substantial portion of the proposed survey area, particularly along the shelf break and upper continental slope—areas that would be subject, in two of the proposed surveys, to higher densities of track-lines. (See Fig. 1, which shows NOAA-modeled coral bottom habitat within the Bureau's Draft Proposed Program, beginning 50 miles from shore.) As you know, hard bottom compositions, including coral bottoms, can significantly increase propagation of airgun noise, as a recent comparison between modeled sound exposure levels in soft- and hard-bottom areas off Central California illustrates.[47] The Fisheries Service, in preparing its take analysis, cannot assume that the proposed surveys will take place entirely in soft-bottom habitat, but conservatively must take the likely occurrence of coral bottom into account.

Third, the Fisheries Service must not assume that the noise received from each firing of a high-energy seismic array is a single pulse. Considering only reflected sound off the sea bottom and the direct noise from the hemispherical propagation, the receiver is hit with at least three distinct wave fronts: sagittal, surface-reflected, and bottom-reflected. All three transmission paths having different geometrical lengths as well as different transmission speeds due to temperature, pressure, and salinity factors. These three paths must be integrated into the Sound Exposure Level ("SEL") metric in the near-to-intermediate field.

Additionally, it is well established that, due to multipath transmission and reverberation effects, airgun pulses tend to elevate ambient noise in the far field across much or the entire inter-pulse interval. Because the noise would effectively be continuous over most of the sound field, take estimates (and mitigation) should be based on NMFS' Level B threshold of 120 dB (SPL) for "continuous noise" rather than its 160 dB (SPL) threshold for impulsive noise, assuming (against our recommendation) that the agency continues to rely on these outdated metrics to estimate take. Use of the 120 dB threshold is particularly appropriate, as opposed to the 160 dB threshold, since the surveys will likely be occurring around the clock.

The Fisheries Service should take all of these factors into account when modeling sound propagation for any draft IHAs.

B. Density Modeling

The use of reliable density estimates of marine mammals is essential to the Fisheries Service's impact analysis. To comply with the MMPA's mandate to use the "best scientific evidence available," the Fisheries Service should use the model produced by the Cetacean Density and

[47] J. Wood et al., PG&E Offshore 3-D Seismic Survey Project EIR: Marine Mammal Technical Report, Appendix H, Central Coastal California Seismic Imaging Project Final Environmental Report (2012) (CSLC EIR No. 758).

Distribution Mapping program for the Atlantic ("CetMap"), since it contains the most comprehensive and up-to-date information.

At the direction of NOAA, Duke University scientists earlier this winter produced density maps for cetaceans off the east coast of the United States and in the Gulf of Mexico, which, in fulfillment of CetMap's objectives, are "time- and species-specific, using survey data and models that estimate density using predictive environmental factors."[48] These maps are intended to replace earlier models, including the Navy Operating Area Density Estimates ("NODE") database and a habitat preference model produced previously by Duke. Indeed, the Bureau stated in Volume III of the PEIS that it "expects that the CetMap density data will be superior to the NODE database used for the calculations in the Programmatic EIS" and that it intended to use CetMap when available.[49]

Of the four IHA applicants, however, only TGS uses the CetMap model to estimate exposures of marine mammals to the noise produced by its proposed activities. Both the Spectrum and the ION applications incorporate marine mammal densities from the Navy's NODE estimates. This older model bases its density estimates on "the NMFS-Southeast Fisheries Science Center (SEFSC) shipboard surveys conducted between 1994 and 2006."[50] The density outputs from this database are four surface density plots for each season and each marine mammal species in the Western Atlantic Ocean.

But CetMap provides a more comprehensive and thorough estimate of marine mammal densities and distribution in the Atlantic than its predecessor models. First, the CetMap model incorporates nearly twice as many years of vessel survey data as NODE, covering the period 1992 to 2014, including, crucially, the last eight years that are considered by NOAA to be of greatest reliability.[51] Second, unlike NODE, CetMap supplements vessel survey data with aerial survey data over the same time periods. Given that some species exhibit vessel avoidance, aerial surveys can be an essential means of detecting and estimating marine mammal densities.[52] Aerial surveys are also an important component of marine mammal surveying because they allow for coverage of greater areas then ship-based surveys. One applicant proposing to conduct seismic surveys in the Atlantic Ocean has already used CetMap in its take estimates, meaning the remaining companies have the ability to conduct updated take estimates using the best models available.

[48] BOEM, *supra* note 41, at 1-28.
[49] BOEM, *supra* note 45, at E-71.
[50] BOEM, *supra* note 45, at E-26.
[51] J. Moore & R. Merrick, eds., *Guidelines for Assessing Marine Mammal Stocks: Report of the GAMMS III Workshop, February 15-18, 2011, La Jolla, California* (2011) (NOAA Tech. Memo. NMFS-OPR-47).
[52] Laird A. Henkel et al., *Comparison of Aerial and At-Sea Survey Methods for Estimating Abundance and Distribution Of Marbled Murrelets and Other Marine Birds and Mammals* (2006), *available at* http://www.car-spaw-rac.org/IMG/pdf/Comparison_of_aerial_and_at-sea_survey_methods_for_estimating_abundance_and_distribution_of_marbled_murrelets_and_other_marine_birds_and_mammals_Final_Report.pdf.

Therefore, the Fisheries Service should use CetMap to calculate marine mammal density and distribution.

C. Behavioral Take Thresholds

The Fisheries Service must use the "best scientific evidence available" and consider behavioral disturbances of marine mammals from sound sources below the existing thresholds.[53]

With the development of compact "Data Tags"[54] and the continued refinement of locational "passive acoustic monitoring," research scientists can now track animals over greater periods of time and across longer distances, allowing them to retrieve a continuous account of the tracked animal's response to a disruptive stimulus or document changes in the vocalizations of multiple animals over, in some cases, very large scales. With this expanded access to data, scientists are finding that behavioral disruptions are occurring at much lower noise exposure levels than what the Fisheries Service currently accepts as the threshold for Level B disturbances,[55] and at much larger distances than what on-board Marine Mammal Observers are capable of observing. These lower exposure levels and wider disturbance areas are particularly pertinent to the Atlantic Outer Continental Shelf plans because of the likelihood that multiple and concurrent seismic airgun surveys will disrupt larger proportions of marine mammal populations, and disrupt individual marine mammals more frequently, than what is assumed in the models presented in any of the IHA applications.[56]

Recent research on disruption thresholds has demonstrated, for example, that:

- Bowhead whales (*Balaena mysticetus)* increase call rates at initial detection of airguns at 94 dB re: 1µPa,[57] then decrease after 127 dB, and stop calling above 160 dB.[58]
- Harbor porpoise buzz rates, a proxy for foraging success,[59] decrease 15% with exposure to seismic airguns at 130–165 dB.[60]

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[53] *Id.* § 1371(a)(3)(A).
[54] Data tags or "DTAGS" are data logging devices that are attached to animals to record conditions such as depth, acoustical exposure, vector, temperature, and chemical conditions. Once fixed to a subject animal, DTAGS can intimately record the animal responses to environmental conditions such as noise exposure.
[55] 160dB_{RMS} re: 1µPa for behavioral disruption for impulsive noise (e.g., impact pile driving), 120dB_{RMS} re: 1µPa for behavioral disruption for non-pulse noise (e.g., vibratory pile driving, drilling).
[56] None of the IHA's under review includes the likelihood that surveys will be occurring simultaneously with other surveys. This perspective is solely under the purview of the Fisheries Service, which the agency must incorporate into the permit approval process. For inadequacy of the propagation models, including more accurate models for concurrent surveys, and continuous "reverberant" noise in the far field, see Comment of Michael Stocker, OCS, to Gary D. Goeke, BOEM (April 30, 2014) (attached as Exhibit 9).
[57] All decibels (dB) herein are referenced to 1 µPa.
[58] S.B. Blackwell SB et al., *Effects of Airgun Sounds on Bowhead Whale Calling Rates: Evidence for Two Behavioral Thresholds*, 10 PLoS ONE e0125720 (2015).

- Sperm whale buzz rates decrease by an average of 19% on exposure to airgun received levels above 130 dB.[61]
- Blue whale call rates increase with exposure to seismic "sparkers"[62] at 140 dB.[63]
- Fin whale call rates decrease and migratory disruption occurs when exposed to seismic airgun surveys at 175 to 285 km and noise levels below shipping noise.[64]
- Seismic survey activity disrupts the breeding display, or singing, of humpback whales across large areas of ocean.[65]
- Blue whales ceased calling on 143 dB exposure to airguns.[66]
- Fin whale and humpback whales stop vocalizing, and at least some are displaced, over an area of at least 100,000 square nautical miles near a seismic airgun source.[67]

In short, the best available evidence shows that seismic airguns behaviorally affect baleen whales across a range of behavioral states; namely foraging, breeding, and migrating at received levels and distances that vastly exceed what the Fisheries Service's regulatory thresholds account for. But airguns have also been shown to affect foraging behavior in odontocetes, including in sperm

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[59] Odontocete biosonar is characterized by siting clicks. Once the prey is sited the predator hones in on the prey in what sounds like a "buzz"—indicating a capture, and thus sustenance.
[60] E. Pirotta et al., *Variation in Harbour Porpoise Activity in Response to Seismic Survey Noise*, 10 Biol. Lett. 20131090 (2014), *available at* http://dx.doi.org/10.1098/rsbl.2013.1090.
[61] P.J.O. Miller et al., 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).
[62] A "sparker" is an electro-dynamic seismic impulse source that generates a loud electrical spark across a gap producing a plasma or vapor bubble that collapses and generates a low-frequency impulse.
[63] Lucia Di Iorio & Christopher W. Clark, *Exposure to seismic survey alters blue whale acoustic communication*, Biol. Lett. 6, 51–54 (2010).
[64] Manuel Castellote et al., *Acoustic and Behavioral Changes by Fin Whales (*Balaenoptera physalus*) in Response to Shipping and Airgun Noise*, 147 Biological Conservation 115 (2012).
[65] S. Cerchio et al., *Seismic Surveys Negatively Affect Humpback Whale Singing Activity off Northern Angola*, 9 PLoS ONE e86464 (2014).
[66] Mark A. McDonald et al., *Blue and Fin Whales Observed on a Seafloor Array in the Northeast Pacific*, 98 J. Acoustical Soc'y of America, 1 (1995).
[67] C.W. Clark & G.C. Gagnon, *Considering the Temporal and Spatial Scales of Noise Exposures from Seismic Surveys on Baleen Whales* (2006) (IWC Sci. Comm. Doc. IWC/SC/58/E9); C.W. Clark, pers. comm. with M. Jasny, NRDC (Apr. 2010); *see also* K. MacLeod et al., *Abundance of Fin (*Balaenoptera physalus*) and Sei Whales (*B. Borealis*) Amid Oil Exploration and Development off Northwest Scotland*, 8 J. Cetacean Research & Mgmt. 247 (2006). Similarly, one study found that a low-frequency, high-amplitude fish mapping sonar silenced humpback whales at distance of 200 km, where received levels ranged from 88 to 110 dB. D. Risch et al., *Changes in Humpback Whale Song Occurrence in Response to an Acoustic Source 200 km Away*, 7 PLoS ONE e29741 doi:10.1371/journal.pone.0029741 (2012).

whales and harbor porpoises, two very disparate odontocete species, at relatively low levels of exposure (above 130 dB).[68] Beaked whales, though never tested experimentally for their response to airgun noise, are known for their sensitivity to various types of anthropogenic sound, including to predominantly low-frequency sources such as vessels, and they alter or abandon their foraging and avoid sounds at levels of 140 dB and below.[69]

All of these disruptions indicate responses that would elevate metabolic stress,[70] cause displacement from areas of biological importance,[71] compromise interspecific communication, and interfere with foraging and other behaviors vital to overall health.

Currently, the lower threshold for Level B takes is 120 dB for continuous noises. However, in Blackwell et al. (2015),[72] calling rates of bowhead whales increased as soon as airgun pulses were detectable (with a cumulative sound exposure level, or $CSEL_{10min}$, of 94 dB re 1μPa^2-s), well below the Fisheries Service's current *continuous* exposure level threshold, let alone its 160 dB threshold for impulsive noise. That latter threshold, which is employed by all of the pending applications, is simply not supportable under any understanding of "best available science." Little if any of the above data describing behavioral disturbances below the 160 dB threshold were available in 1999, when the High Energy Seismic Survey panel issued the report on which the Fisheries Service purportedly based its threshold.[73] Since that time, the literature on ocean noise has expanded enormously due to appreciable increases in research funding from the U.S. Navy, the oil and gas industry, and other government and commercial funding sources. The evidentiary record for a lower threshold in this situation substantially exceeds the one for mid-

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[68] Researchers have also observed harbor porpoises to engage, in some circumstances, in avoidance responses fifty miles from a seismic airgun array, a result that is consistent with both captive and wild animal studies showing harbor porpoises abandoning habitat in response to pulsed sounds at low received levels. D.E. Bain & R. Williams, *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).

[69] N.A. Soto et al., *Does Intense Ship Noise Disrupt Foraging in Deep-diving Cuvier's Beaked Whales (*Ziphius cavirostris*)?*, 22 Mar. Mamm. Sci. 690 (2006); Pirotta, E., Milor, R., Quick, N., Moretti, D., Di Marzio, N., Tyack, P., Boyd, I., and Hastie, G., Vessel noise affects beaked whale behavior: Results of a dedicated acoustic response study, PLoS ONE 7(8): e42535. doi:10.1371/journal.pone.0042535 (2012). *See also* P.L. Tyack et al., *Beaked Whales Respond to Simulated and Actual Navy Sonar*, 6 PLoS ONE e17009 (2011), *available at* doi:10.13371/journal.pone.0017009; Cal. State Lands Comm., Draft Environmental Impact Report (EIR) for the Central Coastal California Seismic Imaging Project H-47 (2012) (CSLC EIR No. 758).

[70] Rosalind M. Rolland et al., *Evidence that Ship Noise Increases Stress in Right Whales*, Proc. R. Soc. B (2012), *available at* doi:10.1098/rspb.2011.2429.

[71] Manuel Castellote et al., *Acoustic and Behavioral Changes by Fin Whales (*Balaenoptera physalus*) in Response to Shipping and Airgun Noise*, 147 Biological Conservation 115 (2012).

[72] *Id.*

[73] High Energy Seismic Survey Team, High Energy Seismic Survey Review Process and Interim Operational Guidelines for Marine Surveys offshore Southern California (1999).

frequency sonar in *Ocean Mammal Institute v. Gates*,[74] in which a U.S. District Court judge invalidated a Fisheries Service threshold that ignored documented impacts at lower received levels as arbitrary and capricious.

The Fisheries Service must revise the thresholds and methodology used to estimate behavioral takes from airgun use. Specifically, we urge the following:

(1) Optimally, the Fisheries Service should employ a combination of specific thresholds for which sufficient species-specific data are available and generalized thresholds for all other species.[75] These thresholds should be expressed as linear risk functions, where appropriate, to account for intraspecific and contextual variability, just as the agency has done for years (using different risk functions, of course) in Navy authorizations.[76] Data from all species should be used to produce generalized thresholds for species lacking sufficient data.

(2) The Fisheries Service must revise its general, multi-species behavioral take threshold to reflect the best available science. An imminently forthcoming paper, whose authors include leading biologists and bioacousticians, concludes that, as a single threshold for cetaceans, a behavioral risk function centered at 140 dB (SPL) comes far closer to reflecting the extant literature on seismic airgun exploration than does the agency's ancient 160 dB threshold.[77] (The paper is to be released on Sept. 1, 2015.) For a general behavioral threshold, the Fisheries Service should adopt a risk function with a mid-point no higher than the 140 dB cited there.

(3) Should the Fisheries Service decline to revise its existing behavioral thresholds, it should appropriately use its threshold for continuous noise, rather than its threshold for impulsive noise, in estimating take. Fundamentally, the use of a multi-pulse standard for behavior harassment does not take into account the spreading of seismic pulses over the interpulse interval due to reverberation and multipath propagation. The continuous, or virtually continuous, nature of the airgun sound has been indicated by myriad sources: for example, in published and unpublished analyses of airgun noise propagation across the interpulse interval;[78] in several papers showing that seismic exploration in the Arctic, the east Atlantic, off Greenland, and off Australia produces virtually continuous ambient noise at vast distances from the array;[79] and by the Fisheries Service's former Open Water Panels for the Arctic,

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[74] 546 F. Supp. 2d 960, 973–75 (D.Hawaii 2008).
[75] By "thresholds," we mean either bright-line thresholds or linear risk functions.
[76] *See, e.g.*, 74 Fed. Reg. 4,844, 4,844–85 (Jan. 27, 2009).
[77] D.P. Nowacek et al., Marine Seismic Surveys and Ocean Noise: Time for Coordinated and Prudent Planning, *Frontiers in Ecology and the Environment* (in press).
[78] M. Guerra et al., *Quantifying Seismic Survey Reverberation off the Alaskan North Slope*., 130 J. Acoustical Soc'y of America 3046; pers. comm. with C. Clark (June 2015) (analysis of noise propagation in review).
[79] S.L. Nieukirk et al., *Sounds from Airguns and Fin Whales Recorded in the Mid-Atlantic Ocean, 1999–2009*, 131 J. Acoustical Soc'y of America 1102 (2012); S.L. Nieukirk et al., *Low-*

which twice characterized the seismic airgun array as a mixed impulsive/continuous noise source and stated that the Fisheries Service should evaluate its impacts on that basis.[80] Because airgun survey noise would be continuous over most of the sound field, the 120 dB "continuous noise" exposure threshold is far more appropriate than the 160 dB threshold for take estimation should the agency choose not to revise its existing standards.

(4) Finally, the Fisheries Service must consider that even behavioral disturbance can amount to Level A take, or to serious injury or mortality, if it interferes with essential life functions through secondary effects. For example, displacement from migration paths can result in heightened risk of ship strike or predation. This displacement should present a significant concern for right whales because their migratory path lies in the middle of the proposed seismic airgun survey area, and right whales are particularly susceptible to ship strike.[81]

D. Auditory Thresholds.

The Fisheries Service must set proper thresholds for Level A takes, particularly marine mammal hearing loss. Revised and updated noise exposure guidelines are currently under review by the Fisheries Service. The agency is currently revising its criteria for temporary and permanent auditory impacts[82] because the agency itself recognizes that the old acoustic thresholds are outdated. The Fisheries Service must also recognize that the old acoustic guidelines do not represent the "the best scientific evidence available."[83] Several of the signers to this letter, based on consultation and review by three bioacousticians, submitted extensive comments on the first draft criteria, which address, among other issues, new data that have appeared since the Southall et al. study was published in 2007. These include data indicating that harbor porpoises experience threshold shift on exposure to airgun signals at substantially

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frequency Whale and Seismic Airgun Sounds Recorded in the Mid-Atlantic Ocean, 115 J. Acoustical Soc'y of America 1832 (2004); E.H. Roth et al., *Underwater Ambient Noise on the Chukchi Sea Continental Slope*, 131 J. Acoustical Soc'y of America 104 (2012); J. Gedamke, 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 (abstract)..

[80] *Id.*; *see also* Expert Panel Review 2010.

[81] 59 Fed. Reg. 28,793; 80 Fed. Reg. 9,313; Fisheries Service, *Recovery Plan for the North Atlantic Right Whale IG-1* (August 2004).

[82] NOAA, Draft Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammals: Acoustic Threshold Levels for Onset of Permanent and Temporary Threshold Shifts (Dec. 23, 2013).

[83] 16 U.S.C. § 1371(a)(3)(A).

lower levels than the two mid-frequency cetaceans (bottlenose dolphins and beluga whales) previously tested.[84]

The Fisheries Service established the upper limit of Level B Takes under the rubric of an exposure that is likely to cause Temporary Threshold Shift (TTS). But here the threshold only refers to a compromise in the animal's sensitivity to signal amplitude without consideration for compromise in hearing acuity, which is an equally important component of healthy hearing. Research has revealed that while outer hair cells in the cochlea (which sense signal amplitude) do not seem to be damaged permanently by over-excitation, a TTS exposure can cause a loss of afferent nerve terminals and a delayed degeneration of the cochlear nerve, permanently compromising hearing acuity in terrestrial mammals.[85] Given that auditory structure and function is highly conserved across mammalian species, there is no reason to think that a comparable degeneration would not also occur in marine mammals. At least some auditory impacts that have previously been categorized as "Level B," because presumed recoverable, should be re-categorized as "Level A."

Hearing loss remains a significant risk where the agency does not require aerial monitoring as standard mitigation, fails to restrict operations in low-visibility conditions, sets safety zone boundaries that may be inadequate to protect high-frequency cetaceans, and does not firmly establish seasonal exclusion areas for biologically important habitat.

The Fisheries Service should take a conservative approach and apply the best available scientific evidence represented in a more precautionary standard for marine mammal hearing loss than is currently proposed.

E. Take Analysis for Other Acoustic Sources.

The Fisheries Service should consider the two following points in assessing impacts from non-airgun acoustic sources.

First, recent investigation into a mass stranding of melon-headed whales raises strong concerns about the impacts of some high-frequency acoustic systems proposed in the present applications. On May 30, 2008, a pod of some 100 to 200 whales stranded in Loza Lagoon, a large mangrove estuary on the northwest end of Madagascar; despite rescue efforts, at least half are believed to have died, with unknown consequences for the larger population. The report of an Independent Scientific Review Panel ruled out nearly all potential causes of this pelagic species entering the lagoon, and found that the "most plausible and likely behavioral trigger" was an industrial

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[84] K. Lucke et al., *Temporary Shift in Masked Hearing Thresholds in a Harbor Porpoise (*Phocoena phocoena*) after Exposure to Seismic Airgun Stimuli*, 125 J. Acoustical Soc'y of America 4060 (2009).
[85] H.W Lin et al., *Primary Neural Degeneration in the Guinea Pig Cochlea after Reversible Noise-induced Threshold Shift*, 12 J. Ass'n. Research Otolaryngology 605 (2011); S.G. Kujawa & M.C. Liberman, Adding Insult to Injury: Cochlear Nerve Degeneration after "Temporary" Noise-induced Hearing Loss, 29 J. Neuroscience 14077-2 (2009).

multibeam echosounder ("MBES") employed by Exxon, in close spatial and temporal association with the stranding event.[86]

The multibeam echosounder associated with that event, the Kongsberg Simrad EM120, has an output carrier frequency of 12 kHz, with 191 directional but overlapping sound beams, an across-track beam fan width of 150°, and an output source level of 236-242 dB (RMS). One of the present applicants, TDI-Brooks, has proposed to deploy a highly similar system, the Kongsberg Simrad EM122, which uses the same peak frequency at an even higher source level (245 dB (RMS))—and, indeed, deploying it from the very same vessel that operated the MBES system off Madagascar. As the Madagascar report found, such equipment could still easily propagate noise at levels above 120 decibels over a greater than 30 km radius even though MBES pulses are directed downwards towards the seafloor. Given the system's frequent noise output and the findings of the Madagascar report, the Fisheries Service should more appropriately apply its take threshold for continuous noise sources (120 dB) rather than its threshold for impulsive noise sources (160 dB) to this MBES system, assuming, again, that it persists in utilizing these old metrics for take estimation. Additionally, as noted below in the "Mitigation" section of these comments, the Fisheries Service must consider the potential for marine mammal stranding if this system is employed.

Second, two recent papers document the significant frequency "leakage" that can occur in some geophysical sound sources, particularly sources used in high-resolution surveys, such as echosounders, that combine high source levels with rapid rise times. The leakage is so significant that tested sources with peak frequencies at and above 200 kHz, well beyond the range of marine mammal hearing, produced substantial noise within marine mammal hearing ranges in much lower bands.[87] For example, a BioSonics sonar system produces 165 dB (SPL) in the 1/3-octave band centered at 20 kHz, and at comparable levels of sound across much of the frequency spectrum below 100 kHz. While these source levels are appreciably lower, at relevant frequencies, than those generated by sub-bottom profilers and other lower-frequency systems, their amplitude is sufficient to induce behavioral effects and contradicts the assumptions made in BOEM's PEIS, in its modeling of representative low-energy sources.[88]

Furthermore, the short rise times that these sources exhibit are correlated across mammalian species with startle response, raising concerns about sensitization. In a 2011 study, researchers demonstrated that sounds eliciting an acoustic startle response in captive grey seals were associated with "rapid and pronounced" sensitization, taking hold after only about three

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[86] 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.

[87] Deng, Z.D., Southall, B.L., Carlson, T.J., Xu, J., Martinez, J.J., Weiland, M.A., and Ingraham, J.M., 200 kHz commercial sonar systems generate lower frequency side lobes audible to some marine mammals, *PLoS ONE* 9(4): e95315.doi:10.1371/journal.pone.0095315 (2014); Hastie, G.D., Donovan, C., Götz, T., and Janik, V.M, Behavioral responses by grey seals (*Halichoerus grypus*) to high frequency sonar, *Marine Pollution Bulletin* 79: 205-210 (2014)..

[88] *See* PEIS at App. D-21 to D-33.

playbacks, whereas sounds that failed to induce a startle response did not sensitize the animals.[89] The startled seals then displayed sustained spatial avoidance, rapid flight responses, and "clear signs of fear conditioning," and, once sensitized, even avoided food that was proximate to the sound source. According to the authors, sounds with short rise times thus have "the potential to cause severe effects on long-term behavior, individual fitness and longevity of individuals in wild animal populations." In one of the more recent studies, the BioSonics sonar system discussed above produced a strong behavioral response in the same species, leading the researchers to conclude that it could produce startle responses, and therefore potentially sensitization, as well.[90] The Fisheries Service should consider the effects of short rise time from these (and other) sources.

F. Masking Effects.

The Fisheries Service should consider masking effects from the mixed impulsive/continuous noise source airguns because the best scientific evidence available demands this consideration. Masking of natural sounds begins when received levels rise above ambient noise levels at relevant frequencies, i.e., where one sound affects the perception of another sound.[91] As noted above, studies of airgun propagation in several regions around the world, and under varied propagation conditions, demonstrates that airguns raise ambient noise levels across the interpulse interval and can do so over enormous distances. The applications' failure to account in any way for masking effects renders them, as in so many other ways, inadequate and incomplete. Such consideration is essential to the agency's take, small numbers, and negligible impact findings, especially for species such as right whales, which are particularly vulnerable.

To assess masking effects, the Fisheries Service should implement the model developed by researchers at NOAA and Cornell that quantifies impacts on the communication space of marine mammals.[92] Researchers have already applied that published model to shipping noise off Massachusetts and off British Columbia.[93] And the same researchers involved in the Massachusetts study applied it to airgun surveys, finding, as in the case of shipping noise, that

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[89] Götz, T., and Janik, V.M, Repeated elicitation of the acoustic startle reflex leads to sensitisation in subsequent avoidance behaviour and induces fear conditioning, *BMC Neurosci* 12:30. doi:10.1186/1471-2202-12-30 (2011).

[90] Hastie et al., Behavioral responses by grey seals.

[91] C.W. Clark et al., *Acoustic Masking in Marine Ecosystems as a Function of Anthropogenic Sound Sources* (2009) (IWC Sci. Comm. Doc. SC/61/E10); C.W. Clark et al., *Acoustic Masking in Marine Ecosystems: Intuitions, Analysis, and Implication*, 395 Marine Ecology Progress Series 201 (2009); *see also* M. Castellote et al., *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).

[92] L.T. Hatch et al., *Quantifying Loss of Acoustic Communication Space for Right Whales in and around a U.S. National Marine Sanctuary*, 26 Conservation Bio. 983 (2012).

[93] Ibid.; R. Williams et al., Acoustic quality of critical habitats for three threatened whale populations, 17 *Animal Conservation* 174-85 (2014).

right whales were particularly vulnerable.[94] Additionally, researchers sponsored by British Petroleum, working with colleagues at the University of California and the North Slope Borough, have applied the model to an analysis of masking effects from seismic operations in the Beaufort Sea.[95] The best available science requires the Fisheries Service to incorporate the Cornell/NOAA model into its analysis.

G. Impact Analysis for Right Whales.

The North Atlantic right whale is considered one of the most endangered species of large whales in the world. Indeed, as the Fisheries Service has repeatedly stated, "the loss of even a single individual [right whale] may contribute to the extinction of the species" and "preventing the mortality of one adult female a year" may alter this outcome.[96] The Fisheries Service must make conservative assumptions in assessing the impacts of the proposed surveys on this species.

First, the Fisheries Service must consider the potential for serious injury and mortality in right whales, either from ship-strike by a seismic vessel or from the indirect effects of noise. Right whales are extremely vulnerable to ship-strike given their slow speeds, their occupation of waters near shipping lanes, and the extended time they spend at or near the water surface. 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);[97] 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.[98] Further, some types of anthropogenic noise have been shown to induce near-surfacing behavior in right whales,

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[94] C.W. Clark et al., *Acoustic Masking in Marine Ecosystems as a Function of Anthropogenic Sound Sources* (2009) (IWC Sci. Comm. Doc. SC/61/E10); C.W. Clark et al., *Acoustic Masking in Marine Ecosystems: Intuitions, Analysis, and Implication*, 395 Marine Ecology Progress Series 201 (2009).

[95] E. Fleishman & B. Streever, *Assessment of Cumulative Effects of Anthropogenic Underwater Sound: Project Summary and Status* 2 (2012).

[96] Endangered Fish and Wildlife; Advance Notice of Proposed Rulemaking (ANPR) for Right Whale Ship Strike Reduction, 69 Fed. Reg. 30,857, 30,858 (June 1, 2004); *see also* Endangered Fish and Wildlife; Final Rule to Implement Speed Restrictions to Reduce the Threat of Ship Collisions with North Atlantic Right Whales, 73 Fed. Reg. 60,173, 60,173 (Oct. 10, 2008); Taking of Marine Mammals Incidental to Commercial Fishing Operations; Atlantic Large Whale Take Reduction Plan, 72 Fed. Reg. 34,632, 34,632 (June 25, 2007); Marine Mammals; Atlantic Large Whale Take Reduction Plan (ALWTRP) Regulations; Seasonal Area Management (SAM) Program, 66 Fed. Reg. 50,390, 50,392 (Oct. 3, 2001).

[97] M.J. Moore et al., Morphometry, *Gross Morphology and Available Histopathology in North Atlantic Right Whale (*Eubalena glacialis*) Mortalities (1970-2002*), 6 Journal of Cetacean Research and Management 199-214 (2004).

[98] R.R. Reeves et al., *Report of the North Atlantic Right Whale Program Review, 13–17 March 2006, Woods Hole, Massachusetts* (2007) (prepared for the Marine Mammal Commission).

increasing the risk of ship-strike at relatively moderate levels of exposure.[99] It is possible that mid-frequency sub-bottom profilers and broadband airguns could produce the same effects, and both should be treated conservatively. Additionally, studies of other baleen whale species, including migratory bowhead whales, indicate that airgun noise can induce substantial displacement, by tens of kilometers (see above). In 2008, the Fisheries Service issued a rule to protect right whales from ship strikes by limiting vessel speed to less than ten knots in certain areas, known as Seasonal Management Areas or Dynamic Management Areas. If airgun surveys push a right whale out of a Seasonal Management Area or Dynamic Management Area, that whale may enter an area where vessels are traveling at a greater speed, presenting a greater danger of ship strikes.[100]

Second, the agency must account for the importance of right whale habitat in the region. The U.S. mid- and southeast Atlantic regions contain both the majority of the right whale's migratory corridor and the species' only known calving grounds. The Fisheries Service has characterized the latter as "a location vital to the population" and "a very high-risk area for pregnant females, new mothers, and calves."[101] 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.[102] 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.[103] Earlier this year, the agency proposed expanding this critical habitat designation to include areas within approximately forty miles of the coastline running from Cape Fear, North Carolina to forty-three miles north of Cape Canaveral, Florida.[104] In doing so, the agency explained that the calving, nursing, and rearing areas off the coasts of Florida, Georgia, South Carolina, and North Carolina are part of "the *only* known calving ground for right whales, and that the most biologically valuable portion of the species' population is utilizing this habitat."[105]

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[99] D.P. Nowacek et al., *North Atlantic Right Whales (*Eubalaena glacialis*) Ignore Ships but Respond to Alerting Stimuli,* 271 Proceedings of the Royal Society of London, Part B: Biological Sciences 227-231 (2004).
[100] See elsewhere in these comments for discussion of other potential indirect effects on right whales.
[101] Fisheries Service, Final Environmental Impact Statement to Implement Vessel Operational Measures to Reduce Ship Strikes to North Atlantic Right Whales at 4-4 (Aug. 2008).
[102] *See* 59 Fed. Reg. 28,793, 28,803 (June 3, 1994).
[103] *See, e.g.*, Endangered Fish and Wildlife; Final Rule to Implement Speed Restrictions to Reduce the Threat of Ship Collisions With North Atlantic Right Whales 73 Fed. Reg. 60,173; Taking of Marine Mammals Incidental to Commercial Fishing Operations; Atlantic Large Whale Take Reduction Plan, 72 Fed. Reg. 34,632 (June 25, 2007).
[104] Fisheries Service, Endangered and Threatened Species; Critical Habitat for Endangered North Atlantic Right Whale, 80 Fed. Reg. 9,313, 9,319 (proposed Feb. 20, 2015). A map of the proposed area is included as Exhibit 8. *See also* Comment from Margaret Cooney, IFAW, to Mary Colligan, Assistant Regional Administrator of NMFS Protected Resources Division, Apr. 21, 2015 (attached as Exhibit 6).
[105] *Id.*

Right whales occupy waters well beyond the areas current designated or proposed as critical habitat. A recent passive acoustic study from Cornell University's Bioacoustics Research Program indicates a year-round presence of critically endangered right whales off the coasts of Virginia and Georgia. The study found that, between sixteen and *at least* sixty-three nautical miles off Virginia's coast, right whales are present throughout the year with peak concentrations occurring from mid-January through late March and with some of the most frequent occurrence found further offshore.[106] The study made similar findings for right whales off the Georgia coast. Given this, it is reasonable and conservative to expect similar right whale occurrence throughout the region. The new evidence of offshore presence is consistent with the findings of the CetMap working group established by NOAA, which recently identified a "biologically important" migratory corridor and calving area that is substantially broader than the critical habitat designated by NOAA.[107]

Third, the Fisheries Service must account for long-range behavioral disruption in modeling take and assessing impacts on right whales. The seasonal closures proposed by the Bureau in the PEIS are insufficient to protect the species. These closure areas do not include the new areas proposed by the Fisheries Service as right whale critical habitat, let alone the migratory corridor and calving grounds designated as biologically important by the CetMap working group and identified as having virtually year-round right whale presence by the recent Cornell study. Although the Bureau commits itself, in the PEIS, to seasonally avoid all right whale critical habitat, there is no indication that the Fisheries Service, which has been sued for unlawful delay in the matter, will have revised its critical habitat designation before the proposed seismic surveys would begin. Regardless, as discussed elsewhere in these comments, a single seismic source can significantly disrupt right whale behavior and reduce right whale communication on a population scale. Multiple studies demonstrate large-scale impacts across a range of baleen whale species and a variety of behavioral contexts; and modeling from Cornell and NOAA shows the right whale is particularly vulnerable to masking effects from low-frequency ambient noise given the acoustic and behavioral characteristics of its calls.[108]

Fourth, the Fisheries Service must consider impacts from all reasonably foreseeable activities—including but not limited to other activities for which MMPA authorizations have been issued—in making its determinations. For example, the Fisheries Service estimated that current Navy sonar activity in the Atlantic Ocean could cause sixty instances of temporary hearing loss and

[106] Aaron Rice et. al., *Acoustic Ecology of North Atlantic Right Whales off of the Virginia Coast: Data Quality and Initial Right Whale Presence Results* (Oct. 2013) (attached as Exhibit 10). This 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, November 14, 2013.
[107] E. LaBrecque et al., Biologically Important Areas for Cetaceans within U.S. Waters—East Coast Region, 41(1) *Aquatic Mammals* 17-29 (2015).
[108] 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.

fifty-one takes by behavioral harassment per year.[109] Beyond the four applications at issue, the Bureau estimates hundreds of thousands of additional line kilometers of surveys over the next six years. And 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—and that already reduces their communication space and increases their metabolic stress levels.[110] The aggregate of these effects, along with the effects of seismic surveying in the U.S. East Coast, could cause significant long-term cumulative effects on right whales.

Given the vulnerability of the species, the Fisheries Service must conservatively apply the best available science in determining the impacts of the proposed activities.

H. Cumulative Impacts.

The Fisheries Service must properly analyze the cumulative impacts of the proposed surveys on marine populations and species. As 75 ocean scientists recently stated with respect to the Atlantic Coast, seismic activity will have "significant, long-lasting and widespread impacts on the reproduction and survival" of threatened whales and commercial fish populations.[111] Many of the signatories are prominent experts in marine bioacoustics and in the biology of marine mammals, fish, and other species. Yet the PEIS that BOEM prepared, despite estimating that geophysical surveys will disrupt vital marine mammal behavior more than 13 million times over the initial six-to-seven years, makes no serious effort to analyze the cumulative population-level effects of these impacts.

In other regions, managers and researchers have begun producing quantitative assessments of the population consequences of human disturbance on marine mammals. For example, researchers at the University of St. Andrews have analyzed the impacts of North Sea wind farm construction on the area's harbor porpoise population, and have determined, based on studies of pile-driving impacts on harbor porpoise foraging, that predicted levels of construction would cause a 12-13 percent population decline over 12 years. Notably, the researchers observed that such a decline was likely to go undetected through current monitoring efforts, and also that the noise-quieting mitigation required by the German government would very significantly curb the decline to under 1 percent.[112] We already have the tools to model the aggregate effects of human noise on marine mammal populations and, where uncertainties exists, alternatives such as expert

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[109] Fisheries Service, 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, 73,055 (Dec. 4, 2013).
[110] Rosalind M. Rolland et al., *Evidence that Ship Noise Increases Stress in Right Whales*, Proc. R. Soc. B doi:10.1098/rspb.2011.2429 (2012).
[111] Letter from Scientists to Obama re Atlantic Seismic (March 5, 2015), *available at* http://docs.nrdc.org/wildlife/files/wil_15030401a.pdf.
[112] U.K. Verfuss et al., *Does Noise Mitigation Matter? Population Consequences of Piling Noise on Marine Mammals* (2014) (presentation given at IMCC Noise Workshop, Glasgow, Aug. 13, 2014).

solicitation are available.[113] The impact assessment provided thus far, in the Bureau's PEIS, is conclusory, and, as the scientists' letter indicates, completely out of line with the determination of some of the leading experts in the field.

The four proposed surveys would take place over the same time period in the same region, and adversely affect the same populations with similar technologies. Furthermore, they would be occurring within a broader context of increased seismic surveys, with applications from other seismic companies already pending before BOEM and possibly before the Fisheries Service itself, and of offshore Navy activity, which take the Fisheries Service has already authorized in high numbers through 2018. The Fisheries Service's past practice of avoiding consideration of cumulative impacts and population-level analysis is not acceptable here. The agency must analyze cumulative impacts on each affected marine mammal population in the region, both in making its "negligible impact" determinations and in satisfying its independent NEPA responsibilities.

I. Serious Injuries and Mortalities.

Because of the risks of serious injury or mortality from near-shore operations, including by the TDI-Brooks high-resolution survey, and from indirect effects, the Fisheries Service should carefully consider whether the proposed activities could cause marine mammal serious injuries or deaths. If an activity could seriously harm or kill marine mammals, then the seismic surveying companies must obtain a LOA.[114]

Seismic survey vessels moving to and from their surveying areas, and potentially during surveying, may strike, injure, and/or kill marine mammals. The agency's Programmatic Biological Opinion recognizes the potential for survey boats to strike whales, including critically endangered right whales: "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."[115] Additionally, airguns have the potential to displace marine mammals into areas where they stand a higher risk of ship-strike or predation; or to cause stranding (as the echosounder system proposed by TDI-Brooks is likely to have done off Madagascar, *see infra* under "Mitigation"); or to induce other behavioral effects that compromise an animal's survival. For example, airgun noise could disrupt or mask the low-amplitude contact calls that right whale mother-calf pairs use during the mother's foraging dives, leading potentially to separation. As discussed above, the loss of even one right whale would have adverse population-level effects. The Fisheries Service must consider the risk of serious injury or mortality posed by the proposed activities.

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[113] See, e.g., S.L. King et al., *An Interim Framework for Assessing the Population Consequences of Disturbance*, Methods in Ecology and Evolution doi: 10.1111/2041-210X.12411 (2015).

[114] 50 C.F.R. § 216.106. Because the activity could seriously harm or kill marine mammals, through ship strikes or entanglement, the Fisheries Service should consider requiring the companies to obtain LOAs instead of IHAs.

[115] Fisheries Service, *supra* note 41, at 158.

J. Use the Same Models for All Four IHA Applications.

Finally, for each category of models required for the IHAs, including marine mammal density, sound propagation, and take models, the Fisheries Service should ensure consistency in the models used so that the impacts can be evaluated in a uniform manner. The reason behind the request for model consistency is three-fold: (1) managers can analyze the impacts to marine mammals more thoroughly and completely if all companies use one set of models; (2) the public can compare the subsequent draft IHAs to look at cumulative impacts more easily; and (3) application of the same models for similar activities affecting the same populations is essential to ensure use of the best available science.

IV. MITIGATION REQUIREMENTS.

It is not sufficient for the Fisheries Service, in fulfilling its mitigation requirements under the MMPA, to simply prescribe safety zones and ramp-up procedures. Such measures, while helpful in reducing risk of near-source injury, are incommensurate to the scale of impact of the acoustic sources here under review. Compliance with the MMPA's "small numbers" and "negligible impact" standards and "least practicable adverse impact" requirement requires the agency to effectively mitigate the long-range, cumulative effects of this profoundly controversial activity. The Fisheries Service should (1) reduce the environmental footprint of acoustic sources; (2) minimize the amount of seismic airgun activity; and (3) use area closures to protect important species and habitat. In addition, it should use best practices in defining operational mitigation.

A. Reduce the Environmental Footprint of Acoustic Sources.

Given the distances over which airgun noise, and the sound from certain other acoustic sources, are known to affect marine mammals, it should be a primary aim of the Fisheries Service's mitigation to minimize the acoustic footprint of the proposed surveys. To this end, the agency should, for example, (1) require use of commercially available quieting technologies for airguns; (2) require attainment of lowest practicable source levels; and (3) carefully select the multibeam echosounders that the companies may use.

1. Quieting Technologies for Airguns.

Quieting technologies are among the most promising means of mitigating ocean noise, with potentially significant long-term reductions in cumulative exposures and impacts on marine species. Industry experts and biologists participating in a September 2009 workshop 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 quieting technologies were technically feasible and could be made available for commercial use within a few years; and that governments should accelerate development and use of these technologies through both research and development funding and regulatory engagement.[116] A 2007 report by

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[116] 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. (Weilgart, L. ed. 2010), *available at* www.okeanos-stiftung.org/okeanos/download.php?id=19.

Noise Control Engineering reached similar conclusions,[117] and, in 2013, the Bureau hosted an international workshop focused in substantial part on seismic as a target for mitigation.

A number of new technologies are now on the horizon of commercial availability. Perhaps the best known is marine vibroseis, a vibratory source that could, by spreading the acoustic energy embedded in a short airgun pulse over several seconds, significantly reduce effective source levels and all but eliminate acoustic output above 100 Hz, which is waste energy for geophysical exploration. A Geo-Kinetics system was field-tested in the Gulf of Mexico last January for shallow-water application, and may be available for commercial deployment at the end of the calendar year.[118] Three other vibroseis systems are in Joint Industry Program development under the terms of the *NRDC v. Jewell* settlement agreement.[119] The environmental superiority of such systems is indicated in a forthcoming technical paper from Curtin University modelers, funded by the International Fund for Animal Welfare: it reports general reductions in both SPL and SEL exposures from an experimental vibroseis system, as compared with a similarly sized airgun array, across several operational scenarios.

Other quieting technologies include modified airguns, including Bolt's new "e-source" airguns, which promise reductions in noise output of 15 dB or more in frequencies above 80–120 Hz, and which will be available for delivery by the end of the calendar year;[120] and BP's "staggered-fire" (or "popcorn") method of seismic acquisition, which could reduce amplitudes by as much as 20 dB.[121] Nor is this list comprehensive.[122] The MMPA requires consideration of equipment and equipment modifications that would reduce impacts on marine mammals.[123] *At minimum*, the Fisheries Service must consider requiring applicants to use the new Bolt airguns, which have been publicly advertised since late 2014 and will be commercially available during the proposed survey periods. It should also investigate the availability of the Geo-Kinetics system for part or all of the proposed surveys.

[117] J, Spence et al., *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).
[118] Pers. comm. from M. Jasny, NRDC, with B. Pramik, Geo-Kinetics (Apr. 2015).
[119] Settlement Agreement, *NRDC v. Jewell*, Case. No. 2:10-cv-01882 (E.D. La.) (settlement entered June 24, 2013).
[120] Bolt Technology Corporation, Engineered for the Marine Environment: The World's Ffirst Bandwidth-controlled airgun, *available at* www.bolt-technology.com/pages/product_esource.htm (last visited Aug. 28, 2015); Teledyne Bolt, eSource Introduction (undated PowerPoint presentation).
[121] A. Ross & R.L. Abma, Offshore Prospecting Signal Processing Controlled Source Signaling, US Patent 20,120,147,701, June 14, 2012, *available at*: http://www.faqs.org/patents/app/20120147701 (accessed June 2014).
[122] *See, e.g.*, J.Y. Guigné et al., *Acoustic Zoom High-resolution Seismic Beamforming for Imaging Specular and Non-specular Energy of Deep Oil and Gas Bearing Geological Formations*, 21 J. Natural Gas Science & Engineering 568 (2014).
[123] *See, e.g.*, 16 U.S.C. § 1371(a)(5)(A)(ii)(I); 50 C.F.R. § 216.104(a)(11).

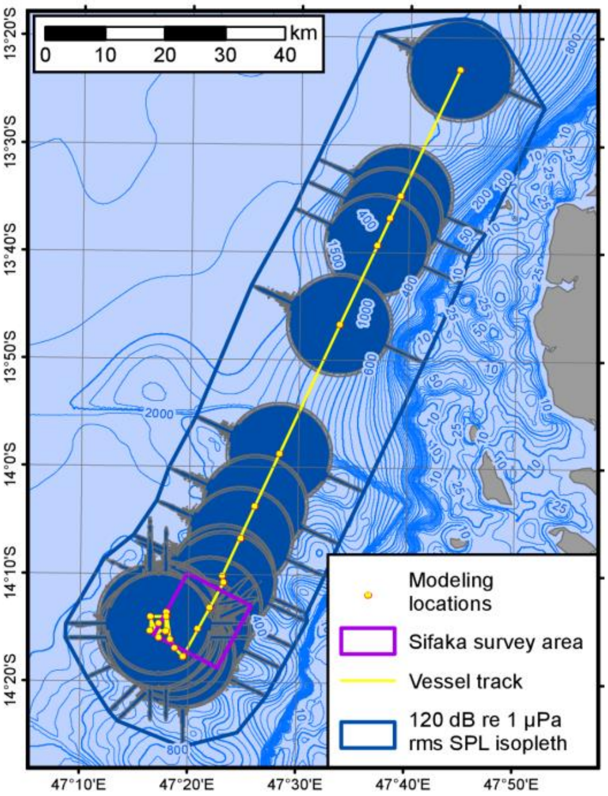

Fig. 2. Modeling of the EM 120 system off the Madagascar coast (Southall et al. 2013).

2. Lowest Practicable Source Levels.

The Fisheries Service should (a) require operators to reduce the effective source levels of their surveys to the lowest practicable level, and provide a transparent standard and oversight mechanism to ensure compliance; and (b) require operators to calibrate their airgun arrays before beginning a survey in order to minimize horizontal propagation of the noise signal, and report field-checked source levels to the agency for purposes of transparency and compliance. Pursuant to the settlement agreement in *NRDC v. Jewell*, the Bureau is presently developing a standard for determining lowest practicable source levels, which is likely to be included in the Programmatic Environmental Impact Statement that the agency develops for Gulf of Mexico geophysical surveys; but the Fisheries Service has an independent obligation under the MMPA to minimize impacts of Atlantic seismic surveys on marine mammals, and it legally cannot and must not wait for the Bureau to finalize its own standards. Additionally, as with the Arctic, the Fisheries Service should prescribe a protocol for in-field sound source validation, both for minimizing horizontal propagation and for verifying source level estimates.

3. Selection of Multibeam Echosounders.

Similarly, the Fisheries Service must prescribe available quieting technology for other acoustic sources that are likely to cause impacts to marine mammals. TDI-Brooks proposes using a multibeam echosounder, the Kongsberg EM 122, whose peak frequency of 12 kHz is far below that of virtually all MBES systems on the market,[124] and well within the range of best hearing for many cetaceans. Indeed, the relevant characteristics of the Kongsberg system, with a nominal source level of 245 dB (SPL), are comparable with some hull-mounted naval sonar systems, e.g., the AN/SQS-25. Even though echosounders, as opposed to military sonar systems, are directed towards the seafloor, such equipment could still easily propagate noise at levels above 120 dBs over a 30–35 km diameter, as a report on an associated mass stranding involving a nearly identical system, with a smaller nominal source level, found (see Fig. 2). As TDI-Brooks notes in its application, a less powerful Kongsberg system, the EM 302, whose peak frequency of 30 kHz

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[124] *See, e.g.*, Kongsberg Maritime, *Multibeam echosounders, available at* http://www.km.kongsberg.com/ks/web/nokbg0240.nsf/AllWeb/620F423FA7B503A7C1256BCD0023C0E5?OpenDocument (last visited Aug. 28, 2015).

would attenuate far more rapidly than that of the proposed system, would cover most of the area the applicant wishes to survey; indeed, that system, according to Kongsberg, is capable of operating to water depths of 7000m. Better still, the EM 710 MKII, which can survey water depths to 2000m, would still cover the majority of the proposed study area, including waters on the shelf break and upper slope that are likely to have higher densities of multiple cetacean species.[125]

Moreover, the Fisheries Service may not be able to authorize use of the Kongsberg system under an IHA. On May 30, 2008, a pod of some 100 to 200 whales stranded in Loza Lagoon, a large mangrove estuary on the northwest end of Madagascar; despite rescue efforts, at least half are believed to have died, with unknown consequences for the larger population. The report of an Independent Scientific Review Panel ruled out nearly all potential causes of this pelagic species entering the lagoon, and found that the "most plausible and likely behavioral trigger" was the similar Kongsberg EM 120 system employed by Exxon, in close spatial and temporal association with the stranding event.[126] (TDI-Brooks proposes using the very same vessel that was used in that event.) Lamont-Doherty Earth Observatory employed a comparable multibeam sonar system—with a center frequency of 15.5 kHz and associated source levels of 237 dB—in a research survey prior to the Gulf of California beaked whale stranding in September 2002, which the survey closely correlated with and may have played a role in that event as well.[127] TDI-Brooks proposes using the system close to the Florida coastline, not substantially further than the roughly 25km distance at the Madagascar system's closest approach to land, with the potential of driving pelagic species, with high acoustic sensitivity at 12 kHz, close to shore, where they would experience heightened stranding risk.

Given the evident potential for stranding and mortality, we do not believe that the Fisheries Service can legally use an IHA to cover deployment of the EM 120 system for the entire proposed study area. In any case, the Fisheries Service should require use of a less powerful system pursuant to the mitigation provision of the MMPA

B. Minimize the Amount of Seismic Airgun Activity.

Given the extraordinarily large spatial scales over which airgun noise propagates, the most effective available mitigation measures involve reducing the acoustic footprint of the activity (previous section) or reducing the amount of the activity (this section).[128] The Fisheries

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[125] *Id.*

[126] B.L. Southall et al., 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 (2013).

[127] T.M. Cox et al., *Understanding the Impacts of Anthropogenic Sound on Beaked Whales*, 7 *J. Cetacean Res. Manage.* 177 (2006); J. Hildebrand, *Impacts of Anthropogenic Sound*, *in* T.J. *Marine Mammal Research: Conservation beyond Crisis* 101 (Ragen et al., eds. 2006).

[128] Time-area closures also have significant value, but are likely to be less effective at mitigating loss of communication space and reducing the long-distance behavioral responses, such as changes in vocalization, documented especially in baleen whales.

Service's continued reliance on an outdated, irrational, and non-conservative threshold, the 160 dB step-function for behavioral harassment, impedes proper application of the MMPA's "small numbers" provision in determining how much seismic activity is allowable under law. As noted above, a series of recent papers demonstrates impacts at far lower received levels, in a range of species and across a variety of behavioral contexts, than the Fisheries Service presently assumes; and a forthcoming paper whose authors include some of the world's leading biologists and bioacousticians concludes that, as a single threshold for cetaceans, a behavioral risk function centered at 140 dB (SPL) comes far closer to reflecting the extant literature on seismic airgun exploration than does the agency's ancient 160 dB threshold.[129] Should the Fisheries Service adopt that behavioral risk function, in line with the best available science, the scale of the proposed geophysical surveys—two of which separately propose more than 60,000 line-kilometers of high-energy seismic in a single year—would almost certainly, and rightly, decrease.

Other means to reduce the amount of seismic activity in a given year include, but are not limited to, setting a limit on the amount of total annual activity allowable from all proposed seismic survey activity in the Atlantic; or requiring applicants to share data.

C. Use Area Closures to Protect Important Species and Habitat.

To satisfy the MMPA's "small numbers," "negligible impact," and "least practicable adverse impact" standards, the Fisheries Service should also use area closures in sensitive areas to protect marine mammals and their habitats.

1. Right Whale Seasonal Closure.

As noted above, a number of studies produced over the last three years demonstrate that industrial airguns impact important behaviors of baleen whales over extraordinarily large spatial scales. These studies include Blackwell et al.'s 2013 and 2015 papers on seismic impacts on migrating bowhead whales;[130] Castellote et al.'s 2012 study on the impacts of seismic airguns on (presumably) foraging fin whales;[131] and Cerchio et al.'s 2014 paper on seismic impacts on breeding humpback whales;[132] and these papers are consistent with several others showing impacts over large areas (e.g., Clark and Gagnon 2008 and Di Iorio and Clark 2010).[133] In short,

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[129] D.P. Nowacek et al., *Marine Seismic Surveys and Ocean Noise: Time for Coordinated and Prudent Planning*, Frontiers in Ecology and the Environment (in press).
[130] S.B. Blackwell et al., *Effects of Airgun Sounds on Bowhead Whale Calling Rates in the Alaskan Beaufort Sea*, 29 Marine Mammal Science E342 (2013); S.B. Blackwell et al., *Effects of Airgun Sounds on Bowhead Whale Calling Rates: Evidence for Two Behavioral Thresholds*, 10 PLoS ONE e0125720 (2015), *available at* doi:10.1371/journal.pone.0125720.
[131] M. Castellote et al., *Acoustic and Behavioural Changes by Fin Whales (*Balaenoptera physalus*) in Response to Shipping and Airgun Noise*, 147 Biological Conservation 115 (2012).
[132] 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).
[133] *E.g.*, C.W. Clark & G.C. Gagnon, *Considering the Temporal and Spatial Scales of Noise Exposures from Seismic Surveys on Baleen Whales* (2006) (IWC Sci. Comm. Doc.

whether measured by distance (e.g., greater than 100 km, as in the case of Castellote et al. (2012)) or exposure levels (e.g., below 120 dB, as in the case of the Blackwell papers), the nominal impact area from any single survey encompasses a substantial part of the right whale's migratory corridor and/or calving grounds. Right whales are also particularly vulnerable to masking effects, which are occasioned by reverberation and the spreading of the airgun pulse through multi-path propagation, and which can, likewise, occur over vast distances.[134] The seasonal closure that the Bureau proposed in its PEIS is predicated on a smaller impact area and does not sufficiently protect right whales from behavioral impacts, including changes in vocalizations and displacement; significant indirect impacts, including a potentially increased risk of ship strike and predation; and loss of communication space. The Fisheries Service should therefore prohibit high-energy seismic surveys within the mid-Atlantic and southeast Atlantic regions from November 1 through April 30, the right whale's migration and calving period.

2. Area Closures for Other Important Marine Mammal Habitat.

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.[135] 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.[136] The Fisheries Service must consider restricting seismic surveys, on either a seasonal or year-round basis, from important marine mammal habitat, whether to ensure satisfaction with the MMPA's negligible impact and small numbers standards, or to meet the "least practicable adverse impact" requirement.

Of clear importance is the area off "the Point" of Cape Hatteras. This area lies at the confluence of the Gulf Stream and the Labrador Current, creating a dynamic ocean front that supports an abundance of marine life, from plankton and invertebrates, to forage fish, to large marine predators such as tuna, swordfish, sharks, seabirds, and marine mammals. Marine mammals occur at exceptionally high densities off Cape Hatteras compared to other areas along the

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IWC/SC/58/E9); L. Di Iorio & C.W. Clark, *Exposure to Seismic Survey Alters Blue Whale Acoustic Communication*, 6 Biology Letters 51 (2010).

[134] L.T. Hatch et al., *Quantifying Loss of Acoustic Communication Space for Right Whales in and around a U.S. National Marine Sanctuary*, 26 Conservation Bio. 983 (2012); *see also* C.W. Clark et al., *Acoustic Masking in Marine Ecosystems as a Function of Anthropogenic Sound Sources* (2009) (IWC Sci. Comm. Doc. SC/61/E10).

[135] *See, e.g.*, T. Agardy et al., A Global Scientific Workshop on Spatio-temporal Management of Noise, Report of Workshop held in Puerto Calero, Lanzarote, June 4–6, 2007; S. Dolman et al., 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).

[136] 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).

Atlantic Coast.[137] The Cape's occurrence between the temperate ecosystem to the north and the subtropical ecosystem to the south also means that many species ranges have either a southern or northern terminus at the Cape.[138] Indeed, according to the new model produced by Duke University for CetMap, Cape Hatteras has the highest marine mammal biodiversity of any area along the Atlantic, and rivals locations internationally renowned for their diversity of species, including northwest Spain, Hawaii, San Diego, and Cape Cod.[139] Yet this same habitat falls within the study area of all four of the applications now before the agency, and within the study area of all the applications the Bureau has received; in two of the three surveys now before the Fisheries Service, it would be subjected to tracklines of relatively high-density. The Fisheries Service should exclude seismic exploration from the Cape Hatteras area, and should consider closures in other areas (e.g., the mid-Atlantic canyons and the Charleston Bump) that may represent significant offshore marine mammal habitat.

D. Use Best Practices in Defining Operational Mitigation.

As discussed above, the most effective available method of mitigating impacts from seismic surveys on marine mammals is reducing the activity as well as the environmental footprint of the activity; and time-area closures may also be effective, as NOAA has recognized. We therefore urge the Fisheries Service to develop and prescribe these other methods and not merely spend its time fine-tuning operational mitigation meant to reduce injury risk close to the source array. That said, the Fisheries Service should consider the following measures to improve the effectiveness of operational mitigation:

(a) Ensure that its safety zone requirement applies to all cetacean species, including delphinids, which are not presently included in the Bureau's Notice to Lessees (NTL 2012-G02) in the Gulf of Mexico.

(b) Require the use of multiple platforms for marine mammal detection, for purposes of maintaining safety zones. This includes use of sufficient numbers of marine mammal observers (i.e., two on/ two off, on two-hour monitoring shifts) with substantial prior experience; real-time passive acoustic monitoring; and use of thermal imaging for plume detection.[140]

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[137] P.N. Halpin et al., *OBIS-SEAMAP: The World Data Center for Marine Mammal, Sea Bird, and Sea Turtle Distributions*, 22 Oceanography 104–115 (2009).
[138] B.D. Best et al.,*Online Cetacean Habitat Modeling System for the U.S. East Coast and Gulf of Mexico*, 18 Endangered Species Research 1-15 (2012); R.S. Schick et al., *Community Structure in Pelagic Marine Mammals at Large Spatial Scales*, 434 Marine Ecology Progress Series 165-181 (2011).
[139] B.L. Byrd et al., *Strandings as Indicators of Marine Mammal Biodiversity and Human Interactions off the Coast of North Carolina*, 112 Fishery Bulletin 1-23 (2014).
[140] D.P. Zitterbart et al., *Automatic Round-the-clock Detection of Whales for Mitigation from Underwater Noise Impacts*, 8 PLoS ONE e71217 (2013), *available at* doi:10.1371/ journal.pone.0071217. It is my understanding that thermal detection technology has significantly improved since this paper was published. The Fisheries Service should contact the authors.

(c) Ensure, as it has in Cook Inlet, that any so-called "mitigation airguns" employed by operators have interpulse intervals (~60 seconds) designed to reduce ensonification while providing a warning signal.

(d) Consider additional "best practices" for safety zone maintenance and monitoring, as set forth in Weir and Dolman (2007) and Parsons et al. (2009).[141]

(e) Incorporate the latest data on ramp-up design, which indicates the need to carefully stagger airgun addition in ways that are potentially perceived by marine mammals as increased noise,[142] into any ramp-up requirement it prescribes here.

(f) Impose a minimum separation distance on seismic vessels beyond the 40 km proposed by the Bureau in its PEIS. As noted above, the literature indicates that baleen whale species may experience displacement around seismic arrays well beyond the 160 dB isopleth; the proposed 40 km separation would do little to mitigate the displacement and allow transit of the whale.[143] Moreover, in settling upon 40 km as its separation distance, BOEM appears to have assumed spherical spreading throughout the sound field, when, again, as discussed above, a more conservative propagation loss formula should be used to account for cylindrical spreading.[144] For these and other reasons, the Fisheries Service should consider larger, more conservative separation distances including, but not limited to, 90 km, which is the distance considered in the Arctic DPEIS.

(g) Require trackline design that minimizes the potential for stranding where surveys are operating closer to shore. 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

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[141] C.R. Weir & S.J. Dolman, *Comparative Review of the Regional Marine Mammal Mitigation Guidelines Implemented During Industrial Seismic Surveys, and Guidance Towards a Worldwide Standard*, 10 J. Int'l Wildlife L. & Policy 1 (2007); E.C.M. Parsons et al., *A Critique of the UK's JNCC Seismic Survey Guidelines for Minimising Acoustic Disturbance to Marine Mammals: Best Practice?*, 58 Marine Pollution Bulletin 643 (2009).
[142] D. Cato, Analysis of the Effectiveness of Ramp-up Design in Mitigation Measure, presentation given at Ocean Noise 2015, Vilanova i la Geltrú, Barcelona, May 15, 2015.
[143] *See, e.g.*, Blackwell et al., *Effects of Airgun Sounds on Bowhead Whale Calling Rates* (2013), *supra* note 135; Clark & Gagnon, *Considering the Temporal and Spatial Scales of Noise Exposures*, *supra* note 20; W.J. Richardson et al., *Displacement of Migrating Bowhead Whales by Sounds from Seismic Surveys in Shallow Waters of the Beaufort Sea*, 106 J. Acoustical Soc'y of America 2281 (1999).
[144] Applying a spherical spreading formula of 20log(r), broadband sound pressure levels at the mid-point between the two arrays would be 152 dB if the sound from the two surveys are in phase, or 149 dB if they are not. By contrast, a cylindrical spreading formula of 10log(r) would yield a received level at the mid-point of 195 dB if the sound from the two surveys are in phase, or 192 dB if they are not. Of course, the actual received level is likely to be somewhere between these two unrealistic models, but Fisheries Service, unlike BOEM in its PEIS, should not assume spherical spreading throughout the sound field.

sources) could cause marine mammals to strand, particularly if used near shore.[145] To reduce analogous risk in other contexts, Australia and the North Atlantic Treaty Organization Undersea Research Program have required planners of mid-frequency sonar exercises to design their tracklines to minimize the potential for embayment and stranding.[146]

(h) Require operators to validate the assumptions about propagation distances used to establish safety zones, calculate take, and make negligible impact determinations. Such analysis should assess received levels beyond the 160 dB, 180 dB, and 190 dB isopleths, to include the 120 dB and 140 dB isopleths as well.

(i) Require that all vessels associated with geological and geophysical activities, including support vessels, adhere to a ten knot speed limit when operating or transiting, to reduce ship-strike risk on right whales and other baleen whales. 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 sixty-five feet in length) and all affected waters (beyond the areas immediately surrounding the major Mid-Atlantic ports) are covered by the speed limit. Should the Fisheries Service wish to focus this provision on right whale conservation, it should use the Cornell (Rice et al.) passive acoustics data to set temporal and spatial parameters around the requirement.

CONCLUSION

The four applications pending before the agency are deficient in their impact and mitigation analysis and do not afford the Fisheries Service a means of fulfilling its responsibilities under the MMPA. We therefore urge the Fisheries Service to find the four pending applications inadequate and incomplete for purposes of further processing beyond this initial stage of review. If the agency moves ahead regardless, we urge it to leave sufficient time for proper consideration of the recommendations made herein, and in other public comments, before publishing proposed IHAs.

Thank you for considering these comments. We welcome the opportunity to meet with you and your staff at any time, and we will continue to engage in this process moving forward.

Very truly yours,

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[145] R.L. Brownell et al., *Hunting Cetaceans with Sound: A Worldwide Review*, 10 J. Cetacean Res. Mgmt. 81 (2008); J. Hildebrand, *Impacts of Anthropogenic Sound, in Marine Mammal Research: Conservation beyond Crisis* 101 (T.J. Ragen et al., eds. 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).

[146] 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).

Michael Jasny
Director, Marine Mammal Protection
Natural Resources Defense Council

Ingrid Biedron, Ph.D.
Marine Scientist, Climate and Energy
Oceana, Inc.

Michael Stocker
Director
Ocean Conservation Research

Sierra Weaver
Senior Attorney
Southern Environmental Law Center

Miyoko Sakashita
Oceans Director
Center for Biological Diversity

Stephen D. Mashuda
Managing Attorney for Oceans
Earthjustice

David Rogers
Executive Director
Environment North Carolina

Carrie Clark
Executive Director
North Carolina League of Conservation Voters

Todd Miller
Executive Director
North Carolina Coastal Federation

Brian Buzby
Executive Director
North Carolina Conservation Network

Hamilton Davis
Energy and Climate Director
Coastal Conservation League

Alice Keyes
Associate Director
One Hundred Miles

Ben Gregg
Executive Director
South Carolina Wildlife Federation

EXHIBIT 1

Civil Penalties Program

The goal of the BSEE OCS Civil Penalties Program is to ensure safe and environmentally sound operations on the Outer Continental Shelf. Through the pursuit, assessment, and collection of civil penalties the program is designed to encourage compliance with the Outer Continental Shelf Lands Act (OCSLA) and BSEE's implementing regulations.

2014 Civil Penalties Summary
Penalties Paid through the Calendar Year of 2014

(1/1/2014 - 12/31/2014)

Name of Violator and Case No.	Violation and Date(s)	Penalty Paid and Date Paid	Regulation(s) Violated 30 CFR)
Linder Oil Company (Production Services Network) G-2009-001	During the course of a BSEE inspection the shutdown valve (SDV), for the fuel gas to the main generator, was bypassed. It was also discovered that Linder was discharging produced water from the production separator into the containment skid. Oct. 25- Oct. 28, 2008 Oct. 2 – Oct. 28, 2008	$150,000* 6/20/14 12/24/14 ***Note: Represents partial payments pursuant to a Settlement Agreement that also addressed Linder's decommissioning obligations. Linder owed a total penalty of $500,000. Linder has now paid a total of $500,000.**	250.803 250.803(a)
McMoran Oil & Gas LLC G-2011-007	During a BSEE incident investigation, it was discovered that McMoran failed to move equipment containing hydrocarbons at least 35 feet from welding area. Another violation was the explosion and rupture of two oil tanks which resulted in spilled oil into the Gulf of Mexico.	$60,000 11/25/14	250.300(a) 250.113

	May 21, 2010 (2 violations)		
McMoran Oil & Gas LLC G-2012-007	During a BSEE incident investigation, it was discovered that a tubing hanger pin ejected while attempting to separate well head from well bore causing an injury. Oct. 27, 2011	$35,000 12/5/14	250.107(a)
Anadarko Petroleum Corporation (Ensco Offshore Co.) G-2012-030	During a BSEE incident investigation, it was discovered that Anardarko failed to develop and use a management system for operation of the subsea BOP system, which includes procedures for prevention of accidental or unplanned disconnects of the system. It was also found that the driller's energized BOP panel was accessed with ongoing wireline operations in the well bore. No JSA had been developed and no Permit to Work had been issued because appropriate personnel were not aware of the action. Dec. 8, 2011 - Feb.19, 2012 Feb. 19, 2012	$70,000 10/10/14	250.401 250.442
Apache Corporation G-2012-038	During the course of a BSEE investigation, it was discovered that the swing brake on the crane was inoperative at the time of the incident. None of the individuals involved in the operation, with the exception of the crane operator, had knowledge of this deficiency. This deficiency was not covered in the JSA. Furthermore, the individuals interviewed	$40,000 9/26/14	250.107

	admitted to not wearing gloves during the operation, despite the wearing of gloves being cited in the JSA. August 12, 2012		
Fairways Offshore Exploration, Inc. (DeLeon & Associates, LLC) G-2013-010	During the course of a BSEE inspection, the SCSSV for Well A-2 and A-2D was being utilized as a tubing plug. The tubing plug had not been tested for leakage at the required 6 month interval. Feb 1 – Oct 24, 2012	$40,000 5/6/2014	250.804(a)(1)
Energy Resource Technology GOM, Inc. G-2013-017	During the course of an unannounced BSEE inspection, it was discovered that the operator failed to shut-in all wells while performing Hot-work cutting operations within the Well-Bay. ERT failed to perform operations in a safe and workmanlike manner. November 26, 2012	$30,000 8/25/14	250.107
Mariner Energy Resources, Inc. G-2013-021	During a BSEE incident investigation, multiple violations were discovered that led to an overpressure event in production vessels that caused a fire. Sept. 2, 2010 (8 violations)	$295,000 11/12/14	250.107 250.107(a) 250.803(c) 250.803(b)(8) 250.300(a)
Energy Resource Technology GOM, Inc. (Wood Group Production Services) G-2013-022	During the course of a BSEE investigation, it was determined that a crane lifting operation led to the collapse of the crane boom, causing a fatality. August 16, 2011 (2 violations)	$80,000 3/12/14	250.401(e)
Ensco Offshore Co.	During a BSEE incident investigation, it was discovered that Ensco	$70,000 12/2/14	250.442 250.401(e)

G-2013-025	failed to develop and use a management system for operation of the subsea BOP system, which includes procedures for prevention of accidental or unplanned disconnects of the system. It was also found that the driller's energized BOP panel was accessed with ongoing wireline operations in the well bore. No JSA had been developed and no Permit to Work had been issued because appropriate personnel were not aware of the action. Feb. 19, 2012 Dec. 9, 2011 – Feb. 19, 2012		
McMoRan Oil & Gas LLC (Danos & Curole Marine Contractors, Inc.) G-2013-028	During the course of a BSEE Investigation into an incident with injury, it was discovered that McMoRan failed to adhere to safety policies and perform all operations in a safe and workmanlike manner during riser pipe decommissioning operations. They did not having proper management and onsite supervision to address safety hazards and deficiencies that contributed to the cause of the incident. March 30, 2013	$35,000 9/28/14	250.107(a)(1)
Stone Energy Corporation G-2013-029	During an inspection, it was discovered that Stone Energy did not comply with blowout prevention equipment requirements during the well abandonment operation. The well was not in a Temporarily	$50,000 8/6/14	250.170(c)(1) 250.1706(c)(5)

	Abandoned (T&A'd) status at the time of the inspection. This means that communication still existed between the hydrocarbon bearing zone and the wellbore. The kill line not being connected as required posed a threat to personnel and the facility in the event of a well control situation. March 26, 2013 (2 violations)		
Black Elk Energy Offshore Operations, LLC 2013-030	During the course of a BSEE inspection, it was discovered that the Sump Tank LSH selector valve was in the bypass position, it was not flagged, nor was it being monitored. The Sump Tank is the containment system for deck drainage from all production vessel skids. Due to the safety device being in the bypass mode, the LSH would not have been able to perform its design function and shut in the facility in the event of a high level in the Sump Tank. March 11, 2013	$30,000 4/9/14	250.803(c)
GOM Shelf LLC G-2013-032	During an inspection, several violations were discovered. Inspectors found that a test separator had been placed out of service on the instrument panel. When inspectors questioned why the vessel was out of service, they found that it had been placed out of service because it was full of sand. Inspectors returned to the structure a day later, performed a re-test and audited the	$1,230,000 11/12/14	250.802(b) 250.107(a)(1)

	records. Records showed that GOM Shelf was aware of sand entering the production system for a prolonged period of time. Despite this awareness, GOM Shelf failed to take steps to sufficiently address the sand hazards. This failure placed the safety of people on the facility, as well as the environment, at risk. March 12, 2013 Feb. 1 – March 12, 2013		
Arena Offshore, LP (Danos & Curole Marine Contractors, Inc.) G-2013-033	During the course of a BSEE investigation, it was determined Arena failed to adhere to safety policies and perform all operations in a safe and workmanlike manner during riser pipe decommissioning operations. They did not having proper management and supervision to address safety hazards and deficiencies that contributed to the cause of the incident. March 30, 2013	$35,000 8/6/14	250.107(a)
Danos and Curole Marine Contractors, Inc. G-2013-034	During the course of a BSEE investigation, it was determined D&C failed to operate in a safe and workmanlike manner for not following their Safe Work Practice Procedures and policies, including failure to utilize Stop Work Authority, Hazard Recognition & Control, and Open Hole Safety. These failures to adhere to proper management and onsite supervision to address safety hazards and equipment deficiencies in	$30,000 7/30/14	250.107(a)(1)

	planning, and make operational errors contributed to the cause of the injury. March 30, 2013		
Chevron U.S.A. Inc. G-2013-035	During the course of a BSEE investigation, it was discovered that the operator failed to operate in a safe and workmanlike manner by failure to utilize proper personal protective equipment per the "Corrosive Chemical Procedure" while dismantling the pump assembly. In addition, there was not a Material Safety Data Sheet for the chemical located on the facility nor was there a Job Safety Analysis or permit to work prepared with this job task. Finally, there was no eye wash station(s) located near the temporary chemical pumping area. May 21, 2013	$35,000 9/23/14	250.107(a)(1)
Black Elk Energy Offshore Operations, LLC G-2013-036	During an onsite BSEE investigation, there was a pollution incident that involved a gasket failure on the departing pipeline riser resulting in the release of liquid hydrocarbons into Gulf of Mexico waters. Also, the facility had been shut-in prior to Black Elk receiving a Performance Improvement Plan (PIP) notification letter from the BSEE Regional Director which states in part: 1) Keep all facilities that currently are in a shut-in status in such status until it provides BSEE with documentation of the corrective actions taken to safely return each	$70,000 4/9/2014	250.101 250.107(a)

	facility into operational status to BSEE's satisfaction. 2) Notify the appropriate District Office at least 48 hours prior to returning these facilities to production to allow for the proper BSEE inspection. Black Elk failed to conduct operations in accordance with lease stipulations as noted in excerpts number 1&2 above from the November 21, 2012 PIP notification letter. February 1, 2013 (2 violations)		
Mariner Energy, Inc. G-2013-037	During the course of a BSEE inspection, 3 violations were discovered where operations were not being conducted in a safe and workmanlike manner. Violation 1 involved unsecured and improperly assembled scaffolding/ fabricated platform utilized for the decommissioning operations. BSEE inspectors observed that the scaffolding/fabricated platform was not secured to the platform and was missing some of the bracings and pins. This could have allowed the scaffolding to shift while personnel were working from the scaffolding deck. Violation No. 2 involved an open-hole/fall hazard located on the deck scaffolding. This hazard posed a potential threat of personnel falling onto the lower platform deck or into the Gulf of Mexico waters from the decking of the scaffolding. Violation No. 3) also involved an Open-	$280,000 4/4/2014	250.107(a)

	hole/fall hazard located on the platform lower deck. BSEE inspectors observed personnel working on a section of the platform deck that had no hand rails presenting a threat of personnel falling into the Gulf of Mexico Waters. May 22-28, 2013		
Apache Corporation G-2013-038	During a BSEE incident investigation, it was discovered that the rigger on top of Marine Portable Transfer tank unhooked the D-ring and then dropped it over the side of tank. The D-ring caught the right index finger of the employee between the side of the tank and the D-ring. It was initially stated that the rigger was wearing the company required high-visibility, impact resistant gloves, but later into the investigation changed his testimony to say he was not wearing any gloves at the time of the incident. April 11, 2013	$75,000 11/12/14	250.107(a)(1)
Linder Oil Company G-2013-039	During a BSEE inspection of the facility's plug and abandonment operations, the inspector found an open hole that was un-barricaded on one side and accessible to personnel working on the well deck creating a fall hazard. After further review of documents, it was found that after pulling the drive pipe from the well B1, an approximately 34" diameter hole was created in the grating in the well deck area.	$25,000 6/20/14	250.107(a)(1)

	May 16, 2013		
Black Elk Energy Offshore Operations, LLC 2013-040	During the course of a BSEE investigation into an incident with injury, the investigators discovered 2 violations of failing to conduct operations in a safe and workmanlike manner. May 4, 2013	$75,000 4/28/14	250.107(a)(1)
BP Exploration & Production Inc. G-2013-041	During the incident investigation, two violations were found. One was for discharging pollutants into Gulf waters and the other was for failure to maintain equipment in a safe manner which led to the discharge. April 19, 2013 (2 violations)	$65,000 11/14/14	250.107 250.300(a)
W&T Offshore, Inc. G-2013-043	During the course of a BSEE inspection, it was discovered that the LSL for the Oil Treater was operating in the by-pass position, and was not flagged or monitored by personnel. June 7, 2013	$30,000 4/24/14	250.803(c)
Hercules Offshore G-2013-045	During the course of a BSEE investigation on a drilling rig, it was determined that the air hoist cable had become entangled with the hose safety clamp during the replacement of inner bushings. The bushing puller tool and air hoist hook were secured to an anchor post after the bushings were replaced. It was also observed that the driller's view of the entangled air hoist cable was obstructed by the traveling block and top drive. The downward	$25,000 3/25/14	250.107(a)

	force of the traveling block and top drive put an undetermined amount of force on the cable and anchor post, breaking the post from the rig floor allowing either the anchor post or the bushing puller tool to strike the injured party. July 8, 2013		
Dynamic Offshore Resources, LLC (Fieldwood Energy, LLC) G-2013-046	During the course of a BSEE investigation into pollution incident, it was discovered that LSH for the Flash Tank (MBB-150) was in bypass and not flagged and monitored resulting in the operator's failure to prevent unauthorized discharge of pollutants into offshore waters. February 27, 2013 March 2, 2013	$45,000 8/4/14	250.803 250.107(a)
Arena Offshore, LP (Wood Group Production Services) G-2013-047	During the incident investigation, it was found that a person was injured when a flash fire occurred while employees were conducting an acidizing operation on the float cell. The flash fire resulted in a contract employee suffering first and second degree burns on his right arm and torso. July 20, 2013	$40,000 8/25/14	250.107(a)
Express P&A G-2013-048	During a BSEE on-site inspection, multiple violations were found. Personnel were working in unsafe areas of the platform; there was unsecured and improperly assembled scaffolding; missing handrails on the platform deck as well as gaps in	$84,000 10/3/14	250.107(a)

	existing handrails. May 24-28, 2013		
Apache Corporation G-2013-049	During the course of a BSEE onsite inspection, it was discovered that the fire and gas detection system for several portable buildings were found with the power switch in the off position rendering the system inoperable and disabling the backup battery system, leaving the building without adequate fire detection. June 24-27, 2013 (4 violations)	$360,000 9/4/14	250.803(b)(9)(v)
Nexen Petroleum U.S.A. Inc. G-2013-051	During the course of an inspection, BSEE Inspectors discovered the SCSSV for wells I-1 and I-2 operating in the by-pass position. Also, they were not flagged or monitored by personnel. September 13, 2013 (2 violations)	$40,000 8/30/14	250.107(a)
Energy XXI GOM, LLC G-2013-052	During a BSEE onsite inspection, inspectors observed multiple oil-leaks on the gas compressor. During a follow up inspection, the operator failed to correct multiple oil leaks on the gas compressor. July 30-September 17, 2013	$7,248 3/5/14	250.107
Dynamic Offshore Resources, LLC G-2013-053	During the incident investigation, it was found that on several occasions the rig crew made the decision to continue to pull drill pipe out of the wellbore even while they were taking gains through the trip tank.	$125,000 10/7/14	250.456(a)

	May 6 – June 6, 2013		
Nexen Petroleum U.S.A. Inc. G-2013-055	During the course of a BSEE inspection, inspectors discovered that the helicoptor landing deck was being utilized as an extension of the platform to conduct abandonment operations without the addition of hand rails. September 24, 2013	$20,000 9/26/14	250.107(a)
SandRidge Energy G-2013-056	During an inspection, gas was observed escaping from a vent cover of a wet oil tank, into the atmosphere, without flame arrestor protection. Sept. 30 - Oct. 9, 2013	$250,000 11/14/14	250.107
Fairways Offshore Exploration G-2014-002	BSEE inspector discovered a violation in which the operator was unable to provide testing records for the Well JA-2D SCSSV, being utilized as a tubing plug. In addition, the operator failed to correct a previous violation for failure to conduct required daily pollution inspections. Sept. 30, 2011 – Aug. 29, 2013 Dec. 7, 2012 – Aug.29, 2013	$32,250 10/3/14	259.301 250.804(a)(1)(i)
McMoran Oil and Gas LLC G-2014-004	An inspection was conducted because an oil sheen was spotted during flight. Violations connected to the spill were due to the sump pile not operating automatically; the LSH and sum pile pneumatic pump failed, and then the sump pile was used as a processing device. October 24, 2013 (3 violations)	$85,000 11/13/14	250.300(b)(4) 250.802(b) 250.300(a)

Century Exploration New Orleans, LLC G-2014-005	During the course of a BSEE onsite inspection, it was discovered that the Coiled Tubing Unit reel gear and chain guards/covers were not installed to protect personnel from the moving components. October 29, 2013	$20,000 10/20/14	250.107
W&T Offshore, Inc. G-2014-006	During an inspection, it was discovered that a fusible cap had been placed on the SSV (of Well G-9) during testing the previous day. The fusible cap had been left in place rendering the SSV inoperable and locking the valve in the open position. The SSV was not flagged, nor was it being monitored by personnel Aug. 7 – 8, 2014	$60,000 11/10/14	250.803(c)
Black Elk Energy Offshore Operations, LLC 2014-007	During an onsite inspection BSEE issued three INCs (one for each well that was flowing at the time the bypassed relay was found.) BSEE Inspectors performed a function test of the emergency ESD system while the relay was in bypass, to see if the SCSSV's pressure would bleed off. During this function test, the SCSSV's control pressure did not bleed off. April 29, 2013 (3 violations)	$180,000 4/28/14	250.803(c) 250.803
Chevron U.S.A. Inc. G-2014-010	During the course of a BSEE investigation into an incident with injury, Chevron failed to properly supervise construction operations after a	$25,000 7/6/14	250.107(a)

	construction worker was injured while stepping on grating that was secured with plastic zip ties. December 9, 2013		
Hilcorp Energy GOM, LLC G-2014-013	During a BSEE onsite inspection, three INCs were issued and forwarded for civil penalty review. An inspector discovered a LSL on the L.P. Separator was in bypass mode, and the separator win in operation and not being tested or maintained. Another violation discovered was that the bottom isolation valve for the LSH on the sump was in the closed position. The sump was not being tested or maintained. The third violation discovered was a valve on the air supply for the sump pump was in the closed position preventing its ability to automatically operate. May 24, 2012 (3 violations)	$75,000 8/14/14	250.803(c) 250.300(b)
Chevron U.S.A. Inc. G-2014-015	During the course of an inspection, BSEE Inspectors discovered an open hole next to the Lease Automatic Custody Transfer skid. The hole was not properly barricaded to prevent personnel from entering the hazardous area. September 1-9, 2013	$160,000 7/30/2014	250.107
Anadarko Petroleum Corporation G-2014-017	During the course of a BSEE investigation involving injuries, it was discovered that a composite air pressure vessel exploded causing a large fireball and flying shrapnel, followed by a venting sound. The	$37,000 9/23/14	250.107(a)

	Subsea personnel were injured, receiving second and third degree burns from the flash fire. November 2, 2013		
SandRidge Offshore, LLC (Wood Group Production Services) G-2014-019	During the course of a BSEE investigation involving injuries, it was discovered that an employee was attempting to clear a line that was being used to transfer coolant (antifreeze) from a 500 gallon poly tank to a compressor. The poly tank exploded and severely injured employee's hand.	$35,000 9/8/14	250.107(a)
Fairfield Nodal G-2014-023	During the course of a BSEE field investigation, Fairfield failed to follow an approved plan that led to the fatality of Spotted Dolphin by entanglement of the tethered line on the Dolphin. November 7, 2013 – January 24, 2014 (2 violations)	$430,000 12/17/14	250.551.3 250.551.6(a)(2)
Tana Exploration Company, LLC G-2014-025	During the time of the inspection, BSEE Inspectors discovered that the well abandonment operations with the tree removed did not contain a secondary power source, independent from the primary source, with sufficient capacity to close all BOP stack components and hold them closed. BSEE Inspectors discovered the pneumatic supply line connected to the pneumatic driven secondary pump on the Hydraulic Power Unit having its "Air Pump Shut-off Valve" in the closed or blocked	$25,000 12/24/14	250.1706

	position. April 18, 2014		
EPL Oil and Gas, Inc. (Spartan Offshore Drilling, LLC) G-2014-029	During the course of a BSEE investigation into an incident with injury, the investigators discovered that an employee was injured while preparing the Texas Deck to install the pollution pan around the BOP on the drilling rig. The section of grating was not secured at the time of the incident. December 17, 2013	$37,000 11/13/14	250.107(a)
Cochon Properties, LLC G-2014-030	During an inspection, it was discovered that the gas detection system in the temporary living quarters was inoperable. The power switch to the gas detection-monitoring unit was in the off position. May 27, 2014	$20,000 11/19/14	250.107(a)
EnVen Energy Ventures, LLC G-2014-031	During a BSEE inspection, upon review of the SCSSV inspection records, the inspectors discovered that the leakage rate for the SCSSVs used in lieu of a tubing plug, in two wells, was above the maximum allowable set forth in the regulations. Nov. 10, 2013 – Feb. 12, 2014 Nov. 10, 2013 – Mar. 15, 2014	$438,000 11/21/14	250.804(a)(1)(i) 250.804(a)(1)(i)
Beta Operating Company, LLC P-2013-002	During the course of a BSEE investigation into an incident with injury, the investigators discovered that an injured party received an electric shock of an estimated 98,000 volts at very low amperage. The person was not wearing proper	$25,000 4/7/14	250.107

	personal protective equipment as required by the JSA at the time of the incident.		
Exxon Mobil Corporation P-2013-003	During the course of a BSEE investigation into an incident with injury, the investigators discovered that an employee fell off the dragway onto the drill deck. September 18, 2012	$30,000 4/30/14	250.107(a)
Exxon Mobil Corporation P-2014-001	During the course of a BSEE investigation, it was discovered that a release of H2S gas under high pressure occurred due to maintenance of an incorrect injection gas compressor fitting. A maintenance team commenced work on the wrong fitting which led to a blowout. January 19, 2013	$20,000 9/12/14	250.107
Beta Operating Company, LLC P-2014-005	During the course of a BSEE investigation, it was discovered that crude oil was released through the flare boom. A safety device was bypassed for reasons other than startup, maintenance or testing and was not properly flagged or monitored. May 23, 2014	$30,000 12/15/14	250.803(c)
Total Penalties Paid: 1/1/2014 - 12/31/2014 **53 Cases:** $5,695,498			

The purpose of publishing this civil penalties summary is to provide information to the public regarding OCSLA and regulatory violations of special concern in OCS operations and to provide an additional incentive for safe and environmentally sound operations.

ESD	Emergency Shut Down
INC	Incident of Non Compliance
JSA	Job Safety Analysis

LSH	Level Safety High
LSL	Level Safety Low
SCSSV	Surface Controlled Subsurface Safety Valve
SDV	Shut Down Valve
SSV	Subsurface Safety Valve

EXHIBIT 2

By Regular and Electronic Mail

July 2, 2012

Mr. Gary D. Goeke
Chief, Regional Assessment Section
Office of Environment (MS 5410)
Bureau of Ocean Energy Management
Gulf of Mexico OCS Region
1201 Elmwood Park Boulevard
New Orleans, Louisiana 70123-2394
GGEIS@boem.gov

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

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

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

[4] Nieukirk, 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.

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[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.okeanos-stiftung.org/okeanos/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

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[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., Effecter 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 "<u>may</u> 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

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[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

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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.okeanos-stiftung.org/okeanos/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., 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) (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/lsesale/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 µPa (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]

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[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., Reponses 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

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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

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[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

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[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 µPa 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

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[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.

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[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 km^2 of ocean floor. Big Rock encompasses 93 km^2 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

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[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

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[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.

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[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,

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[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

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[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-Quieting 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 μPa (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 $\mu Pa^2(s)$) – 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

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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 ceteaceans, *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

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[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.okeanos-stiftung.org/okeanos/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]

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[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).

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[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 µPa (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 µPa (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 µPa 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]

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[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. 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).

[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

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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,"

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[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 aftteis.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

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[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

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[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.

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[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., 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); 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 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

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[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, 300 *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

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www.st.nmfs.noaa.gov/cetsound (previewed 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

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[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 PDEIS 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

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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

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[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.

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[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

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[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.

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[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 ecosystemshifts 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 of 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,

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[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.

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[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 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).

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[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")

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[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 polies 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 (9^{th} 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

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[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,

Michael Jasny
Senior Policy Analyst
NRDC

Miyoko Sakashita
Senior Attorney and Oceans Director
Center for Biological Diversity

Harold Shepherd
Executive Director
Center for Water Advocacy

Cindy Zipf
Executive Director
Clean Ocean Action

Sierra Weaver
Attorney
Defenders of Wildlife

Steve Roady
Senior Attorney
Earthjustice

Michael Stocker
Director
Ocean Conservation Research

Matthew Huelsenbeck
Marine Scientist
Oceana

Catherine Wannamaker
Senior Attorney
Southern Environmental Law Center

Pete Stauffer
Ocean Program Manager
Surfrider Foundation

Sharon Young
Marine Issues Field Director
The Humane Society of the U.S.

Sarah Dolman
Noise Pollution Campaign Manager
Whale and Dolphin Conservation Society

EXHIBIT 3

OCEANA | Protecting the World's Oceans

MEMORANDUM

1350 Connecticut Ave. NW, 5th Floor
Washington, DC 20036 USA
Toll free +1.877.7.OCEANA
P| +1.202.833.3900
F| +1.202.833.2070
oceana.org

May 7, 2014

Via Federal e-Rulemaking Portal
Mr. Gary D. Goeke
Chief, Environmental Assessment Section
Office of Environment
Bureau of Ocean Energy Management
1201 Elmwood Park Boulevard,
New Orleans, Louisiana 70123-2394
ggeis@boem.gov

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 area[2] 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.

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[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

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[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

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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.

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[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.

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[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 offsore 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

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[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

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[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.

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[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.
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[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.
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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,

Eric A. Bilsky

Eric A Bilsky
Assistant General Counsel
Oceana
ebilsky@oceana.org

Sara Young
Marine Scientist
Oceana
syoung@oceana.org

Adam Pearse
Law Fellow
Oceana
apearse@oceana.org

Elizabeth Allgood
U.S. Campaigns Director
International Fund for Animal Welfare
eallgood@ifaw.org

Margaret Cooney
Campaigns Officer
International Fund for Animal Welfare
mcooney@ifaw.org

EXHIBIT 4

Annual Level A Take Estimates from Seismic Airgun Sources Using Southall et al. (2007) Criteria for Marine Mammal Species during the Project Period

Order Cetacea	*2012*	*2013*	*2014*	*2015*	*2016*	*2017*	*2018*	*2019*	*2020*	**Total by Species**
Baleen Whales										
Common Minke Whale	0	0	0.083	0.161	0.017	0.067	0.047	0.022	0.024	0.421
Sei Whale	0	0	0.208	0.402	0.047	0.17	0.121	0.061	0.068	1.077
Bryde's Whale	0	0	0.632	1.237	0.144	0.714	0.535	0.364	0.173	3.799
Blue Whale	0	0	0.831	1.622	0.18	0.908	0.672	0.443	0.215	4.871
Fin Whale	0	0	0	0	0	0	0	0	0	0
North Atlantic Right Whale	0	0	0.036	0.071	0.008	0.045	0.034	0.024	0.009	0.227
Humpback Whale	0	0	3.046	5.931	0.674	3.102	2.279	1.415	0.848	17.295
Toothed Whales, Dolphins, Porpoises										
Short-beaked Common Dolphin	0	0	116.584	225.454	18.848	96.111	64.095	28.714	23.101	572.907
Pygmy Killer Whale	0	0	0.161	0.312	0.061	0.158	0.129	0.082	0.091	0.994
Short-Finned Pilot Whale	0	0	11.616	22.498	74.416	55.161	93.694	123.153	153.571	534.109
Long-Finned Pilot Whale	0	0	59.577	117.528	13.886	79.691	61.042	45.685	14.791	392.2
Risso's Dolphin	0	0	370.55	731.439	87.14	501.58	385.115	290.103	92.466	2458.393
Northern Bottlenose Whale	0	0	0.004	0.007	0.001	0.003	0.002	0.001	0.001	0.019
Pygmy Sperm Whale	0	0	0	0	0.081	0.041	0.08	0.083	0.138	0.423
Dwarf Sperm Whale	0	0	2.819	5.564	1.326	4.2	3.676	3.169	2.01	22.764
Atlantic White-sided Dolphin	0	0	1.347	2.659	0.522	1.965	1.659	1.415	0.768	10.335
Fraser's Dolphin	0	0	0.208	0.402	0.032	0.161	0.105	0.041	0.04	0.989
Sowerby's Beaked Whale	0	0	0	0	0.006	0.004	0.007	0.009	0.012	0.038
Blainville's Beaked Whale	0	0	1.459	2.816	0.225	1.126	0.731	0.282	0.282	6.921
Gervais' Beaked Whale	0	0	1.459	2.816	0.225	1.126	0.731	0.282	0.282	6.921
True's Beaked Whale	0	0	1.459	2.816	0.225	1.126	0.731	0.282	0.282	6.921
Killer Whale	0	0	0.052	0.1	0.033	0.054	0.052	0.04	0.056	0.387
Melon-Headed Whale	0	0	0.161	0.312	0.061	0.158	0.129	0.082	0.091	0.994
Harbor Porpoise	0	0	2.064	3.995	0.655	1.913	1.509	0.963	1.012	12.111
Sperm Whale	0	0	0.095	0.184	0.015	0.076	0.05	0.021	0.019	0.46
False Killer Whale	0	0	0.155	0.3	0.126	0.194	0.204	0.186	0.224	1.389
Pantropical Spotted Dolphin	0	0	135.938	263.432	35.378	127.155	96.513	61.914	53.839	774.169
Clymene Dolphin	0	0	64.945	125.855	16.902	60.749	46.109	29.58	25.722	369.862
Striped Dolphin	0	0	527.416	1020.455	157.93	486.916	383.424	258.754	256.777	3091.672
Atlantic Spotted Dolphin	0	0	771.308	1496.301	201.604	741.31	564.738	369.59	303.44	4448.291
Spinner Dolphin	0	0	0.611	1.184	0.159	0.571	0.434	0.278	0.242	3.479
Rough-Toothed Dolphin	0	0	0	0	0.036	0.023	0.043	0.061	0.075	0.238
Bottlenose Dolphin	0	0	14.775	28.936	21.683	28.545	34.819	39.072	42.117	209.947
Cuvier's Beaked Whale	0	0	10.213	19.709	1.577	7.883	5.119	1.972	1.972	48.445
TOTAL	**0**	**0**	**2099.812**	**4084.498**	**634.223**	**2203.006**	**1748.628**	**1258.143**	**974.758**	13003.07
									13003.07	

Annual Level A Takes Estimates from Seismic Airgun Sources Uing 180-dB Criteria for Marine Mammal Species during the Porject Period

Order Cetacea	*2012*	*2013*	*2014*	*2015*	*2016*	*2017*	*2018*	*2019*	*2020*	**Total by species**
Baleen Whales										
Common Minke Whale	0.000	0.000	0.342	0.666	0.101	0.364	0.285	0.196	0.144	**2.098**
Sei Whale	0.000	0.000	1.965	3.855	0.648	2.473	2.009	1.567	0.925	**13.442**
Bryde's Whale	0.000	0.000	1.948	3.820	0.642	2.445	1.986	1.548	0.918	**13.307**
Blue Whale	0.000	0.000	2.182	4.274	0.700	2.653	2.139	1.632	1.000	**14.580**
Fin Whale	0.000	0.000	4.400	8.638	1.507	5.679	4.657	3.705	2.180	**30.766**
North Atlantic Right Whale	0.000	0.000	1.162	2.290	0.611	1.757	1.595	1.464	0.858	**9.737**
Humpback Whale	0.000	0.000	5.897	11.542	1.853	7.071	5.671	4.275	2.632	**38.941**
Toothed Whales, Dolphins, Porpoises										
Short-beaked Common Dolphin	0.000	0.000	3,121.383	6,146.553	1,114.258	4,282.933	3,551.165	2,919.887	1,611.226	**22,747.405**
Pygmy Killer Whale	0.000	0.000	2.253	4.410	0.705	2.708	2.170	1.635	0.997	**14.878**
Short-Finned Pilot Whale	0.000	0.000	2,354.300	4,631.133	840.256	3,170.157	2,627.151	2,145.343	1,224.552	**16,992.892**
Long-Finned Pilot Whale	0.000	0.000	297.400	582.360	96.845	362.017	292.887	224.439	139.821	**1,995.769**
Risso's Dolphin	0.000	0.000	1,619.672	3,180.466	551.169	2,095.819	1,717.190	1,367.649	796.896	**11,328.861**
Northern Bottlenose Whale	0.000	0.000	0.127	0.250	0.043	0.174	0.143	0.116	0.061	**0.914**
Pygmy Sperm Whale	0.000	0.000	2.371	4.592	0.559	2.140	1.562	0.872	0.770	**12.866**
Dwarf Sperm Whale	0.000	0.000	14.844	29.005	4.264	16.955	13.300	9.592	5.939	**93.899**
Atlantic White-sided Dolphin	0.000	0.000	4.668	9.152	1.467	5.795	4.657	3.573	2.063	**31.375**
Fraser's Dolphin	0.000	0.000	0.242	0.468	0.055	0.210	0.151	0.079	0.076	**1.281**
Sowerby's Beaked Whale	0.000	0.000	0.203	0.397	0.060	0.233	0.184	0.134	0.085	**1.296**
Blainville's Beaked Whale	0.000	0.000	39.568	77.313	11.835	45.464	35.978	26.232	16.739	**253.129**
Gervais' Beaked Whale	0.000	0.000	39.568	77.313	11.835	45.464	35.978	26.232	16.739	**253.129**
True's Beaked Whale	0.000	0.000	39.568	77.313	11.835	45.464	35.978	26.232	16.739	**253.129**
Killer Whale	0.000	0.000	1.965	3.843	0.602	2.309	1.839	1.363	0.852	**12.773**
Melon-Headed Whale	0.000	0.000	2.523	4.942	0.818	3.098	2.505	1.924	1.168	**16.978**
Harbor Porpoise	0.000	0.000	7.054	13.798	2.245	8.376	6.733	5.072	3.235	**46.513**
Sperm Whale	0.000	0.000	158.828	309.723	44.502	173.124	134.518	93.561	62.258	**976.514**
False Killer Whale	0.000	0.000	2.801	5.491	0.930	3.501	2.848	2.218	1.334	**19.123**
Pantropical Spotted Dolphin	0.000	0.000	446.741	876.082	145.967	559.932	454.020	352.985	208.113	**3,043.840**
Clymene Dolphin	0.000	0.000	207.184	406.191	67.382	258.155	209.054	161.919	96.038	**1,405.923**
Striped Dolphin	0.000	0.000	2,038.848	3,993.224	650.891	2,483.607	2,000.683	1,526.327	928.896	**13,622.476**
Atlantic Spotted Dolphin	0.000	0.000	2,978.964	5,847.582	988.880	3,813.267	3,105.692	2,446.233	1,406.107	**20,586.725**
Spinner Dolphin	0.000	0.000	1.949	3.821	0.634	2.429	1.967	1.523	0.903	**13.226**
Rough-Toothed Dolphin	0.000	0.000	13.755	26.888	4.279	16.048	12.821	9.510	6.112	**89.413**
Bottlenose Dolphin	0.000	0.000	5,977.039	11,748.210	2,090.846	7,908.443	6,521.887	5,266.486	3,022.262	**42,535.173**
Cuvier's Beaked Whale	0.000	0.000	276.973	541.189	82.842	318.247	251.849	183.622	117.174	**1,771.896**
TOTAL	**0.000**	**0.000**	**19,668.687**	**38,636.794**	**6,732.066**	**25,648.511**	**21,043.252**	**16,819.145**	**9,695.812**	**138,244.267**
									138,244.267	

Annual Level B Take Estimates (160-dB criteria) from Airgun Surveys for Marine Mammal Species during the Project Period

Order Cetacea	*2012*	*2013*	*2014*	*2015*	*2016*	*2017*	*2018*	*2019*	*2020*	**Total by species**
Baleen Whales										
Common Minke Whale	0.000	0.000	33.522	65.282	9.857	35.718	27.956	19.257	14.116	**205.708**
Sei Whale	0.000	0.000	192.625	377.801	63.466	242.395	196.917	153.588	90.689	**1,317.481**
Bryde's Whale	0.000	0.000	190.896	374.359	62.904	239.608	194.649	151.692	89.980	**1,304.088**
Blue Whale	0.000	0.000	213.901	418.875	68.622	259.980	209.629	159.949	98.045	**1,429.001**
Fin Whale	0.000	0.000	431.204	846.583	147.732	556.574	456.478	363.111	213.637	**3,015.319**
North Atlantic Right Whale	0.000	0.000	113.846	224.490	59.848	172.225	156.298	143.499	84.052	**954.258**
Humpback Whale	0.000	0.000	577.964	1,131.230	181.646	692.987	555.789	419.002	257.919	**3,816.537**
Toothed Whales, Dolphins, Porpoises										
Short-beaked Common Dolphin	0.000	0.000	305,926.755	602,423.698	109,208.426	419,770.312	348,049.714	286,178.116	157,916.298	**2,229,473.319**
Pygmy Killer Whale	0.000	0.000	220.776	432.193	69.105	265.443	212.700	160.267	97.713	**1,458.197**
Short-Finned Pilot Whale	0.000	0.000	230,744.930	453,897.344	82,353.473	310,707.070	257,487.079	210,265.101	120,018.336	**1,665,473.333**
Long-Finned Pilot Whale	0.000	0.000	29,148.152	57,077.138	9,491.739	35,481.323	28,705.807	21,997.239	13,703.882	**195,605.280**
Risso's Dolphin	0.000	0.000	158,744.009	311,717.478	54,020.063	205,411.212	168,301.811	134,043.314	78,103.785	**1,110,341.672**
Northern Bottlenose Whale	0.000	0.000	12.462	24.544	4.259	17.031	13.994	11.395	6.003	**89.688**
Pygmy Sperm Whale	0.000	0.000	232.353	450.073	54.784	209.782	153.072	85.460	75.450	**1,260.974**
Dwarf Sperm Whale	0.000	0.000	1,454.885	2,842.740	417.949	1,661.508	1,303.577	940.144	582.097	**9,202.900**
Atlantic White-sided Dolphin	0.000	0.000	457.481	896.987	143.826	567.919	456.474	350.144	202.187	**3,075.018**
Fraser's Dolphin	0.000	0.000	23.717	45.882	5.427	20.593	14.819	7.782	7.470	**125.690**
Sowerby's Beaked Whale	0.000	0.000	19.910	38.905	5.903	22.874	18.068	13.148	8.286	**127.094**
Blainville's Beaked Whale	0.000	0.000	3,878.016	7,577.415	1,159.902	4,455.915	3,526.252	2,570.966	1,640.602	**24,809.068**
Gervais' Beaked Whale	0.000	0.000	3,878.016	7,577.415	1,159.902	4,455.915	3,526.252	2,570.966	1,640.602	**24,809.068**
True's Beaked Whale	0.000	0.000	3,878.016	7,577.415	1,159.902	4,455.915	3,526.252	2,570.966	1,640.602	**24,809.068**
Killer Whale	0.000	0.000	192.589	376.649	59.002	226.289	180.233	133.567	83.546	**1,251.875**
Melon-Headed Whale	0.000	0.000	247.240	484.381	80.135	303.674	245.516	188.604	114.448	**1,663.998**
Harbor Porpoise	0.000	0.000	691.367	1,352.385	219.996	820.894	659.933	497.063	317.088	**4,558.726**
Sperm Whale	0.000	0.000	15,566.706	30,355.996	4,361.663	16,967.893	13,184.100	9,169.873	6,101.896	**95,708.127**
False Killer Whale	0.000	0.000	274.527	538.213	91.113	343.104	279.084	217.358	130.741	**1,874.140**
Pantropical Spotted Dolphin	0.000	0.000	43,785.058	85,864.840	14,306.228	54,878.902	44,498.535	34,596.047	20,397.152	**298,326.762**
Clymene Dolphin	0.000	0.000	20,306.091	39,810.739	6,604.129	25,301.751	20,489.358	15,869.727	9,412.707	**137,794.502**
Striped Dolphin	0.000	0.000	199,827.536	391,375.882	63,793.815	243,418.330	196,086.989	149,595.327	91,041.146	**1,335,139.025**
Atlantic Spotted Dolphin	0.000	0.000	291,968.246	573,121.475	96,920.094	373,738.318	304,388.840	239,755.284	137,812.574	**2,017,704.831**
Spinner Dolphin	0.000	0.000	191.026	374.513	62.127	238.022	192.750	149.292	88.549	**1,296.279**
Rough-Toothed Dolphin	0.000	0.000	1,348.103	2,635.268	419.376	1,572.892	1,256.603	932.059	599.076	**8,763.377**
Bottlenose Dolphin	0.000	0.000	585,809.587	1,151,442.029	204,923.786	775,106.463	639,210.107	516,168.326	296,211.886	**4,168,872.184**
Cuvier's Beaked Whale	0.000	0.000	27,146.110	53,041.902	8,119.316	31,191.403	24,683.766	17,996.764	11,484.217	**173,663.478**
TOTAL	**0.000**	**0.000**	**1,927,727.622**	**3,786,792.119**	**659,809.515**	**2,513,810.234**	**2,062,449.401**	**1,648,444.397**	**950,286.777**	**13,549,320.065**
									13,549,320.065	

Annual Level A Take Estimtes from All Non-Airgun High-Resolution Geophysical Surveys Using Southall et al. (2007) Criteria for Marine Mammal Species during the Project Perio

Order Cetacea	*2012*	*2013*	*2014*	*2015*	*2016*	*2017*	*2018*	*2019*	*2020*	**Total by Species**
Baleen Whales										
Common Minke Whale	0.0003	0.0004	0.0004	0.0004	0.0004	0.0003	0	0	0	**0.0022**
Sei Whale	0.002	0.0024	0.0024	0.0024	0.0024	0.0021	0.0004	0	0	**0.0141**
Bryde's Whale	0.0023	0.003	0.003	0.003	0.003	0.0027	0.0007	0	0	**0.0177**
Blue Whale	0.0002	0.0005	0.0005	0.0005	0.0005	0.0005	0.0003	0	0	**0.003**
Fin Whale	0.0155	0.0208	0.0208	0.0208	0.0208	0.0185	0.0053	0	0	**0.1225**
North Atlantic Right Whale	0.0021	0.0026	0.0026	0.0026	0.0026	0.0022	0.0005	0	0	**0.0152**
Humpback Whale	0	0	0	0	0	0	0	0	0	**0**
Toothed Whales, Dolphins, Porpoises										
Short-beaked Common Dolphin	4.0936	5.2235	5.2235	5.2235	5.2235	4.546	1.1299	0	0	**30.6635**
Pygmy Killer Whale	0.0004	0.001	0.001	0.001	0.001	0.0009	0.0006	0	0	**0.0059**
Short-Finned Pilot Whale	0.0053	0.0106	0.0106	0.0106	0.0106	0.0106	0.0053	0	0	**0.0636**
Long-Finned Pilot Whale	0	0	0	0	0	0	0	0	0	**0**
Risso's Dolphin	1.863	2.2287	2.2287	2.2287	2.2287	2.0205	0.3658	0	0	**13.1641**
Northern Bottlenose Whale	0	0	0	0	0	0	0	0	0	**0**
Pygmy Sperm Whale	0.0048	0.0064	0.0064	0.0064	0.0064	0.0059	0.0016	0	0	**0.0379**
Dwarf Sperm Whale	0.0145	0.0192	0.0192	0.0192	0.0192	0.0178	0.0047	0	0	**0.1138**
Atlantic White-sided Dolphin	0	0	0	0	0	0	0	0	0	**0**
Fraser's Dolphin	0.0001	0.0003	0.0004	0.0004	0.0004	0.0003	0.0003	0	0	**0.0022**
Sowerby's Beaked Whale	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0	0	0	**0.0012**
Blainville's Beaked Whale	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0	0	0	**0.0012**
Gervais' Beaked Whale	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0	0	0	**0.0012**
True's Beaked Whale	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0	0	0	**0.0012**
Killer Whale	0.0025	0.0061	0.0061	0.0061	0.0061	0.0058	0.0036	0	0	**0.0363**
Melon-Headed Whale	0.0001	0.0004	0.0004	0.0004	0.0004	0.0003	0.0003	0	0	**0.0023**
Harbor Porpoise	0.0005	0.0007	0.0007	0.0007	0.0007	0.0006	0.0002	0	0	**0.0041**
Sperm Whale	0.0008	0.0009	0.0009	0.0009	0.0009	0.0008	0.0001	0	0	**0.0053**
False Killer Whale	0.0001	0.0004	0.0004	0.0004	0.0004	0.0003	0.0003	0	0	**0.0023**
Pantropical Spotted Dolphin	0.4477	0.5868	0.62	0.62	0.62	0.5432	0.1677	0.0287	0.0287	**3.6628**
Clymene Dolphin	0.2139	0.2803	0.2962	0.2962	0.2962	0.2595	0.0801	0.0137	0.0137	**1.7498**
Striped Dolphin	0.5954	0.7674	0.8121	0.8121	0.8121	0.7114	0.2107	0.0386	0.0386	**4.7984**
Atlantic Spotted Dolphin	5.3991	6.9574	7.3614	7.3614	7.3614	6.4414	1.898	0.3397	0.3397	**43.4595**
Spinner Dolphin	0.002	0.0026	0.0028	0.0028	0.0028	0.0024	0.0008	0.0001	0.0001	**0.0164**
Rough-Toothed Dolphin	0.0099	0.0145	0.0145	0.0145	0.0145	0.0134	0.0047	26.1283	0	**26.2143**
Bottlenose Dolphin	1.2977	2.1422	2.3608	2.3608	2.3608	1.9922	1.04	0.1955	0.1955	**13.9455**
Cuvier's Beaked Whale	0.0013	0.0015	0.0015	0.0015	0.0015	0.0013	0.0003	0	0	**0.0089**
TOTAL	**13.9759**	**18.2814**	**18.9981**	**18.9981**	**18.9981**	**16.6017**	**4.9222**	**26.7446**	**0.6163**	**138.1364**
									138.1364	

Annual Level A Take Estimates from All Non-Airgun High-Resolution Geophysical Surveys Using 180-dB Criteria for Marine Mammal Species during the Project Period

Order Cetacea	*2012*	*2013*	*2014*	*2015*	*2016*	*2017*	*2018*	*2019*	*2020*	**Total by Species**
Baleen Whales										
Common Minke Whale	0.0002	0.0003	0.0003	0.0003	0.0003	0.0003	0.0002	0.0001	0.0004	**0.0024**
Sei Whale	0.0004	0.0005	0.0005	0.0005	0.0005	0.0006	0.0012	0.0008	0.0024	**0.0074**
Bryde's Whale	0.0004	0.0005	0.0005	0.0005	0.0005	0.0006	0.0012	0.0008	0.0024	**0.0074**
Blue Whale	0.0007	0.001	0.0011	0.0011	0.0011	0.0011	0.0015	0.0009	0.0026	**0.0111**
Fin Whale	0.0012	0.0016	0.0017	0.0017	0.0017	0.0018	0.0031	0.0019	0.0055	**0.0202**
North Atlantic Right Whale	0.002	0.0025	0.0025	0.0025	0.0025	0.0027	0.0051	0.0031	0.0089	**0.0318**
Humpback Whale	0.0025	0.0034	0.0035	0.0035	0.0035	0.0034	0.0037	0.0022	0.0066	**0.0323**
Toothed Whales, Dolphins, Porpoises										
Short-beaked Common Dolphin	1.2187	1.4589	1.4946	1.4946	1.4946	1.5087	2.0876	1.3143	3.8682	**15.9402**
Pygmy Killer Whale	0.0004	0.0005	0.0005	0.0005	0.0005	0.0006	0.0011	0.0008	0.0024	**0.0073**
Short-Finned Pilot Whale	0.0132	0.0166	0.0171	0.0171	0.0171	0.1358	1.2475	0.805	2.3163	**4.5857**
Long-Finned Pilot Whale	0.0027	0.0033	0.0033	0.0033	0.0033	0.0153	0.1295	0.0932	0.2808	**0.5347**
Risso's Dolphin	0.0913	0.1118	0.1118	0.1118	0.1118	0.1826	0.8666	0.5861	1.7367	**3.9105**
Northern Bottlenose Whale	0	0	0	0	0	0	0.0001	0	0.0001	**0.0002**
Pygmy Sperm Whale	0.0011	0.0015	0.0015	0.0015	0.0015	0.0014	0.0007	0.0005	0.0017	**0.0114**
Dwarf Sperm Whale	0.0034	0.0046	0.0046	0.0046	0.0046	0.0046	0.0057	0.0038	0.0119	**0.0478**
Atlantic White-sided Dolphin	0	0.0001	0.0001	0.0001	0.0001	0.0002	0.0017	0.0014	0.0044	**0.0081**
Fraser's Dolphin	0.0004	0.0006	0.0007	0.0007	0.0007	0.0006	0.0003	0.0001	0.0002	**0.0043**
Sowerby's Beaked Whale	0	0	0	0	0	0	0.0001	0.0001	0.0002	**0.0004**
Blainville's Beaked Whale	0	0	0	0	0	0.0013	0.0134	0.0104	0.032	**0.0571**
Gervais' Beaked Whale	0	0	0	0	0	0.0013	0.0134	0.0104	0.032	**0.0571**
True's Beaked Whale	0	0	0	0	0	0.0013	0.0134	0.0104	0.032	**0.0571**
Killer Whale	0.0005	0.0007	0.0007	0.0007	0.0007	0.0007	0.001	0.0007	0.0021	**0.0078**
Melon-Headed Whale	0.0004	0.0005	0.0005	0.0005	0.0005	0.0006	0.0014	0.0009	0.0029	**0.0082**
Harbor Porpoise	0.0016	0.0018	0.0018	0.0018	0.0018	0.0019	0.0031	0.0023	0.0068	**0.0229**
Sperm Whale	0.0002	0.0002	0.0002	0.0002	0.0002	0.0041	0.043	0.0377	0.1213	**0.2071**
False Killer Whale	0.0004	0.0006	0.0006	0.0006	0.0006	0.0007	0.0016	0.001	0.0029	**0.009**
Pantropical Spotted Dolphin	0.3036	0.4453	0.4509	0.4509	0.4509	0.4381	0.3559	0.161	0.4798	**3.5364**
Clymene Dolphin	0.145	0.2127	0.2154	0.2154	0.2154	0.2088	0.1643	0.0729	0.217	**1.6669**
Striped Dolphin	0.3964	0.5755	0.5831	0.5831	0.5831	0.6088	0.9086	0.5299	1.5825	**6.351**
Atlantic Spotted Dolphin	3.4607	4.9269	4.9955	4.9955	4.9955	4.7511	3.0827	1.2151	3.5657	**35.9887**
Spinner Dolphin	0.0013	0.0019	0.002	0.002	0.002	0.0019	0.0015	0.0007	0.002	**0.0153**
Rough-Toothed Dolphin	0.0057	0.0074	0.0075	0.0075	0.0075	0.0073	0.008	0.0052	0.0164	**0.0725**
Bottlenose Dolphin	0.9382	1.4056	1.465	1.465	1.465	1.6672	3.8323	2.2521	6.4434	**20.9338**
Cuvier's Beaked Whale	0.0002	0.0002	0.0002	0.0002	0.0002	0.009	0.0939	0.0726	0.2243	**0.4008**
TOTAL	**6.5928**	**9.187**	**9.3677**	**9.3677**	**9.3677**	**9.5644**	**12.8944**	**7.1984**	**21.0148**	**94.5549**
									94.5549	

Annual Level A Take Estiamtes from All Non-Airgun High-Resolution Geophysical Surveys Using 160-dB Criteria for Marine Mammal Species during the Project Period

Order Cetacea	*2012*	*2013*	*2014*	*2015*	*2016*	*2017*	*2018*	*2019*	*2020*	**Total by Species**
Baleen Whales										
Common Minke Whale	0.0225	0.0287	0.03	0.03	0.03	0.0282	0.02	0.0135	0.0419	**0.2448**
Sei Whale	0.0358	0.0476	0.0511	0.0511	0.0511	0.0557	0.1152	0.0784	0.2328	**0.7188**
Bryde's Whale	0.0355	0.047	0.0505	0.0505	0.0505	0.0553	0.1169	0.079	0.2338	**0.719**
Blue Whale	0.0659	0.098	0.1037	0.1037	0.1037	0.1048	0.1448	0.0871	0.2568	**1.0685**
Fin Whale	0.1153	0.1598	0.1665	0.1665	0.1665	0.1722	0.3083	0.1847	0.5384	**1.9782**
North Atlantic Right Whale	0.1945	0.2461	0.2491	0.2491	0.2491	0.269	0.5016	0.3002	0.8702	**3.1289**
Humpback Whale	0.2454	0.3285	0.3444	0.3444	0.3444	0.3313	0.3597	0.2189	0.6492	**3.1662**
Toothed Whales, Dolphins, Porpoises										
Short-beaked Common Dolphin	119.444	142.9833	146.4839	146.4839	146.4839	147.8699	204.6009	128.8144	379.127	**1562.291**
Pygmy Killer Whale	0.0345	0.0494	0.0494	0.0494	0.0494	0.0549	0.1097	0.0759	0.237	**0.7096**
Short-Finned Pilot Whale	1.292	1.6287	1.6711	1.6711	1.6711	13.3054	122.2637	78.8942	227.0254	**449.4227**
Long-Finned Pilot Whale	0.2621	0.3201	0.3267	0.3267	0.3267	1.4975	12.6893	9.1359	27.5252	**52.4102**
Risso's Dolphin	8.9444	10.9577	10.9577	10.9577	10.9577	17.8981	84.9354	57.4417	170.2112	**383.2616**
Northern Bottlenose Whale	0	0	0	0	0	0.0006	0.0063	0.0041	0.0118	**0.0228**
Pygmy Sperm Whale	0.1119	0.1503	0.1503	0.1503	0.1503	0.141	0.0732	0.0472	0.1675	**1.142**
Dwarf Sperm Whale	0.3358	0.4508	0.4508	0.4508	0.4508	0.4557	0.5592	0.3686	1.1655	**4.688**
Atlantic White-sided Dolphin	0.0027	0.0055	0.0055	0.0055	0.0055	0.0208	0.168	0.1357	0.4275	**0.7767**
Fraser's Dolphin	0.0345	0.0568	0.0637	0.0637	0.0637	0.0575	0.0304	0.0098	0.0183	**0.3984**
Sowerby's Beaked Whale	0.0023	0.0026	0.0026	0.0026	0.0026	0.003	0.0073	0.0056	0.0175	**0.0461**
Blainville's Beaked Whale	0.0023	0.0026	0.0026	0.0026	0.0026	0.1259	1.3153	1.0167	3.14	**5.6106**
Gervais' Beaked Whale	0.0023	0.0026	0.0026	0.0026	0.0026	0.1259	1.3153	1.0167	3.14	**5.6106**
True's Beaked Whale	0.0026	0.0032	0.0032	0.0032	0.0032	0.1265	1.3156	1.0167	3.14	**5.6142**
Killer Whale	0.0509	0.0642	0.0678	0.0678	0.0678	0.068	0.0952	0.0667	0.2021	**0.7505**
Melon-Headed Whale	0.0361	0.0525	0.0525	0.0525	0.0525	0.0604	0.1362	0.0921	0.2839	**0.8187**
Harbor Porpoise	0.1543	0.1717	0.1812	0.1812	0.1812	0.1894	0.299	0.2206	0.6643	**2.2429**
Sperm Whale	0.0182	0.0215	0.0215	0.0215	0.0215	0.4051	4.2127	3.6965	11.8913	**20.3098**
False Killer Whale	0.0389	0.0582	0.0582	0.0582	0.0582	0.0674	0.1524	0.0959	0.2885	**0.8759**
Pantropical Spotted Dolphin	29.7529	43.6445	44.1968	44.1968	44.1968	42.9366	34.8805	15.7818	47.022	**346.6087**
Clymene Dolphin	14.2145	20.8513	21.1152	21.1152	21.1152	20.46	16.1068	7.1416	21.2706	**163.3904**
Striped Dolphin	38.8529	56.4013	57.1529	57.1529	57.1529	59.6638	89.0555	51.9312	155.0979	**622.4613**
Atlantic Spotted Dolphin	339.1818	482.888	489.6133	489.6133	489.6133	465.651	302.1377	119.089	349.4761	**3527.264**
Spinner Dolphin	0.1306	0.1899	0.1924	0.1924	0.1924	0.1862	0.1484	0.0672	0.2001	**1.4996**
Rough-Toothed Dolphin	0.5554	0.7281	0.7355	0.7355	0.7355	0.7138	0.7853	0.5128	1.6114	**7.1133**
Bottlenose Dolphin	91.9501	137.76	143.5851	143.5851	143.5851	163.3981	375.6071	220.7238	631.5169	**2051.711**
Cuvier's Beaked Whale	0.0158	0.0181	0.0181	0.0181	0.0181	0.881	9.2072	7.1172	21.9798	**39.2734**
TOTAL	**646.1387**	**900.4186**	**918.1559**	**918.1559**	**918.1559**	**937.38**	**1263.78**	**705.4814**	**2059.682**	**9267.348**
									9267.348	

EXHIBIT 5

Reichert, Christina

To: Reichert, Christina
Subject: FW: Notification: Receipt of Applications for Multiple IHAs in the Atlantic Ocean
Attachments: 7-27-15_Notice of receipt of multiple IHA apps for Atlantic activities_as filed.pdf

Subject: FW: Notification: Receipt of Applications for Multiple IHAs in the Atlantic Ocean

From: Craig Woolcott - NOAA Federal [mailto:craig.woolcott@noaa.gov]
Sent: Monday, July 27, 2015 4:22 PM
To: Craig Woolcott - NOAA Federal <craig.woolcott@noaa.gov>
Cc: Meagan Dunphy-Daly - NOAA Federal <meagan.dunphy-daly@noaa.gov>
Subject: Notification: Receipt of Applications for Multiple IHAs in the Atlantic Ocean

Good afternoon colleagues -

NOAA has received four Incidental Harassment Authorization (IHA) requests under the Marine Mammal Protection Act (MMPA) for proposed oil and gas geophysical survey activity in the Atlantic Ocean. The filed notification of receipt is attached to this email, and I have included additional background information below. Once the notification is published in the Federal Register, there will be an initial public review comment period of 30 days. This initial public review period is not typical for the issuance of IHAs, but it is required for more complex actions authorized through a different section of the statute.

Please feel free to contact me with any questions at Craig.Woolcott@noaa.gov or 202-482-7940.

Regards,
Craig

Background information:

- Under the MMPA, NOAA Fisheries is charged with the conservation and protection of marine mammals, including the appropriate authorization of incidental take.
  - NOAA Fisheries works with applicants to produce adequate and complete applications before publishing notice of the proposed authorizations for public comment. We then consider input from the public, make our final determinations, and issue or deny the authorization.
  - Typically, this process takes six to nine months, but may take longer for projects that are more complex.
  - NOAA Fisheries' responsibility is to consider the anticipated effects of the action to individual marine mammals in a population-level context and determine whether those consequences reflect a negligible impact on the relevant stocks. NOAA Fisheries may authorize the incidental taking

of "small numbers" of marine mammals if the taking will have no more than a negligible impact on the species/stock.
    - Behavioral disturbance of individual marine mammals by seismic surveys is well-documented, meaning that an MMPA authorization is required. The potential impacts to marine mammal populations grow with the scale of the proposed survey activity. It is difficult to document population level effects, but recent science has demonstrated connections between disturbance and energetic costs that can affect vital rates and, ultimately, population.
- This group of actions is not typical as the proposed surveys are very large in scale and complicated.
    - The scale of the proposed surveys is unprecedented in U.S. waters, with some surveys involving multiple source vessels and occurring year-round throughout a broad section of the Atlantic Ocean.
    - These proposed surveys are much larger than the typical academic seismic survey and involve much larger acoustic sources that produce more noise.
    - NOAA has been working diligently with the applicant companies to produce adequate applications and to address fundamental MMPA issues.
- This initial public review period is not typical for the issuance of IHAs, but it is required for more complex actions authorized through a different section of the statute.
    - NOAA Fisheries believes a public comment period will be productive in identifying information that should be considered in the decision-making process for these complex proposed surveys.
    - This public comment period does not represent additional time in the process; the public will gain an extra review period while the proposed authorizations are concurrently in development.
    - The regular public comment period will occur when we publish the proposed authorizations (targeted for September 2015).
- NOAA Fisheries is committed to careful review and to ensuring appropriate use of the best available information in satisfying the requirements of the MMPA and NOAA Fisheries' implementing regulations for these proposed surveys.

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Craig A. Woolcott
Congressional Affairs Specialist
Office of Legislative and Intergovernmental Affairs
National Oceanic and Atmospheric Administration (NOAA)
U.S. Department of Commerce - Herbert C. Hoover Building
14th and Constitution Ave., NW
Washington, DC 20230
Tel: (202) 482-7940
Cell: (202) 306-4704
Craig.Woolcott@noaa.gov

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EXHIBIT 6

April 21, 2015

Mary Colligan
Assistant Regional Administrator
NMFS Protected Resources Division
Greater Atlantic Regional Office
55 Great Republic Drive
Gloucester, MA 01930

RE: Endangered and Threatened Species; Critical Habitat for Endangered North Atlantic Right Whale

Dear Ms. Colligan,

I am writing on behalf of the International Fund for Animal Welfare (IFAW), the Natural Resources Defense Council (NRDC), Oceana, Inc., and millions of our concerned supporters on the proposed rule to expand the critical habitat for the endangered North Atlantic right whale. We are very supportive of the proposed rule to expand the critical habitat for North Atlantic right whales with two new areas – approximately 29,945 nm^2 of marine habitat in the Gulf of Maine and Georges Bank region (Unit 1) and off the Southeast U.S. coast (Unit 2). It is our request that the National Marine Fisheries Service also

1. Include the mid-Atlantic migratory corridor and the southernmost portion of the current critical habitat in the right whale critical habitat expansion; and

2. Increase right whale protection measures to provide the protection necessary to allow for the recovery and long-term survival of right whales, including

    a. Expanding Seasonal Management Areas that reduce ship strikes to include all portions of the proposed critical habitat in the northeast and critical habitat in the mid-Atlantic migratory corridor out to 30 nms as well as areas in the Southeast Atlantic;

    b. Protect right whales from gear entanglement through expanded SMAs and expanding entanglement regulations to encourage the use of gear innovations such as sinking or neutrally buoyant line to reduce and prevent entanglement, and to promote science-based catch quotas; and

    c. Protecting right whales from proposed oil and gas exploration and development in the Atlantic Ocean through rules that prevent or limit the seismic airgun activity.

Conservation of North Atlantic right whales is imperative. With a population of about only 500, it is paramount that necessary precautions are taken to ensure species growth and prohibit further detriment to their existence. The most recent NMFS draft stock assessment for North Atlantic right whales, puts the species' annual Potential Biological Removal (PBR) level at 0.9 individuals, but for the period of 2008 through 2012, the minimum rate of annual human-caused mortality and serious injury to right whales averaged 4.75 per year, with incidental fishery entanglement reports at 3.85 per year, and ship strike records at 0.9 per year.[1] This level of mortality and serious injury is four times greater than the species' PBR. This means there are no unnatural right whale mortalities that can be deemed "insignificant" to their endangered population. NOAA is the United States agency responsible for protecting and recovering endangered marine species, and therefore, it is your duty to provide the protection required to safeguard this critically endangered population.

<u>We Support Proposed Rule to Expand Critical Habitat for North Atlantic Right Whale</u>

We applaud the National Marine Fisheries Service's (NMFS) efforts towards expanding North Atlantic right whale critical habitat. The designation and protection of critical habitat is one of the primary ways in which the fundamental purpose of the ESA, "to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved," is achieved.[2] When designating critical habitat, NMFS considers the following characteristics: (1) space for individual and population growth, and for normal behavior; (2) food, water, air, light, minerals, or other nutritional or physiological requirements; (3) cover or shelter; (4) sites for breeding, reproduction, rearing of offspring, germination, or seed dispersal; and (5) habitats that are protected from disturbance or are representative of the historic geographical and ecological distributions of species.[3] Right whale critical habitat has not been revised since 1994 and since that time, our understanding of their seasonal habitat use has grown exponentially. Now that it is widely known that right whale critical habitat is much broader than originally believed, it is only right that the critical habitat boundaries reflect that modernized knowledge and the best science available.

In 1994, at the time when the North Atlantic right whale critical habitat was designated, right whale foraging grounds were thought to be solely located in the Great South Channel and the Cape Cod Bay. Now various studies and analysis of right whale sightings data in U.S. northwest Atlantic waters indicate foraging habitat important to the conservation of right whales is much more extensive than originally perceived. In fact, a study conducted in 2008 found that there is no statistically significant difference between the Sightings Per Unit Effort (SPUE) of right whales inside the current Cape Cod Bay critical habitat and the areas to the east (P=0.669).[4] Instead of two essential feeding grounds, six areas in the region are now understood to be seasonally important for right whale foraging purposes: Cape Cod Bay (January-April), Great South Channel (April-June), the western Gulf of Maine (April-May and July-October), the northern edge of Georges Bank (May-July), Jordan Basin (August-October), and Wilkinson Basin (April-July).

Jordan and Wilkinson Basins are also essential for right whales because they serve as overwintering areas for their prey, copepods. Right whales can be found foraging in these Basins year-round, but they

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[1] Waring *et al*. 2014 Draft Marine Mammal Stock Assessment Reports. Retrieved from: http://www.nmfs.noaa.gov/pr/sars/pdf/atl2014_draft.pdf
[2] 16 U.S.C. § 1536(a)(2).
[3] 50 C.F.R. § 424.12(b)(1)–(5).
[4] Nichols, O. C., Kenney, R. D., & Brown, M. W. (2008). Spatial and temporal distribution of North Atlantic right whales (Eubalaena glacialis) in Cape Cod Bay, and implications for management. Fishery Bulletin, 106(3), 270-280. Retrieved from http://0-web.ebscohost.com.library.colgate.edu/ehost/detail?sid=84ec6e2f-a35a-4c65-a80e-369c291643f9%40sessionmgr115&vid=1&hid=128&bdata=JnNpdGU9ZWhvc3QtbGl2ZQ%3d%3d#db=aph&AN=34474673

feed in especially high numbers during the fall and early winter months.[5] For example, right whale surveys conducted in Jordan Basin during the winter of 2004-2005 reported up to 24 foraging whales at a time[6] and in the winter of 2008, NOAA's Northeast Fisheries Science Center (NEFSC) observed 44 individual right whales on December 3rd and 41 on December 14th – about 14% of the total estimated population at the time.[7] After the overwintering period is over, the copepods in these Basins distribute to the other aforementioned areas in abundance and become the right whales food source throughout their foraging habitat. Right whale foraging activity is triggered by these high concentrations of copepods and a standard analysis of metabolic needs suggests that they require these dense patches to survive.[8] It is essential that all of the areas within the Gulf of Maine and Georges Bank region are included in the expansion as proposed so the dense copepod concentrations needed for right whale survival cannot be easily disturbed by harmful activities. Each of the listed areas make up North Atlantic right whale foraging habitat and are crucial to the long-term survival of right whales; because of this, these areas should be designated as critical habitat to right whales as proposed according to the Endangered Species Act (ESA).

The best science currently available also indicates that the existing North Atlantic right whale critical habitat boundaries in the southeast Atlantic Ocean are underrepresenting vital right whale habitat necessary to their species' conservation. As the location of the only calving grounds for right whales, this region is paramount to their population's growth and ultimate survival. Recent studies indicate that the current critical habitat boundaries need to be expanded to include areas farther offshore and substantially further north off the coast of Georgia.[9] As stated by the NMFS, southern North Carolina waters are a "substantial and core portion of the right whale calving area".[10] This expanse includes suitable average environmental conditions and has a high predicted sightings rate of calving right whales. Also by using a developed model to mean sea surface temperature (SST) throughout December-March, with right whale sightings per unit effort (SPUE) averaged across years, one study predicted suitable calving habitat for right whales over much of the continental shelf south of Cape Fear, North Carolina. It is clearly evident that right whale critical habitat should be expanded to encompass the proposed expansion. [11]

Therefore, the proposed expanded critical habitat for right whales represents important foraging, calving, and reproduction areas.

Inclusion of the Mid-Atlantic Migratory Corridor and the Southernmost Portion of the Current Critical Habitat in the New Right Whale Critical Habitat Expansion

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[5] Pace RM III, Merrick RL. (2008.) Northwest Atlantic Ocean Habitats Important to the Conservation of North Atlantic Right Whales (Eubalaena glacialis). Northeast Fish Sci Cent Ref Doc. 08-07; 24 p. Retrieved from http://www.nefsc.noaa.gov/publications/crd/crd0807/

[6] Ibid.

[7] Dawicki, Shelley. (January 2009). High numbers of right whales seen in Gulf of Maine. NOAA National Marine Fisheries Service. Retrieved from http://www.eurekalert.org/pub_releases/2009-01/nnmf-hno010209.php

[8] Pace, R.M. and Merrick, R.L. (April 2008). Northwest Atlantic Ocean habitats important to the conservation of North Atlantic right whales (*Eubalaena glacialis*). Retrieved from http://www.nefsc.noaa.gov/publications/crd/crd0807/crd0807.pdf

[9] Keller, C.A., Garrison, L., Baumstark, R., Ward-Geiger, L.I., and Hines, E. (2012). Application of a habitat model to define calving habitat of the North Atlantic right whale in the southeastern United States. Endangered Species Research, doi: 10.3354/esr00413. Retrieved from http://www.int-res.com/articles/esr_oa/n018p073.pdf

[10] NMFS (2012). U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments –North Atlantic right whale. Retrieved from http://www.nmfs.noaa.gov/pr/sars/pdf/ao2012.pdf

[11] Keller, C.A., Garrison, L., Baumstark, R., Ward-Geiger, L.I., and Hines, E. (2012). Application of a habitat model to define calving habitat of the North Atlantic right whale in the southeastern United States. Endangered Species Research, doi: 10.3354/esr00413. Retrieved from http://www.int-res.com/articles/esr_oa/n018p073.pdf

While we are very pleased with the proposed critical habitat expansion, we request that you consider including the mid-Atlantic migratory corridor and the entire currently designated critical habitat in the southeast in the proposal as well. As mentioned above, when designating critical habitat, NMFS considers space for normal behavior and sites for breeding and reproduction.[12] Here, the mid-Atlantic migratory corridor represents an area of normal species behavior because whales use the corridor to move between the species' southern calving sites and northern foraging sites. Further, the southernmost portion of the current critical habitat is essential for breeding and reproduction. Thus, NMFS should include both the mid-Atlantic migratory corridor and the southernmost portion of the current critical habitat in the expanded right whale critical habitat.

The mid-Atlantic migratory corridor connects both essential habitats and is traversed by the most important and vulnerable members of the population – mothers and calves. It is crucial that these essential foraging and calving grounds receive the increased protection and special management consideration necessary to allow the North Atlantic right whales devastatingly low population to recover. Including this area in the expansion would help to safeguard their migratory route and ensure that mothers and calves are able to access their calving and foraging grounds. If this area is not included, detrimental activities could take place in the corridor and put mothers and calves at an increased risk of injury and mortality. Complete protection of mothers and calves is crucial to population growth. It is already apparent that NMFS acknowledges right whale use of this high risk area by allotting Seasonal Management Areas (SMAs) out to 20 nautical miles from mid-Atlantic ports. As a known, necessary area to right whales it should be included in the critical habitat expansion.

Also, in order to provide the best possible protection, the southern tip of the existing Southeast Atlantic critical habitat should not be decreased or narrowed as proposed. The safety of calving habitat is crucial to right whale success and should not be downsized by any means if we are to provide right whales with the best protection possible. At their current endangered status, the right whale population is not at a point where protection should be decreased for their species. By including the existing southern tip in the proposed critical habitat boundaries, as previously indicated, 91% of analyzed sightings would be included in the expansion. This would provide right whales with nearly full habitat coverage.

Therefore, NMFS should include the mid-Atlantic migratory corridor because the species normally uses it to move between the southern calving sites and northern foraging sites. And NMFS should include the southernmost portion of the current critical habitat because this area is essential for breeding and reproduction.

<u>Expanding Protective Measures to Strengthen Right Whale Protection within the Newly Designated Critical Habitat</u>

We request that NMFS expand protective measures within existing and newly designated critical habitat to strengthen whale protection. NMFS also states that critical habitat provides a benefit to species by focusing federal, state, and private conservation and management efforts in areas designated critical habitat.[13] Recovery efforts can then address special considerations needed in critical habitat areas,

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[12] 50 C.F.R. § 424.12(b)(1)–(5).
[13] *See Palila v. Hawaii Department of Land and Natural Resources*, 852 F. 2d 1106 (9th Cir. 1988).

including conservation regulations to restrict private as well as federal activities.[14] Therefore, to provide the necessary protections for right whales, NMFS should

1. Expand Seasonal Management Areas (SMAs) that reduce ship strikes to include all portions of the proposed critical habitat in the northeast and critical habitat in the mid-Atlantic migratory corridor out to 30 nms as well as areas in the Southeast Atlantic;

2. Protect right whales from gear entanglement through expanded SMAs and expanding entanglement regulations to encourage the use of gear innovations such as sinking or neutrally buoyant line to reduce and prevent entanglement, and to promote science-based catch quotas; and

3. Protect right whales from proposed oil and gas exploration and development in the Atlantic Ocean through rules that prohibit or limit seismic airgun activity.

First, NMFS should expand SMAs[15] that reduce ship strikes to include all portions of the proposed critical habitat in the northeast. Ship strikes currently remain one of the greatest known causes of North Atlantic right whale mortality.[16] Many of their physiological tendencies, such as swimming slowly, living in near-shore waters, and spending extended periods of time near the surface, put them in extreme jeopardy of being struck by a traversing vessel. Given the vulnerability of the right whale population, the loss of even one whale reduces the species chance of long-term survival.

The feeding behavior of pregnant or breeding females and their calves put them at a particularly high risk of vessel collision. Surface intervals for calves and females with calves average 5.69 minutes, whereas surface intervals for all other individuals, excluding the pregnant female, average 3.13 minutes. Pregnant females have the highest average surface interval at 11.08 minutes.[17] Therefore, ships are most likely to hit the individuals most essential in reviving the population. Females have an average lifetime calf production total of 5.25 calves; killing a reproductive female has a potentially critical impact on the population's recovery.[18]

Considering right whale vulnerability to ship strikes and their critically endangered status, SMAs should be expanded to include all portions of the proposed critical habitat in the northeast. Also, in the mid-Atlantic SMAs should be extended out to at least 30 nm as whales have been detected further offshore than current regulations reach. Reduced ship speeds of 10 knots or lower have proven to decrease the likelihood of ship strikes to right whales. In fact, since the Ship Speed Rule went into effect in 2008, none of the 5 reported ship strike serious injury and mortalities of North Atlantic right whales in U.S. waters occurred in SMAs. Modeling studies indicate that in these areas, the probability of fatal vessel

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[14] *Id.*

[15] SMAs should include both restrictions on vessel speed and restrictions on the use of fishing gear that can interact with and entangle North Atlantic right whales.

[16] Recovery Plan for the North Atlantic Right Whale, (August 2004); Prepared by the National Marine Fisheries Service Department of Commerce; page IG-1

[17] Baumgartner, M.F., Mate, B.R. (2003). Summertime foraging ecology of North Atlantic right whales. Mar Ecol Prog Ser. 264:123–135. Retrieved from http://ir.library.oregonstate.edu/xmlui/bitstream/handle/1957/27353/SummertimeForagingEcologyOf.pdf?sequence=1

[18] Kraus, S. D., Brown, M. W., Caswell, H., Clark, C. W., & al, e. (2005). North atlantic right whales in crisis. *Science, 309*(5734), 561-2. Retrieved from http://search.proquest.com/docview/213603412?accountid=10207

strikes to right whales has been reduced by 80 to 90 percent.[19] On the contrary, though fewer vessel strike mortalities have occurred inside active SMAs, their prevalence has increased outside of these areas, meaning that more area should be protected to reduce vessel strike mortalities. Specifically, about 32% of pre-Ship Speed Rule right whale vessel strike mortalities occurred outside of SMAs during their active times, showing that the spatial extent of SMAs is insufficient in certain seasons.[20] Dynamic Management Areas (DMAs)[21] may pop up where there are multiple right whale sightings outside of SMAs, but relying on this measure alone in such prevalent right whale habitat provides inadequate protection to this endangered species. DMAs are only subject to voluntary speed restrictions and unfortunately receive low compliance. They may have had some tacit benefit in raising awareness of mariners to the problem of right whale vulnerability to ship strikes, but when measured by vessels either avoiding an area or restricting speed within it, the DMA program has likely had little or no impact in reducing ship strike occurrences.[22] Studies suggest that due to a large number of right whale observations that have occurred incidentally outside SMAs – like in Jordan Basin where at least 3 DMAs were issued in 2009,[23] at least 5 in 2010,[24] at least 3 in 2011,[25] and finally at least 1 in 2012 [26] – consideration should be given to either expanding the sizes of the SMAs to encompass a large portion, if not all, of the recurring DMAs or to establishing new SMAs. In order to fully take advantage of the effectiveness of this protection measure, SMAs need to be expanded to include larger portions of right whale habitat.

As the migratory corridor between the right whale calving grounds in the southern Atlantic and their feeding grounds in the north, the mid-Atlantic should not only be included in the proposed critical habitat expansion, but also deserves ship speed regulations to be expanded there as well. Analysis indicates that SMAs only cover a small portion of essential right whale habitat, a fact that is also made evident by the proposed rule to expand their critical habitat extensively. By expanding the existing SMAs in the mid-Atlantic migratory corridor out to 30 nm instead of 20 nm, an additional 15,453 km^2 of protection would be allotted to this critically endangered species.[27] Studies have shown that in the mid-Atlantic a 20 nm buffer from each port typically picks up less than half the sightings that pass the ports'

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[19] NOAA (2013). NOAA proposal extends rule reducing risk of whale ship strikes along U.S. East Coast. Retrieved from http://www.noaanews.noaa.gov/stories2013/20130605_rightwhale.html

[20] van der Hoop, J. M., Vanderlaan, A. S. M., Cole, T. V. N., Henry, A. G., Hall, L., Mase-Guthrie, B., Wimmer, T. and Moore, M. J. (2015), Vessel Strikes to Large Whales Before and After the 2008 Ship Strike Rule. Conservation Letters, 8: 24–32. doi: 10.1111/conl.12105. Retrieved from http://onlinelibrary.wiley.com/doi/10.1111/conl.12105/full

[21] Areas where voluntary speed restrictions are adopted in response to aggregations of Atlantic Right Whales outside of SMAs.

[22] Ibid p. 35

[23] Khan, C, Cole, T, Duley, P, Glass, A, Gatzke, J. (2010). North Atlantic Right Whale Sighting Survey (NARWSS) and Right Whale Sighting Advisory System (RWSAS) 2009 Results Summary. US Dept Commer, Northeast Fish Sci Cent Ref Doc. Retrieved from http://www.nefsc.noaa.gov/publications/crd/crd1007/crd1007.pdf

[24] Khan, C, Cole, T, Duley, P, Henry, A, Gatzke, J. (2011). North Atlantic Right Whale Sighting Survey (NARWSS) and Right Whale Sighting Advisory System (RWSAS) 2010 Results Summary. US Dept Commer, Northeast Fish Sci Cent Ref Doc. Retrieved from http://www.nefsc.noaa.gov/publications/crd/crd1105/1105.pdf

[25] Khan C, Cole T, Duley P, Henry A, Gatzke J, Corkeron. (2012). North Atlantic Right Whale Sighting Survey (NARWSS) and Right Whale Sighting Advisory System (RWSAS) 2011 Results Summary. US Dept Commer, Northeast Fish Sci Cent Ref Doc. Retrieved from http://www.nefsc.noaa.gov/publications/crd/crd1209/

[26] Gatzke J, Khan C, Henry A, Cole T, Duley P. (2013). North Atlantic Right Whale Sighting Survey (NARWSS) and Right Whale Sighting Advisory System (RWSAS) 2012 Results Summary. US Dept Commer, Northeast Fish Sci Cent Ref Doc. Retrieved from http://www.nefsc.noaa.gov/publications/crd/crd1308/

[27] Schick, R. S., Halpin, P. N., Read, A. J., Slay, C. K., Kraus, S. D., Mate, B. R., & ... Clark, J. S. (2009). Striking the right balance in right whale conservation. Canadian Journal Of Fisheries & Aquatic Sciences, 66(9), 1399-1403. doi:10.1139/F09-115. Retrieved from http://0-web.ebscohost.com.library.colgate.edu/ehost/detail?sid=53199adf-1de7-4fde-bcd8-2b53e9af1cc6%40sessionmgr111&vid=1&hid=128&bdata=JnNpdGU9ZWhvc3QtbGl2ZQ%3d%3d#db=aph&AN=44183936

entrances. With a 25 nm buffer, over 50% of right whale sightings are included at five of the nine ports. At 30 nm, only the Delaware Bay port, which has few sightings, includes less than 50% of sightings. The other eight ports include between 55% and 94% of all sightings and 80% of tagged animal sightings at this inclusion distance. At 35 nm, sighting inclusion is close to 100% at all nine ports.[28] The mid-Atlantic migratory corridor has the highest right whale ship strike incidence and mortality density.[6]

Therefore, it is paramount that ship speed regulations be applied more extensively to this area and buffers at least extend out to 30 nm in order for the SMAs to be effective.

Second, NMFS should expand protections against entanglement to fully safeguard the right whale population so they may achieve long-term survival. Entanglement is another leading cause of right whale mortality, with nearly three-quarters of all known North Atlantic right whales inflicted with scars from past entanglements with commercial fishing gear[29]. North Atlantic right whales' migratory route and foraging and calving habitats coincide with a variety of fisheries, putting them in grave danger of entanglement. Similar to ship strikes, entanglements are most likely to occur with calves, juveniles, and pregnant females – vulnerable members of the population that are essential to growth.[30]

Several measures can be taken to help prevent entanglement occurrences. These measures include regulating or prohibiting in SMAs the use of fishing gear that interact with and lead to entanglement of North Atlantic right whales. Appropriate measures also include promoting, and as appropriate, requiring adoption of gear innovations like sinking or neutrally buoyant line, and encouraging science-based catch quotas, which can promote efficiency, productivity, and profit, while minimizing unintended threats and "bycatch" of marine species.

Entanglements are inhibiting the North Atlantic right whale population from reaching the Marine Mammal Protection Act's (MMPA) mandate to reach the Zero Mortality Rate Goal (ZMRG) and the ESA recovery mandate 16 U.S.C. § 1531(b). According to NMFS over half of all identified right whale deaths have been caused by entanglement in commercial fishing gear.[31] Also, it is estimated that more than 75% of North Atlantic right whales have been entangled at some time in their lives[32] – a percentage that has risen considerably from 57% in 1990,[33] 61.6% in 1998,[34] and may have even risen again within the past few years. Fishermen take advantage of the biological productivity and advantageous conditions found within right whale habitat the same as the whales do, creating a potentially harmful co-occurrence of right whale presence and fishing gear.

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[28] Knowlton, A.R., Ring, J.B., Russell, B. (July 2002). Right whale sightings and survey effort in the mid Atlantic region: migratory corridor, time frame, and proximity to port entrances. Report submitted to NMFS ship strike working group. Retrieved from http://www.greateratlantic.fisheries.noaa.gov/shipstrike/ssr/midatanticreportrFINAL.pdf

[29] Knowlton, A.R., Marx, M.K., Pettis, H.M., Hamilton, P.K., & Kraus, S.D. (February 2005). Analysis of scarring on North Altantic Right Whales (Eubalaena Glacialis): Monitoring rates of entanglement interaction: 1980-2002. Retrieved from http://docs.lib.noaa.gov/noaa_documents/NOAA_related_docs/Analysis_Scarring_North_Atlantic_Right_Whales.pdf

[30] Knowlton, A. R., Hamilton, P. K., Marx, M. K., Pettis, H. M., and Kraus, S. D. (2012). Monitoring North Atlantic right whale (*Eubalanena glacialis)* entanglement rates: a 30 yr retrospective. Marine Ecology Progress Series, 466, 293-302.

[31] NMFS (2012). U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments –North Atlantic right whale. Retrieved from http://www.nmfs.noaa.gov/pr/sars/pdf/ao2012.pdf

[32] Knowlton, A.R., M.K. Marx, H.M. Pettis, P.K. Hamilton and S.D. Kraus. (2005). Analysis of scarring on North Atlantic right whales (Eubalaena glacialis): monitoring rates of entanglement interaction 1980-2002. National Marine Fisheries Service. Contract #43EANF030107. Final Report.

[33] National Marine Fisheries Service. (2013). Draft Recovery Plan for the North Pacific Right Whale (Eubalaena japonica). National Marine Fisheries Service, Office of Protected Resources, Silver Spring, MD. (citing Kraus, S.D. 1990. Rates and potential causes of mortality in North Atlantic right whales. Marine Mammal Science 6(4):278-291).

[34] Hamilton, P.K., M.K. Marx, and S.D. Kraus. (1998). Scarification analysis of North Atlantic right whales (Eubalaena glacialis) as a method of assessing human impacts. Northeast Fisheries Science Center. Contract No. 4EANF-6-0004. Final Report.

Therefore, NFMS should expand entanglement regulations, including through SMAs and through gear technology requirements, to more effectively mitigate entanglement incidences.

Third, NMFS should protect right whales from the proposed expansion of oil and gas development in the Atlantic Ocean through rules that limit the sonic impact from seismic activity. The Bureau of Ocean Energy Management (BOEM) has proposed to authorize geological and geophysical activities to support its oil and gas development, renewable energy, and marine minerals programs in the Federal waters of the mid- and south Atlantic Outer Continental Shelf – completely engulfing right whale calving grounds and the mid-Atlantic migratory corridor.[35] Their Environmental Impact Statement (EIS) discusses strategies to minimize right whale takes, but with such a small population size, no right whale death can be deemed insignificant to the population's survival. Accordingly, NMFS should look to the best available science, including the acoustic guidelines currently under development, in developing protective regulations to prohibit in critical habitat damaging sonic impacts from seismic exploration. These regulations might include buffer zones distancing seismic activity outside of critical habitat to make sure that the noise level inside critical habitat is not too high, or other appropriate science-based protections tailored to the particular kind of threat posed by different seismic activities.

Therefore, to fully protect the right whale within existing and newly designated critical habitat, NMFS should

1. Expanding Seasonal Management Areas that reduce ship strikes to include all portions of the proposed critical habitat in the northeast and critical habitat in the mid-Atlantic migratory corridor out to 30 nms as well as areas in the Southeast Atlantic;

2. Protect right whales from gear entanglement through expanded SMAs and expanding entanglement regulations to encourage the use of gear innovations such as sinking or neutrally buoyant line to reduce and prevent entanglement, and to promote science-based catch quotas; and

3. Protecting right whales from proposed oil and gas exploration and development in the Atlantic Ocean through rules that prevent or limit seismic airgun activity.

<u>Conclusion</u>

We are in full support of the proposed rule to expand North Atlantic right whale critical habitat and also respectfully requests that you consider

1. Including the mid-Atlantic migratory corridor and the southernmost portion of the current critical habitat in the right whale critical habitat expansion; and

2. Increasing right whale protection measures to provide the protection necessary to allow for the recovery and long-term survival of right whales, including

[35] BOEM (2012). Proposed geological and geophysical activities – mid-Atlantic and south Atlantic planning areas – biological assessment. Retrieved from http://www.boem.gov/uploadedFiles/BOEM/Oil_and_Gas_Energy_Program/GOMR/Biological_Assessment_finalforwebposting_wcover_5-24-12.pdf

a. Expanding Seasonal Management Areas that reduce ship strikes to include all portions of the proposed critical habitat in the northeast and critical habitat in the mid-Atlantic migratory corridor out to 30 nms as well as areas in the Southeast Atlantic;

b. Protect right whales from gear entanglement through expanded SMAs and expanding entanglement regulations to encourage the use of gear innovations such as sinking or neutrally buoyant line to reduce and prevent entanglement, and to promote science-based catch quotas; and

c. Protecting right whales from proposed oil and gas exploration and development in the Atlantic Ocean through rules that prevent or limit seismic airgun activity.

In order to safeguard the right whale population, we must protect them and limit disturbances from current and future threatening implications to the best of our abilities. On behalf of our organizations, we thank you for considering our views and recommendations.

Sincerely,

Margaret Cooney
Campaigns Officer
International Fund for Animal Welfare

Taryn Kiekow Heimer
Senior Policy Analyst
Natural Resources Defense Council

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

EXHIBIT 7

North Atlantic Right Whale Critical Habitat: Southeast Atlantic

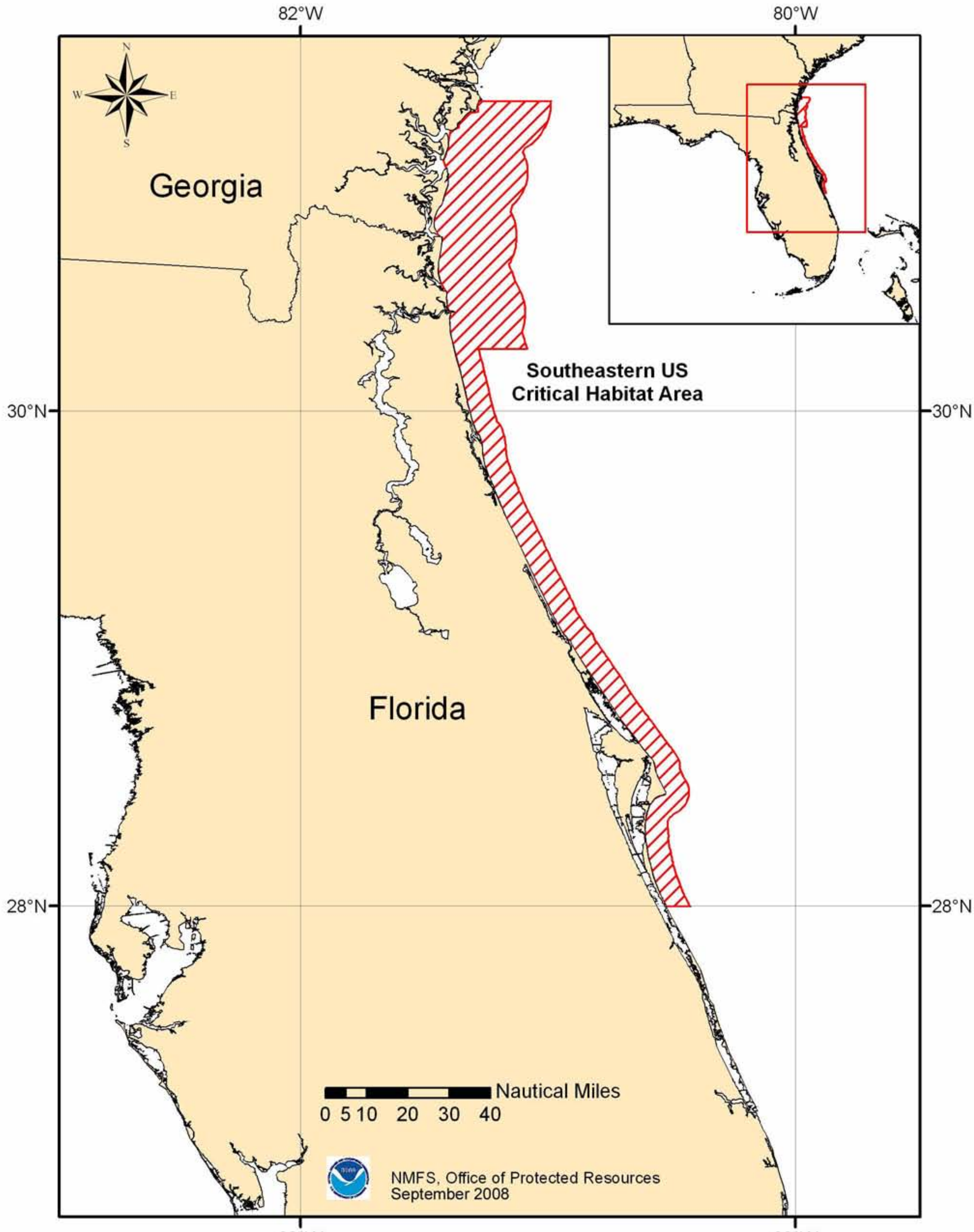

EXHIBIT 8

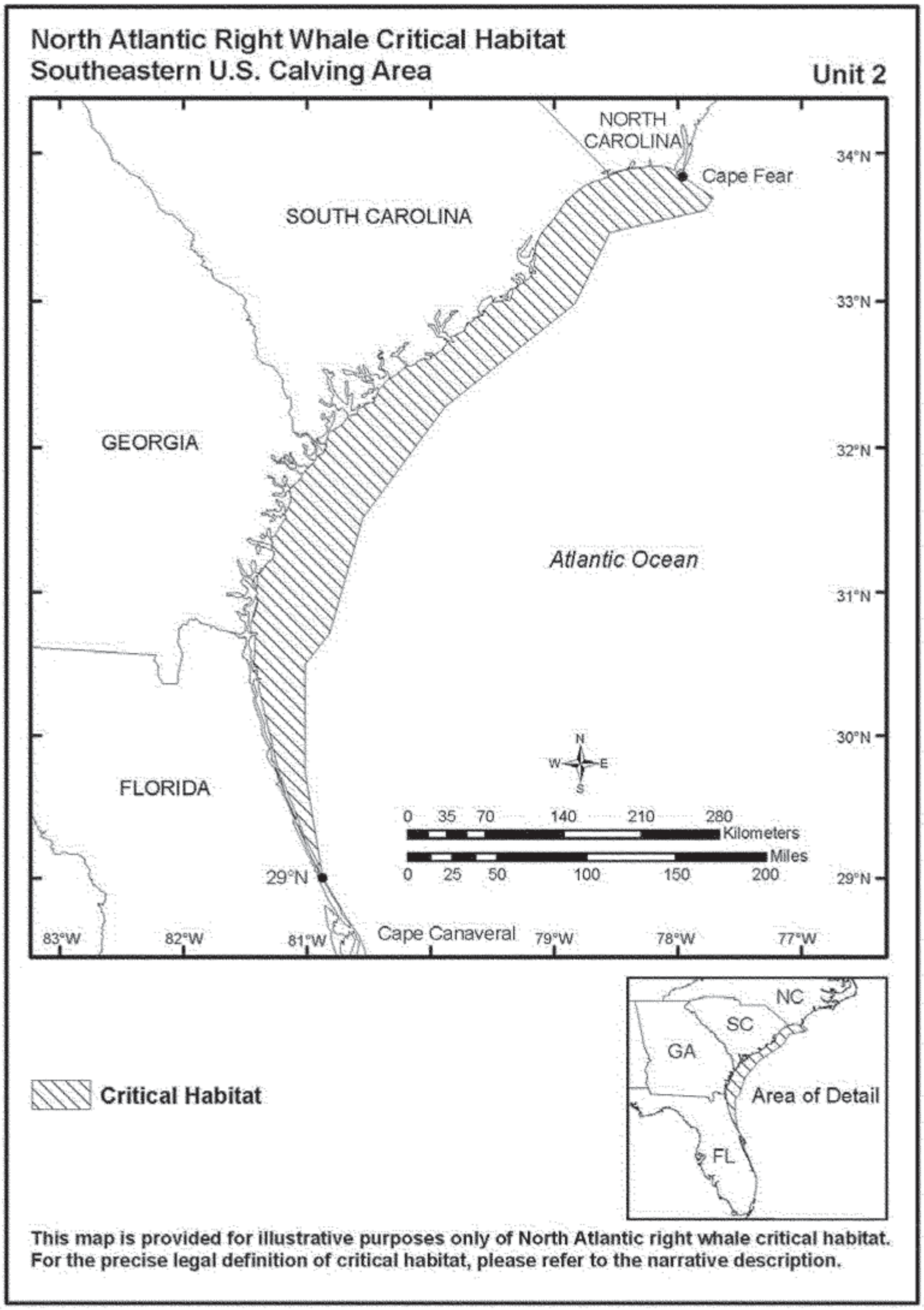

Figure 2. Area considered for designation as North Atlantic right whale southeastern calving critical habitat.

Ocean Conservation Research

Science and technology serving the sea

Mr. Gary D. Goeke, Chief, April 30, 2014
Regional Assessment Section,
Office of Environment (MS 5410),
Bureau of Ocean Energy Management,
Gulf of Mexico OCS Region,
1201 Elmwood Park Boulevard,
New Orleans,
Louisiana 70123–2394

Cc: Jill Lewandowski, USDOI

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

Dear Mr. Goeke,

We appreciate this opportunity to submit our comments on the Final Programmatic Environmental Impact Statement on the Atlantic OCS Proposed Geological and Geophysical Activities (hereinafter Atlantic G&G PEIS). In this document we will comment on how and if our original comments on the 2012 Draft Environmental Impact Statement were addressed, and to the extent that we can, comment on the changes made in the document reflecting the comments of the public and industry.

As in our original comments we will attempt to be thorough and informative in our review. 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.

In our conversations with colleagues about this "final" PEIS the fact continuously arises that Draft EIS on acoustical guidelines was recently submitted by NOAA for public review[1] (hereinafter "NOAA Acoustical Guidelines"). While these guidelines represent an incremental improvement over previous noise exposure guidelines, we found them lacking due to the paucity of data establishing auditory thresholds across marine mammal species, and with the submission of new data which puts the whole concept of "Temporary Threshold Shift" into question.[2, 3] (We have attached our critique of the guidelines to this letter.)

[1] 78 Fed. Reg. 78822 "Draft Guidance for Assessing the Effects of Anthropogenic Sound on 13 Marine Mammals" (Dec. 27, 2013)
[2] Kujawa, S.G., and M.C. Liberman. 2009. Adding insult to injury: Cochlear nerve degeneration after "temporary" noise-induced hearing loss. The Journal of Neuroscience 29:14077-2
[3] Lin, H.W., A.C. Furman, S.G. Kujawa, and M.C. Liberman. 2011. Primary neural degeneration in the guinea pig cochlea after reversible noise-induced threshold shift. Journal of the Association for Research in Otolaryngology 12:605-616.

Box 559, Lagunitas, California 94938
V. 415.488.0553 F. 415.488.1725
www.OCR.org

Given that the Atlantic G&G PEIS depends on the most up-to-date scientific information it stands to reason that a final decision on the plan cannot be issued until the noise guidelines are amended, approved, and used as guidelines for the Atlantic G&G PEIS.

It appears that BOEM had anticipated this, and why what is known as "Southall 2007" [4] was cited so extensively in the Atlantic G&G Draft PEIS. So while using the Southall guidelines in parallel with the legacy guidelines presaged the issuance and review of the NOAA Acoustical Guidelines, we believe that there are too many shortcomings in the acoustical guidelines to even approximate impacts indicated in the literature which has been published since the Southall 2007 paper. (e.g. Roland et.al.[5], 2012 and Costellote et.al 2012 [6])

So while we will put effort into our review, we believe in the end that a final "Final PEIS" will need another review using a revised set of acoustical guidelines.

From an editorial perspective it is clear that "Alternative B, the preferred action" is a paean to the fossil fuel industry. One of the deepest concerns of conservationists about the Atlantic G&G plan is that choosing the wrong alternative will be a tacit gateway for fossil fuel development on the Eastern Seaboard. In light of all we know about the severe impacts of fossil fuel on global climate, and the risks that fossil fuel extraction – particularly deepwater exploration and production on local and regional marine habitat, continuing to subsidize the hydrocarbon industry with the opportunities cleared by Alternative B is reckless and irresponsible.

Political, social, economic, and environmental threats posed by higher-energy climate conditions, sea level rise, and dependence on politically volatile non-renewable fossil fuel have been well detailed. Continuing to place the future of our civilization in the hands of private global energy interests is the epitome of madness. For these reasons alone it should be clear that the only realistic alternative would be Alternative C – the no action alternative which promotes the development of offshore wind and tidal energy resources. Choosing this alternative will send a clear message to the world that the US government is finally taking a stand on the climate disaster that is currently and rapidly unfolding.

Regarding some of the specific aspects of BOEM responses to our 2012 comments to the Draft PEIS,[7] we appreciate the time that went into reviewing and in a number of cases revising the "Final" PEIS in response to many of our (collective) concerns, although there remain some issues that we either did not express clearly enough, or the issue was not

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[4] 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.

[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

[6] Manuel Castellote, Christopher W. Clark, Marc O. Lammers 2012 "Acoustic and behavioural changes by fin whales (*Balaenoptera physalus*)in response to shipping and airgun noise" Biological Conservation 147 (2012) 115–122

[7] Found in BOEM-2014-001-v3 Table 6: NGO-E-4 comments 0.01 through 0.31

resolved due to established regulatory guidelines – some of which we believe are regulatory shortcomings.

In response to our comment NGO-E-4-0.07 about hearing damage in fish, we believe that there is still too little known about fish hearing to make the broad assumption that "fishes are not likely to ever become permanently deaf."[8] We dismissed the Smith 2006 paper because the study was on goldfish – not representative of marine fish, and while Lombarte and Popper, (1994)[9] indicate high densities of hair cells in the saccule, there is no clear correlation that these high densities result in increased (or even what humans might consider "good") hearing sensitivity. While Mann et.al., (2009) do correlate increased hearing sensitivity in other gadiformes[10] correlated with age (or size of the saccular otolith and associated sensory epithelia of the inner ear) the effect of the increase in saccule size and number of hair cells does not clearly point to the same relationship between quantity of hair cells to hearing acuity (or hearing damage) found in humans and other terrestrial vertebrates. Thus I would not rely on hair cell density, or even "self repair" to be a proxy for hearing health or acuity.

Furthermore McCauley et al., (2003)[11] does not indicate hair cell repair as indicated in the Atlantic G&G PEIS section 4.2.5.1.4; rather the paper indicated intermediate and long-term damage through "blebbing" and holes developing in the sensory epithelia. The paper also included the statement that "impact of exposure on ultimate survival of the fish is not clear. Fishes with impaired hearing or vestibular senses would have reduced fitness, potentially leaving them vulnerable to predators." This is an important factor that the Atlantic G&G PEIS continues to overlook – whether it is in fish or in marine mammals: That when animal's sensory systems are compromised they become less fit. Even if the compromise is "temporary," the animals will become more subject to predation, less capable of locating food, navigating, and sensing its surrounding for any survival purpose. McCauley et al., (2003) noted serious physiological compromise after 58 days. This is a long time to not hear well. And the very cage that prevented the fish from dispersing (used as a dismissive argument in the PEIS) may have also protected them from predation. (There was no later histologies performed on these subjects tracking degradation or recovery.)

Regarding the comment about caged fish not being able to escape from the noise; sedentary fish will not necessarily disperse when under assault, but may be predisposed to diving down and "sheltering in place."[12] This response is likely an adaptation to escape predation rather than to escape noise. In McCauley 2000 squid swam closer to the surface when exposed to noise where low frequency noise levels would be attenuated by the

[8] Atlantic G&G PEIS section 4.2.5.1.4
[9] Lombarte, A. and A.N. Popper. 1994. Quantitative analyses of postembryonic hair cell addition in the otolithic endorgans of the inner ear of the European hake, (*Merluccius merluccius*). Journal of Comparative Neurology 345:419-428
[10] David A. Mann, Christopher D. Wilson, Jiakun Song & Arthur N. Popper . 2009 "Hearing Sensitivity of the Walleye Pollock" Transactions of the American Fisheries Society Volume 138, Issue 5, pp 1000-1008
[11] McCauley, R. D., Fewtrell, J, and Popper, A. N. (2003). High intensity anthropogenic sound damages fish ears. J. Acoust. Soc. Am., 113:638-642
[12] Lise Doksæter, Nils Olav Handegard, and Olav Rune Godø, Petter H. Kvadsheim and Nina Nordlund. 2011 "Behavior of captive herring exposed to naval sonar transmissions (1.0–1.6kHz) throughout a yearly cycle." Acoust. Soc. Am. V.131:2

Lloyd mirror effect.[13] If the caged fish attempted to escape the noise they may have sensed the quieter boundary area near the surface and sheltered there. This provides an additional perspective on the cage issue from McCauley et. al., (2003) which also casts a shadow (or sheds light) on the BOEM response to our comment NGO-E-4-0.08, so our comments still stands, paraphrased in this and the previous paragraph. So the phrase "No mortality or injury is expected because there has been no observation of direct physical injury or death to fishes from airguns" should be pulled from the Atlantic G&G PEIS Summary page xviii

There is an ongoing assumption that fish will successfully disperse from areas they find unsuitable, represented in the BOEM comment "…adult fish exposed to elevated sound levels would be able to leave the area most severely impacted by the survey noise" made in the section 4.2.5.1. "Summary of Fish and Invertebrate Hearing Capabilities." This statement is pure speculation and is not consistent with what we know about sedentary and non-migratory fish. This assumption should not be used as a mitigation strategy and should be pulled from the EIS.

The fact stated in section 4.2.5.1.4 that "there is no evidence in fishes for permanent hearing loss" can also as factually be rephrased to "there is no evidence in fishes that permanent hearing loss does not occur." To substantiate this point; fish deafened "temporarily" in lab settings would typically be dissected to perform a histology of the inner ear. Deaf fish in their native habitat would likely be eaten – leaving no evidence of their hearing impairment.

As we have indicated in our 2012 comments, an absence of evidence does not indicate an absence of harm, and given the overwhelming evidence that human enterprise is significantly compromising marine habitat it becomes incumbent upon us to apply the precautionary principal when there is an absence of evidence of possible harm from habitat compromise.[14]

We also continue to stand behind our comments that "The DEIS treats invertebrates very lightly - almost dismissively" because we find the following summary statement in Appendix D:

> "At present very little is known about the response to invertebrates to sound exposure and it is not possible to specify levels of sound exposure that are safe for invertebrates. There are few, if any, data suggesting that exposure to seismic airguns produce immediate mortality for invertebrates. A more important issue for invertebrates is likely to be the induction of sub-lethal effects that may impact life functions without causing death."

[13] McCauley, R.D., 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: Analysis of airgun signals and effects of air gun exposure on humpback whales, sea turtles, fishes and squid. Report from Centre for Marine Science and Technology, Curtin University, Perth, Western Australia, for Australian Petroleum Production Association, Sydney, NSW.

[14] "Precautionary Tools for Reshaping Environmental Policy" MIT Press 2005 Edited by Nancy Myers and Carolyn Raffensperger

This is the convener's synthesis of Dr. Jerry Payne's presentation to the "Effects of Noise on Fish, Fisheries, and Invertebrates in the U.S. Atlantic and Arctic from Energy Industry Sound" workshop cited in the PEIS as Normandeau (2012) [15] This comment was found in the "Gap Analysis" section of the report – which substantiates the fact that there is little known about the impacts of seismic impulses, or any other noise on marine invertebrates.

It is important to establish here that while marine invertebrates are not specifically protected under an agency such as the Marine Mammal Commission (MMC), and that any regulatory oversight on the general health of any given species falls under the Department of Commerce (DOC)[16] which predicates regulatory guidelines on the commercial importance of the species. Thus abalone, clams, and lobsters are regulated, but sea pens and zooplankton are not. Because these "lesser creatures" do not have a "front line" regulatory status, there is little incentive to understand their natural history (no funding for research). As a consequence we know very little about the impacts of chemical pollution, over-harvesting, or industrial noise on these building-block species - and do not have a regulatory framework or mitigation guidelines to protect them.[17]

But many species that are protected under the DOC depend on these unregulated and unprotected species. If we use the "no evidence of harm" argument to justify disrupting their habitat we are setting a bad precedent of opening a gateway for potential habitat disruption that will have impacts on species of concern which are protected under our regulatory regimes.

Regarding the use of Appendix J for any guidance on impact s on fish, it appears as though Dr. Popper arrives at similar conclusion that we have; that with all of the uncertainty it is hard to predict, especially in broad terms, what impact noises will have on fish. Representative of some of his comments:

> "The data obtained to date on effects of sound on fishes are very limited both in terms of the number of well-controlled studies and in the number of species tested. Moreover, there are significant limits in the range of data available for any particular type of sound source."
>
> "Because of the limited ways in which behavior of fishes in these studies were "observed" (often by doing catch rates, which tell nothing about how fishes really react to a sound), there really are no data on the most critical questions regarding behavior."
>
> "Long-term rises in sound level are not likely to result in death or physiological effects (though it is possible that there may be long-term changes in stress levels

[15] Normandeau Associates, Inc. 2012. "Effects of noise on fish, fisheries, and invertebrates in the U.S. Atlantic and Arctic from energy industry sound-generating activities." A literature synthesis for the U.S. Dept. of the Interior, Bureau of Ocean Energy Management.
[16] National Oceanographic and Atmospheric Administration (NOAA) over National Marine Fisheries Service (NMFS) are under the Department of Commerce.
[17] In Normandeau 2012 Dr. Payne states "These laboratory studies should focus on deriving dose-response relationships, including those for chronic sound exposure, for both commercially important species as well as keystone zooplankton species such as *Calanus*".

and immune response), but they could also produce hearing impairment, masking, and/or behavioral effects"

"There are very few data documenting effects of any intense sound source on eggs and larvae in the open ocean. Far more data are needed before any preliminary conclusions can be reached on the effects of sound on eggs and larvae, and studies need to include, in addition to mortality, effects on growth and body tissues."

Using Dr. Popper's synthesis of existing literature, and citing his expressed need for more data, we submit that the Atlantic Seaboard should not be used as a makeshift lab for studies on the impacts of anthropogenic noise on fish and invertebrates.

Regarding BOEM response to our propagation models (NGO-E-4-0.10) we found that the models used in Appendix D were even more simplistic than our models – reverting back to either spherical or cylindrical spreading. We stand by our comments:

One assumption [made in the Atlantic G&G PEIS, Appendix D 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 20dB $\log_{10}$ 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]

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:1µPa @ 1m[(FN.19)] would require 10km to attenuate to 180dB re:1µPa exposure level.

[18] Urick, R. J. 1983. Principles of Underwater Sound. (3rd Edition). McGraw-Hill Book Company, New York, NY. Chapter 6

[19] 235 dB (from Appendix D Table-22) – 6dB to accommodate for directionality of the array.

$$229\text{dB} - 180\text{dB} = 41\text{dB} \rightarrow 10\log_{10}(1/13000) = -41\text{dB}$$

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.[20,21,22,23] 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).

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:

[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] Nieukirk, 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] 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" 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

$$10\log_{10}(1/20000) = 43\text{dB} \rightarrow 235\text{dB} - 43\text{dB} = 192\text{dB re:}1\mu\text{Pa}$$

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. Additionally, while convergence zones as an artifact of propagation are mentioned in Appendix D, there is no evidence that this propagation characteristic is used in calculating exposure levels in marine mammals that are well beyond the visual reach of Marine Mammal Observers or even the acoustical reach of passive acoustic monitors.

Regarding BOEM response to our comment NGO-E-4-0.15 on fuel spills. We appreciate that the DEIS text has been revised to not include speculative text about marine mammal "avoidance behavior" of toxic oil spills it nonetheless continues to treat fuel oil spills lightly – speculating that "lighter, volatile components of the fuel would evaporate to the atmosphere almost completely in a few days. Evaporation rate may increase as the oil spreads because of the increased surface area of the slick. Rougher seas, high wind speeds, and high temperatures also tend to increase the rate of evaporation and the proportion of oil lost by this process" citing an American Petroleum Industry (1999) document which all seems rather innocuous. But it is a well-known practice that once ships are beyond the regulatory reach of the coastal states that they burn filthier and much thicker bunker fuel.

If I were writing this section I would balance the "lighter" fuel impacts discussion with an equally weighted comment on bunker fuel – and perhaps not cite a document published by one of the leading US petroleum industry propaganda organizations.[24]

We know from aerial photographs of dolphins and whales surfacing through oil slicks, and dramatically increased mortality rates of marine mammals in the Gulf of Mexico as a consequence of the 2010 BP-Macondo rig blowout, treating any fossil fuel spill lightly both flies in the face of the facts, and ignores the high probability of oil spills occurring, and marine mammal habitat compromise resulting from spills of any size. And while the scope of the Atlantic G&G PEIS does not cover Oil and Gas Exploration and Production (E&P) (as we have indicated above) if the wrong action alternative is selected this PEIS will serve as a gateway for Oil and Gas E&P – dramatically increasing the probability of both catastrophic as well as chronic oil spills – and the toxic compromise of protected species.

Regarding our comments NGO-E-4-0.18 on considering the increased impacts of a complex array of simultaneous signals: BOEM response that "The complexity of the integrated sound field or "soundscape" referred to in this comment is not feasible or

[24] It is ironic that BOEM response to our comment includes the statement "However, BOEM and NOAA cite the best available information available" e.g.: American Petroleum Institute. 1999. "Fate of spilled oil in marine waters: Where does it go? What does it do? How do dispersants affect it?" API Publication No. 4691. 57 pp.

appropriate to model in a programmatic document since there are so many different possibilities of equipment combinations to be used for various surveys" misses our point that while the DEIS and PEIS evaluate each noise as an autonomous event, these noises are often concurrent with other noises, all of which contribute to a "soundscape." It would be difficult (and not particularly helpful) to characterize each possible assemblage of equipment to their unique contribution to the soundscape. But it is important to state that no survey will have any particular noise from which the exposure impacts will supersede others (if louder) or will be negated by louder noises if quieter. Rather the entire compliment of noise will contribute to the overall impact.

There is currently no metric for the behavioral impacts of complex soundfields composed of multiple antagonistic noises, but it stands to reason (as in the "common sense"[25] approach to "ramp-up" as a mitigation practice stands to reason) that a juggernaut of banging, screeching, chirping, thrashing, and jangling noises from a moving soundsource will induce higher stress in exposed animals than a single banging, or screeching, or chirping noise from the same moving source. The call here is not to deconstruct and model each scenario considering a full complement of equipment; rather it is to state that the impacts complex soundfields need to be considered in their own complexity – with the understanding that additional complexity increases the uncertainty of any anticipated behavioral responses - tending toward higher impact, rather than a lower impact that would be derived from simple cumulative impact metrics.

If simple metrics are to be used for complex soundfields, then all of the noises running simultaneously – including any vessel propulsion system - would qualify as a continuous sound source and be subject to the 160dB mitigation criteria. We understand from BOEM response to our comment NGO-E-4-0.24 that vessel propulsion noise is not currently regulated by BOEM. We are not sure how this exclusion became set in (or was omitted from) the regulations, but given that the vessels under consideration in the PEIS are soundsource platforms with large compliments of acoustical stimulus, communication, and control signals, it might be time to look at the entire soundfield generated by these acoustical platforms in a regulatory context (as indicated above).

Additionally thruster-stabilized drilling platforms that would be used in COST well drilling are not technically "vessels underway;" rather they are stationary noise sources being used for activities that are under BOEM purview and should be regulated as such. This foregoing comment also applies to BOEM response to our comment NGO-E-4-0.25. Thruster-stabilized operating platforms are increasingly becoming a feature in offshore operations and we appreciate that "BOEM will consider the acoustic effects from these activities in site/permit-specific evaluations of individual survey applications," and that "Text has been added to the section to note noise attenuation conditions, approximate radial distance, and the fact that BOEM will evaluate project-specific noise sources, as necessary."

Regarding BOEM response to our comment NGO-E-4-0.29 that "Prohibiting all survey operations at night is not feasible based on the operational requirements for broad scale surveys that may require months of 24 hour days to complete" precisely illustrates our

[25] See BOEM response to our comment NGO E-4-0.06

point. If it is not feasible to shut down operations at night when opportunities for preventing impacts are reduced, then operations should not continue at all.

This entire Environmental Impact Statement exercise is not designed to drop regulations when it is not convenient to adhere to them, it is designed to safeguard marine protected species and marine habitat from undue impacts. This is particularly the case during the night – a time when our already limited knowledge of marine mammal behavior is at its lowest. To blithely exempt seismic operations from established mitigation procedures because "it is not feasible" is a nadir of hubristic thinking.

Seismic surveys are an integral part of the entire offshore fossil fuel industry. This industry is incredibly profitable (as any pension fund manager will concur). One reason it is so profitable is that the industry has been able to externalize their costs – often by way of not paying for the damage their operations exact on the environment. Seismic surveys are very expensive, but this is the cost of doing business. If it is more costly to shut down an operation when it is not able to adhere to the law, then that cost of shutting down will need to be assumed into the cost of doing business – not foisted on marine animals that otherwise do not benefit in any way from the suppositions that inflicting "limited damage" to their populations is somehow "OK."

All of our other forgoing comments aside, the BOEM statement about the 'infeasibility of shutting down seismic surveys at night' is really all that is needed to rule out both Action Alternatives A or B. But to summarize the other shortcomings of the Atlantic G&G PEIS:

1) The PEIS should be reevaluated in the context of the most up-to-date NOAA Acoustic Guidelines. These guidelines have just recently been reviewed by the public and stakeholders whose comments will need to be addressed in what will become the final NOAA Acoustic Guidelines. As we found many shortcomings with the guidelines we don't expect the final guidelines to align with the comparisons made in the Atlantic G&G PEIS referencing Southall 2007.[26]
2) Not enough is known about fish hearing to make the broad assumption that the proposed action alternatives will not either damage physically, or disrupt behaviorally commercially or biologically important fish.
3) No enough is known about fish hearing to assume that any temporary damage or displacement will not adversely impact individual fishes, or the fitness of any fish species populations.
4) BOEM statements in 4.2.5.1. "Summary of Fish and Invertebrate Hearing Capabilities" about fish dispersing from a survey area is speculative and should not be implied as a mitigation strategy.
5) The statement in section 4.2.5.1.4 that "there is no evidence in fishes for permanent hearing loss" can also as factually be rephrased to "there is no evidence in fishes that permanent hearing loss does not occur." This is one of many places in the PEIS where statements about the absence of evidence does not perfect the argument for the absence of harm.[27]

[26] "Draft Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammals" OCR Comments (attached to this document).
[27] See Colin Macilwain (2014) "Beware of backroom deals in the name of 'science'" Nature v.508:7496 on "lack on evidence" being used to substantiate industry arguments of "no harm."

6) Very little is known about impacts of seismic and other survey signals on marine invertebrates. This dearth on knowledge should not be a reason for proceeding under the assumption that there will be no harm to species that - while not protected, may nonetheless be important elements in the trophic fabric of animals that are protected.
7) Our current state of knowledge about fish and invertebrate responses to chemical, electromagnetic, seismic survey, and other survey signals is very sketchy. The proposed action alternatives should not be used to find out "the hard way" what fish and invertebrates can endure.
8) Propagation models used in the PEIS Appendix D remain simplistic, only considering cylindrical and hemispherical spreading and only mentioning, but not modeling surface ducting,[28] leaving propagation models used in calculating exclusion zones only speculative.
9) While 'convergence zones' are mentioned in the PEIS there no evidence that this propagation characteristic is used in calculating exposure levels in marine mammals that are well beyond the visual reach of Marine Mammal Observers or even the acoustical reach of passive acoustic monitors.
10) PEIS Sections 2.1.3.2 and 4.2.2.3 discussion on fuel oil spills should be expanded to include a realistic discussion about fuels that will be used, not just lighter, more volatile, and faster dispersing fuels.
11) Because survey platforms are increasingly being fitted with various acoustical signal generators, the produced soundfield impacts should be considered in its entirety, not as a composite of individual signals.
12) Because the complex soundfields produced by survey vessels are a product of many overlapping sounds, the resulting soundfield should be considered as continuous and subject to the 160dB (re:1µPa) mitigation threshold and exclusion zone guidelines.
13) Thruster-stabilized drilling platforms that used in COST well drilling are not "vessels underway;" rather they are stationary noise sources being used for activities that are under BOEM purview and should be regulated as such.
14) Finally, precluding regulatory constraints on seismic survey vessels at night because "it is not feasible" is the strongest argument for prohibiting their implementation. Laws and guidelines – regardless of how simplistic, incomplete, or inconvenient are nonetheless a product of many years of research and deliberation by many dedicated, thoughtful, and informed people. Dismissing them for the sake of expediency is both unlawful and sets a dangerous precedent.

Even if BOEM satisfactorily addresses our above concerns we still believe that Action Alternatives A and B should be disallowed. Unfortunately it seems almost a foregone conclusion that Atlantic Geophysical and Geological plan will include the seismic survey regulatory framework necessary to advance oil and gas exploration and production on the Eastern Seaboard. And this would be a shame, because we know without question that the global environmental consequences of promoting a fossil fuel-based economy are killing the planet – by way of atmospheric CO_2 as well as all of the chemical and materials products of that industry which are poisoning our water, and littering the ocean and terrestrial landscapes with "cheap" and thus disposable plastic products.

[28] See: Ivan Tolstoy "Ocean Acoustics: Theory and Experiment in Underwater Sound" p. 181-185 American Institute of Physics.

If we are to assure an acceptable life quality in the future for ourselves as well as our future generations this must stop.

But it is clear that despite over 30 years of discussing the deleterious impacts of fossil fuel on the global environment we cannot muster the political will to have the industry account for the costs of exploration, production, and use of their products – rather we continue to find ways to subsidize the industry by exempting them from environmental laws, making provisional allowances for “take authorizations,” suggesting that damaging our environment is acceptable and necessary for “our national security,” and even sending our youth out to secure fossil fuel resources in foreign countries – many losing their lives and killing others to do so. This is madness.

But herein lies an opportunity: While we have not, and likely will not find the political will to change our global energy strategy (and hopefully save the planet), we do have the regulatory framework to shift our global energy priorities from fossil fuel over to wind, tidal, wave, and solar power. Making the right decision on the Atlantic G&G PEIS could be a watershed toward turning the fossil fuel juggernaut around.

Due to the foregoing arguments, Action Alternatives A and B should be disallowed. The “No Action Alternative C” should be the preferred action.

Thank you for this opportunity to review and comment on the proposed actions.

Sincerely,

Michael Stocker
Director

Appendix

OCR Comments on NOAA Acoustical Guidelines

February 26, 2014

Chief, Marine Mammal and Sea Turtle Conservation Division,
Office of Protected Resources,
National Marine Fisheries Service,
1315 East-West Highway,
Silver Spring,
MD 20910-3226

Re: Draft Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammals

To Whom it May Concern;

It is clear that much work and consideration has been put into the "Draft Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammals" (hereinafter "Draft Guidance document"), gathering together and including many of the studies that have been executed, reviewed, and published over the past decade. The guidelines represent a significant improvement over the broad-brush threshold guidelines that have been used to date and as such should more accurately represent potential noise induced physiological impacts of noise exposures on marine mammals. The preparers should be applauded for their work.

I am also encouraged that the Draft Guidance document has provisions for updating the thresholds as new data become known, reflecting the best available science.[29] It is important in this context to assure that all of the best available science is considered when updating the guidelines.

Even with all of the work that has been put into achieving a greater understanding of marine mammal acoustical sensory systems, there remains many shortcomings in what we know, how we frame our inquiries, and our assumptions about the impacts of noise on these animals. Our concerns are outlined in the following body of this letter.

The paucity of data:

Establishing Temporary Threshold Shift exposure levels the document relies heavily on so few subjects, and many tests on these few animals from the SPAWARS studies.[30] This dependence is also woven into the fabric of the main reference studies used to substantiate the Draft Guidance document (Finneran and Jenkins; 2012 and Southall et. al. 2007) wherein the mature (13 – 20 y.o.) to old (35 – 40 y.o.) animals are used to examine auditory performance. The Draft Guidance document also relies heavily on the University of Hawaii studies of the hearing responses of one captive born Atlantic bottlenose dolphin. (Mooney et.al. 2009, Nachtigall et. al. 2003, 2004)

[29] Draft Guidance document section IV
[30] Finneran, J.J. 2011; Finneran and Schlundt 2009; Finneran and Schlundt 2010; Finneran and Schlundt 2011; Finneran and Schlundt 2013; Finneran et.al. 2000; Finneran et.al. 2002; Finneran et.al. 2005; Finneran et.al. 2007; Finneran et.al. 2010a; Finneran et.al. 2010b

All of the SPARWAR subjects and the University of Hawaii subject have been systematically exposed to noise studies for many years. The dolphin and beluga whale subjects of these studies have lived in a busy environment full of anthropogenic noise, and continuously exposed to noise testing, so it is highly likely that they have been habituated to the test environment. It is clear that these animals do not represent approximately 125 different species of wild marine cetaceans in their own environment.

This paucity of data from a limited number of subjects discussed in the Draft Guidance document text,[31] but because there are so many ingrown layers of these references through Finneran and Jenkins 2012, and Southall et. all. 2007, and that these studies are used to conjecture the hearing performance of "Low Frequency" cetaceans, are all facts that should be clearly established as significant caveats in interpreting the guidelines. These interpretations should be founded on the precautionary principal that lacking data to prove otherwise, an assumption of harm should direct actions with unknown impacts.[32]

For the record, all cetacean TTS models – including the models for the "Low Frequency cetaceans are based on six bottlenose dolphins (five from SPAWAR, one from Univ. of Hawaii) three belugas (two from SPAWAR, one from Popov et. al. 2011b) two harbor porpoises (one from Kastelein et. al. 2012a, and one from Lucke et. al. 2009) and two Yangtze finless porpoises (Popov et.al. 2011a). Additionally all pinniped thresholds are derived from only four individual animals, two California sea lions (aged between 12 and 21 years), three harbor seals (one from Long Marine Lab, the other two from SEAMARCO), and a northern elephant seal (Kastak et.al 1999, Kastak et.al.2005). The California sea lions were mature to old, aged 12 - 21 years in the two cited studies,[33] the domesticated harbor seal (named "Sprouts") from Long Marine Lab had been inadvertently exposed to damaging airborne construction noise at four years of age [34] which may have had long term impacts on its hearing sensitivities,[35] the two harbor seals from SEAMARCO were captive bred, and a young (4 – 7 years) elephant seal whose provenance was not articulated in the citations.

All data are taken from captive animals:

All of these animals – cetaceans and pinnepeds, are captive so we can assume a few things about them: With the exception of the captive bred harbor seals from SEAMARCO, they were likely rescued and thus either suffered some trauma or were not as fit as their wild kin. Additionally their captive habitat is not fraught with predation, nor are they taxed with the necessity of locating their own food supplies, so it is possible that these animals are less alert due their provenance and to habituating to these less stimulating (sensory-deprived relative to their natural habitat) circumstances. Although it is not surprising that the

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[31] Section 1.1 directly under the introductory paragraph of the Draft Guidance document.
[32] "Precautionary Tools for Reshaping Environmental Policy" MIT Press 2005 Edited by Nancy Myers and Carolyn Raffensperger
[33] Schusterman, Ronald J., Brandon Southall, David Kastak and Colleen Reichmuth Kastak "Age-related hearing loss in sea lions and their scientists" J. Acoust. Soc. Am. 111, 2342 (2002)
[34] Kastak, David and Ronald J. Schusterman (1996) "Temporary threshold shift in a harbor seal (*Phoca vitulina*) J. Acoust. Soc. Am. 100 (3)
[35] Lin, H.W., A.C. Furman, S.G. Kujawa, and M.C. Liberman. 2011. Primary neural degeneration in the guinea pig cochlea after reversible noise-induced threshold shift. Journal of the Association for Research in Otolaryngology 12:605-616

captive bred harbor seals had significantly lower auditory thresholds[36] and lower onset of TTS[37] than the Long Marine Lab harbor seal given their "cushy" captive life and not having been acoustically traumatized and an early age.

It should also be noted that the three species of pinnipeds are species that are commonly found in coastal mid-latitudes in close proximity to high concentrations of human activity. It would be hard to determine how this proximity to what is now noisy habitat is reflected in their physiology as opposed to the polar seals. We know behaviorally that the polar seals are extremely songful, which is not found in the harbor seal, the elephant seal, or the California sea lion. It would stand to reason that the polar seals have different, if not more complex acoustical adaptations than the two captive phocid species.

Natural protective hearing mechanisms are not included in the threshold model:

Model inaccuracies due to habituation to captivity may be compounded by the fact that the test animals may employ biological protections to prepare them for their tests – protections akin to the "wincing" that visual animals use to protect their eyes from damage. Terrestrial animals have a mechanism, like "wincing" in their middle ears that protect them from damaging sounds. This mechanism is a tightening of the tensor tympani muscles around the middle ear ossicles, protecting the hearing organ from physical damage. While this mechanism is fast acting in response to unexpected stimulus, once terrestrial animals are habituated to expect loud noise, the system is activated by the expectation. In humans the mechanism kicks in when noise levels reach 75dB SL (re: 20µPa)[38] – about 10dB SL below where OSHA guidelines for TTS-level noise exposures occur in humans, and about 50dB SL below where PTS occurs.

The middle ear structure of marine mammals differs significantly from the middle ears of terrestrial animals. We are learning about how environmental sounds are conveyed into the odontocete's inner ears. This mechanism seems to include the lipid channels in their lower jaws,[39] and the mobility of the bulla (the bone envelope that houses the cochlea and semicircular canals). While this mechanism does include the same middle ear ossicles of terrestrial mammals, these bones in cetaceans can be rigidly attached to each other and connected differently (by way of ligaments) to the tympanic membrane.[40] While the ears of the odontocetes or mysticetes do not have the same tensor tympani found in terrestrial mammals, it is probable that these hearing specialist animals would have an analogous system to protect their inner ears from

[36] Kastelein,Ronald A., Paul J. Wensveen1, Lean Hoek, Willem C. Verboom and John M. Terhune. (2009) "Underwater detection of tonal signals between 0.125 and 100kHz by harbor seals (*Phoca vitulina*)" J. Acoust. Soc. Am. 125, 1222

[37] Kastelein, R.A., R. Gransier, L. Hoek, A. Macleod, and J.M. Terhune. (2012b). Hearing threshold shifts and recovery in harbor seals (Phocina vitulina) after octave-band noise exposure at 4 kHz. Journal of the Acoustical Society of America 132:2745-2761

[38] Pierre Buser and Michel Imbert "Audition" 1992. MIT Press. p. 110 - 112.

[39] Heather Koopman, Suzanne Budge, Darlene Ketten, Sara Iverson "The Influence of Phylogeny, Ontogeny and Topography on the Lipid Composition of the Mandibular Fats of Toothed Whales: Implications for Hearing" 2003 Paper delivered at the Environmental Consequences of Underwater Sound conference, May 2003.

[40] G.N. Solntseva, "The auditory organ of mammals"1995 p. 455 in "Sensory Systems of Aquatic Mammals" R.A. Kastelein, J.A. Thomas and P.E. Nachtigall eds. De Spil press.

periodic or occasional sound levels that would otherwise damage their organs of hearing.[41] In fact it stands to reason that echolocating odontocetes would necessarily have some form of "automatic gain control" (AGC) because they need to discriminate bio-sonar return signals much quieter than their outgoing signal. If they did not have some form of AGC their own outgoing signal might induce a temporary threshold shift that would defeat their receiving sensitivity, given that outgoing clicks of *tursiops* can be as loud as $227dB_{(peak)}$ re: 1µPa[42] and TTS for continuous signals in MF cetaceans is $224dB_{(peak)}$. If this assumption is correct, then the "sound test" habituated odontocetes [43] would obviously yield much higher thresholds for TTS than their wild, un-habituated counterparts – given that they will always "prepare" for acoustical assaults when asked to perform in a given testing situation.[44]

Lab data are derived from signals that are not representative of exposure signals:

In terms of the range of impact relative to signal amplitude, Kastelein and Rippe (2000) studied younger animals (harbor porpoise *Phocena phocena*) [45] with more appropriate test signals yielded significantly different results than what was found in the much older, test-habituated subjects. These animals demonstrated an aversion to more complex signals in the frequency range of the proposed sonars and at 130dB re: 1µPa@1m. (Animals used in the Kastelein and Rippe study had been recently taken into captivity and approximately three years old at the time of the study.)

It should also be noted that all non-impulsive signals used in the citations upon which the thresholds are established are sinusoids or sinusoidal-derived band-limited 'pink' noise.[46] While these signals do lend consistency to audiometric testing, they do not necessarily reflect the characteristic signals being introduced into the sea. We are particularly concerned with the exponential proliferation of acoustical communication signals being used in underwater multimodal communication networks for control and monitoring of autonomous and remotely operated equipment for resources extraction, scientific research, and industrial exploration.

[41] This system might involve thermo-regulating the viscosity, and thus the acoustical compliance of the lipids through regulating blood circulation around the organs – thereby attenuating or accentuating acoustical transfer through the organ as needed.

[42] Aroyan JL, McDonald MA, Webb SC, Hildebrand JA, Clark D, Laitman JT, Reidenberg JS (2000) "Acoustic Models of Sound Production and Propagation." In: Au WWL, Popper AN, Fay RR (eds), *Hearing by Whales and Dolphins.* New York: Springer-Verlag, pp. 409-469.

[43] e.g. J. J. Finneran, C. E. Schlundt, D. A. Carder, J. A. Clark, J. A. Young, J. B. Gaspin, S. H. Ridgway Auditory and behavioral responses of bottlenose dolphins (*Tursiops truncatus*) and a beluga whale (*Delphinapterus leucas*) to impulsive sounds resembling distant signatures of underwater explosions. J. Acoustical Soc. of America. V.108(1) July 2000.

[44] Nachtigall, Paul E., and Alexander Ya. Supin (2013) "False killer whale reduces its hearing sensitivity when a loud sound is preceded by a warning" J. Exp. Biology 216, 3062-3070

[45] R.A, Kastelien, H.T. Rippe " The Effects of Acoustical Alarms on the Behavior of Harbor Porpoises (*Phocena phocena*) in a floating pen" Marine Mammal Science 16(1) p. 46 – 64. January 2000

[46] Band limited "Pink Noise" is typically derived from Fourier Transfer derived Gaussian noise constructed from sine waves without any coherent time-domain component.

These communication signals include characteristically rapid rise-times either in set frequencies such as square waves or other high "crest factor"[47] signals which are not sinusoidal, or they include signals that are rapid rise time in frequency switching of sinusoids such as "Frequency Shift Key" (FSK) and spread spectrum frequency hopping schemes such as Orthogonal Frequency-Division Multiplexing (OFDM), Trellis Coded Modulation (TCM), and Time Domain Multiplexing (TDM). Many of these schemes, when used in short to intermediate distance acoustic communication technologies (1km – 10km) operate in the 10kHz – 100kHz ranges that overlap all of the marine mammal hearing groups. Furthermore due to the need for well-defined leading edges required for reliable state-change detection, the signals read more like impulsive signals and are characterized by high kurtosis in amplitude and frequency variability over time.

Kurtosis (β) describes the shape of a probability distribution on an x-y graph. It is equated with the "peakedness" of the curve as a product of the distribution of observed data around the mean:

$$\beta = \frac{1}{N}\sum_{\infty}^{N}\left(\frac{X_i - \overline{X}}{S}\right)^4$$

Where:

> N = the number of elements in the distribution.
> S = Standard deviation
> X= are the discreet peaks in data stream (for sound, the pressure/time waveform) over some interval of time.

Kurtosis then is an expression weather the data are peaked or flat relative to a Gaussian distribution. This matters because noise impacts from high kurtosis signals induce significantly higher hearing losses than exposures from sinusoidal signals[48] and is associated with "unpleasantness" or aggravating characteristics of sound.[49] This characteristic is only taken into consideration in Draft Guidance document relative to impulsive sounds and the Equal Energy Hypothesis (EEH) (Danielson et al. 1991; Hamernik et al. 2003; Henderson and Hamernik 1986; Henderson et al. 1991).

Unfortunately there is a dearth of data on the physiological impacts of high kurtosis continuous signals or tone bursts on hearing systems, but avoidance behavior which is a proxy for self-protection is clearly influenced by sound quality characterized by high kurtosis signals.[50,51]

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[47] Crest factor is the ration of peak to RMS value of a signal. Pure sinusoidal waves have a crest factor of .707; pure "square waves have a crest factor of 1; repetitive impulse sounds have a crest factor greater than 1.

[48] Hamernik, R. P., Qiu, W., and Davis, B. (2003). "The effects of the amplitude distribution of equal energy exposures on noise-induced hearing loss: "The kurtosis metric," J. Acoust. Soc. Am. 114, 386–395

[49] Sukhbinder Kumar, Helen M. Forster, Peter Bailey, Timothy D. Griffiths (2008) "Mapping unpleasantness of sounds to their auditory representation" J. Acoust. Soc. Am. 124: 6

[50] R.A. Kastelien, D. Goodson, L. Lein, and D. de Haan. "The effects of acoustic alarms on Harbor Porpoise (*Phocena phocena*)" 1997 P.367-383 in A.J. Read, P.R. Wiepkema, and P.E. Nachigall eds. "The Biology of Harbor Porpoise" de Spil publishers, Woerned, The Netherlands.

The Verboom and Kastelein (2005) study extrapolates a TTS level for these animals at 150 dB(*w*) re:1µPa@1m for the harbor seal, and 137dB(*w*) re:1µPa@1m[52] for the harbor porpoise. These levels are significantly lower than the TTS levels of 160dB SEL_{CUM} for HF Cetaceans and 183dB SEL_{CUM} for Phocids suggested in Draft Guidance document Table 6. The paper also goes on to suggest that hearing injury – PTS, will occur in the Harbor seal at 190dB – Less than half the energy of the 197dB level found in Draft Guidance document Table 6. While this is just one paper, it evaluates various responses to different sounds and is one of the earlier papers to suggest segregating species into their various hearing function groups. As such the paper should be included and brought into consideration in the Draft Guidance document.

The foregoing also suggests that noise exposure guidelines should include a metric for sound quality, not just instantaneous, periotic, or cumulative exposure amplitude as suggested in the Draft Guidance document table 6b. We need a metric that expresses actual signal quality, not merely exposure profile. And while we do not have enough data to derive a precise "quality" metric, we do have enough information to know that not all signals inflict equal impact and that if signals are anything other than sinusoidal-derived continuous signals or tone bursts that the exposure should be reviewed on a case-basis (as provided for in Draft Guidance document section 2.3 "TTS and PTS Onset Acoustic Threshold Levels.")

For example: when digital communication signal exposures are subject to impact assessment, the thresholds should be established using data from Kastelein et.al (2005) and Kastelein et.al (2006) where actual communication signals were used. In these studies it was found that discomfort thresholds in Harbor porpoise were at 103 – 104 dB for Direct Sequence Spread Spectrum signals, and 111 – 112 dB for Modulated Frequency Shift Key signals (all re: 1µPa, frequency range: 6.3kHz – 18kHz). In a similar study with Harbor seals it was found that the discomfort thresholds were all around 107 (dB re: 1µPa) for all communication signal types.[53]

While "discomfort thresholds," are not a defined term in the Draft Guidance document, they are indicative of pain and avoidance behavior well below the TTS levels suggested in the Draft Guidance document. Kastelein et.al were not measuring TTS in these studies, but there is a probable correlation between avoidance behavior and physiologically damaging (TTS inducing) sound types (not just sound levels).

It is noted in the Draft Guidance document that there are no data on PTS in marine mammals, but the estimated PTS levels used in the DEIS, like the PTS figures from the Verboom and Kastelein (2005) study are extrapolations – extrapolating from behavioral responses to noise exposure of young, healthy marine mammals against known human and terrestrial mammal auditory responses. The disparity between the TTS

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[51] W.C. Verboom and R.A. Kastelein. "Some examples of marine mammal 'discomfort thresholds' in relation to man-made noise." June 22, 2005. Proceedings from the 2005 Undersea Defense Technology conference 2005, Sponsored by TNO, P.O. Box 96864, 2509 JG The Hague, The Netherlands.

[52] "dB(*w*) re: 1µPa@1m" is not a standard metric but was an attempt by the authors to weight broadband noise for the inverse shape of the relevant audiogram. Not equal energy but equal perceived loudness for the subject, so direct comparison to dB SEL_{CUM} is not precise, but approximate (time dimension notwithstanding).

[53] Kastelein et.al. (2006) Continuously varying frequency sound, Direct Sequence Spread Spectrum, frequency sweep, and Modulated Frequency Shift Key signals.

figures used by Verboom and Kastelein (2005) and the numbers used in the DEIS indicate a high degree of scientific uncertainty in the models and extrapolation methods used in both sets of assumptions. I am more inclined to accept the Verboom and Kastelein (2005) data because they are inherently more precautionary in that they examine the thresholds of behavioral response, not the upper limits of physiological response.

PTS Thresholds based on terrestrial and hearing generalist species:

Regarding the estimation of PTS onset relative to TTS levels used in the DEIS, I find the statement that TTS extrapolation for PTS onset "based on data from humans and terrestrial mammals"[54] a bit troubling. Firstly because beyond this cursory statement there is no explanation of the way the relationship was derived. Due to its historic use throughout the NMFS DEIS's over the years[55] I presume they are linear regressions adapted from the W.D. Ward et. al. (1960) papers [56] (also cited in the Draft Guidance document). Ward's data were all taken from human subjects – highly visually adapted terrestrial mammals. Ward's research indicates a threshold of PTS by examining the maximum recoverable TTS in human and finds that humans can recover from a TTS of 50dB without permanently damaging their hearing. The Ward studies are "conservatively" tempered in the legacy DEIS's (see ref. 19) by incorporating a study of cats by Miller et.al. (1963)[57] that indicates that cat's threshold of PTS is at 40dB recoverable TTS.[58]

The cat is also a highly visually adapted terrestrial animal, though it is more dependent on aurality than humans.[59] One correlation that can be deduced here is that animals that are more dependent of sound cues are less able to recover from extreme TTS. Thus if there is a 10 dB disparity in recovery levels between humans (50dB difference on onset of TTS and PTS) and cats (40dB difference on onset of TTS and PTS), it might reasonably follow that cetaceans who rely almost exclusively on acoustical cues would be even less likely to recover from extreme TTS. While we don't know what these differences are between these onset thresholds, it is appropriate to bear in mind that this framing again calls in the precautionary principal; inasmuch as we should assume harm where data does not exist.

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[54] Draft Guidance document section 2.3.4 "Development of TTS and PTS Onset Acoustic Threshold Levels" item #6

[55] e.g. "Gulf of Alaska Navy Training Activities Preliminary Final Environmental Impact Statement/ Overseas Environmental Impact Statement." March 2011. Section 3.8-88–92 "Relationship between TTS and PTS, and "Overseas Environmental Impact Statement/Environmental Impact Statement. Undersea Warfare Training Range." October 2005. 4.3.3.2 Relationship Between TTS and PTS

[56] e.g.: Ward, W.D. "Recovery from high values of temporary threshold shift." J. Acoust. Soc. Am., 1960. Vol. 32:497–500.

[57] Miller, J.D., C.S. Watson, and W.P. Covell. 1963. "Deafening effects of noise on the cat."Acta Oto-Laryngologica Supplement Vol. 176:1–91.

[58] The Gulf of Alaska DEIS states further that "A variety of terrestrial mammal data sources point toward 40 dB as a reasonable estimate of the largest amount of TS that may be induced without PTS" though no citations are provided to substantiate this statement. The Undersea Warfare Training Range DEIS cites Kryter et al. (1966) stated: "A TTS that approaches or exceeds 40 dB can be taken as a signal that danger to hearing is imminent." Then the DEIS speculates: "These data indicate that TSs up to 40 to 50 dB may be induced without PTS, and that 40 dB is a reasonable upper limit for TS to prevent PTS."

[59] Ralph E. Beitel "Acoustic pursuit of invisible moving targets by cats" JASA – 1996. Vol.105(6) p.3449 This paper indicates that cats will follow acoustic cues without needing to visually identify the cue, unlike humans, who will use an auditory cue to help localize a source of noise which they will then "look for the source."

The threshold difference between TTS and PTS vary in the Draft Guidance document tables, depending on whether the exposures are weighted or un-weighted, which demonstrate a more thorough evaluation of the literature than what had been used in the legacy guidelines. In the threshold tables the level difference between onset of TTS and onset of PTS thresholds are 15dB for impulsive noise exposure, and 20dB for non-impulsive noise exposure (14dB for the pinnepeds) in all frequency classes of animals.

While we appreciate that the extrapolations used to derive onset of PTS from onset of TTS are much more conservative than what has been used in the legacy guidelines, they are based on assumptions that are still of questionable validity inasmuch as they are based on extrapolated models that meld terrestrial, highly visual animals with (mostly) old, test-weary odontocetes. I feel that these assumptions provide a poor stand-in for a diverse variety of wild marine mammals, in their own habitat, being subjected to extreme levels of noise that they are not biologically adapted to or trained to expect.

Current data on long-term neural damage from "TTS" not included in the DEIS:

Additionally, while the Draft Guidance document does allude to the Kujawa and Liberman (2009) [60] and Lin et. al. (2011)[61] findings to the that "temporary" threshold shift is a predictor of a longer-term permanent damage to the inner hair cell ganglion, these findings are "soft-pedaled" in the document for wont of more data.[62] This position flies in the face of the precautionary principal – particularly in light of the knowledge that TTS is NOT "temporary" and thus TTS is a "Level A take" We should be confident that there is true recoverability of compromised hearing which does not cause long-term synaptic damage before we abuse these animals − to later find that the abuse causes irreversible harm. I suspect than once any of the SPAWARS subjects dies, a histology of their auditory nervous system will tell us volumes about the TTS and PTS assumptions that have been made using these animals.

SEL_{CUM} accumulation period modeled for convenience but not substantiated by the literature:

Regarding setting the baseline for the SEL_{CUM} metric (Draft Guidance document 2.3.1.1 Recommended Baseline Accumulation Period), while helpful for modeling simplification, we find this whole section troubling. Using a 24 hour accumulation window is only a convenience which only has meaning in terms of how we set our watches; exposed animals do not "clear the stack" after 24 hours and start anew. Accumulation of sound form the purposes of SEL_{CUM} should continue as long as the sound continues. This is particularly germane as the noises we are using in the ocean are increasingly becoming continuous – from the "around the clock" seismic surveys, to the increasing array of autonomous vehicles and stationary equipment, to the continuously operating communication and navigation beacons.

[60] Kujawa, S.G., and M.C. Liberman. 2009. Adding insult to injury: Cochlear nerve degeneration after "temporary" noise-induced hearing loss. The Journal of Neuroscience 29:14077-2
[61] Lin, H.W., A.C. Furman, S.G. Kujawa, and M.C. Liberman. 2011. Primary neural degeneration in the guinea pig cochlea after reversible noise-induced threshold shift. Journal of the Association for Research in Otolaryngology 12:605-616.
[62] Draft Guidance document section 3.2.1 Temporary Threshold Shift Acoustic Threshold Levels: "It is not known whether smaller levels of TTS would lead to similar changes. NOAA acknowledges the complexity of noise exposure on the nervous system, and will re-examine this issue as more data become available."

"Avoidance behavior" used as an exposure mitigation strategy:

We also find it troubling that this section is loosely hinged on the idea of "avoidance behavior" being a mitigating factor in the exposure. With the understanding that the Draft Guidance document is specifically about MMPA "Level A Takes" and not behavioral impacts Castellote et.al. (2010) notes that seismic survey noise disrupted an entire migration season of fin whales. In this case the avoidance behavior was at cause for a loss of entire breeding year (which is not strictly physical damage to the organism but does have a profound bearing on survival). That this "avoidance behavior" occurred at hundreds of kilometers from the airgun source points to a fallacy in the assumption that animals can escape the impacts of noise by moving out of the noise field. It may be that case that animals would avoid the most direct physiological impacts of noise by moving away from the source, although this is not always the case as commonly seen in dolphins that gambol in the bow waves of ships and in the "diner bell" effect of net predator pinnipeds[63] that for one reason or another have elected not to avoid noise exposure. Thus "avoidance behavior" cannot be relied upon as a mitigation strategy and should not be incorporated into any exposure models.

This brings forth a larger concern about framing. It is well known that behavioral responses to any stimulus are dependent on situations and circumstances; courting animals will be less disturbed by alien noises than resting animals; net predator animals will even be attracted to noises designed to harass them if they know that food is available for the mere cost of their suffering.[cit.35] Regulators like clear guidelines, but by viewing all animals mechanistically we are assuming that all animals will predictably respond, or be impacted similarly. Segregating animals into frequency groups is an improvement – expressing our deeper understanding of marine mammal bioacoustics derived over the past decade of research, but given the paucity of quality data the guidelines remain a very blunt gauge to measure our impacts on the marine acoustic habitat.

In summary, while we find the Draft Guidance document a significant improvement over the previous guidelines and we welcome its final implementation, as it is currently written there remain many shortcomings. We are pleased that the document includes provisions and a schedule for revising as more data become available, because it is clear that much data is lacking and significant revisions will be required.

The following points have been detailed in the foregoing review:

- Where data are lacking, assume harm until the data clearly indicates otherwise.
- All models for TTS depend on very few animals and thus are incomplete.
- The animals from which the TTS data are derived are captive and test-regime habituated and thus are a poor proxy for their wild counterparts.
- The four species of captive odontocetes are a data-poor approximation of the 125+ species of all cetaceans.
- The two species of phocids found in the Draft Guidance document are commonly found in close proximity to human population centers and are not good stand-ins for Arctic and Antarctic seals.

[63] Jefferson, T. A. and B. E. Curry, 1996, "Acoustic methods of reducing or eliminating marine mammal-fishery interactions: do they work?" Ocean and Coastal Management 31:41–70

- Captive animal's provenance further segregates them from wild animals due to their differing survival tactics relative to food provision and predator awareness.
- Signals used in auditory test regimes are not representative of typical exposure signals found in the field and this are inadequate models for actual exposure impacts.
- Where there is a disparity in TTS onset thresholds, the lower thresholds should be used, not cast out as "outliers." (Draft Guidance document App. B Section 2.2 III)
- Currently there is no metric to express various sound qualities that do have bearing on impacts (e.g. rise time, kurtosis).
- Extrapolating PTS from TTS by way of terrestrial, visually dominant animals (from Ward et.al. 1960 and Miller e.al. 1963) requires a deeper discussion and a precautionary approach.
- Findings by Kujawa and Liberman (2009) and Lin et.al. (2011) indicate that TTS is <u>not</u> temporary, but is an injury and should be classified as a MMPA "Level A Take." This data has been excluded from the Draft Guidance document because there are no equivalent data on marine mammals and lower TTS levels. It should be included.
- SEL_{CUM} accumulation period should not "dump and reset" after 24 hours (for complex models) or integrate over 1 hour (for simple models); rather accumulation should continue for the entire duration of the exposure.
- Avoidance behavior of an exposed animal should not be incorporated into any mitigation model.

There is a larger philosophical discussion here that while our focus on regulatory thresholds does drive the very reason we are engaged in this exercise, in attempting to find clear numeric guidance we sometimes lose track of our relationship with our mutually inhabited marine (and terrestrial) habitats. The noise exposure guidelines we have in place for our own neighborhoods are not based on physiological damage to our neighbor; rather they are based on annoyance. Our neighbor's "ability to recover their hearing sensitivity" from acoustical assault is not an acceptable threshold for our less-than-neighborly noise-making behavior. So why should we believe it is acceptable to expose clearly sentient marine animals to noises that compromise their sensory systems?

This is not just sentimentality, because as we understand the interdependence of all life on our planet it is becoming increasingly clear that as we compromise the habitats of other life forms on the planet we are also compromising our own habitat, and that without a healthy and robust natural environment no amount of money or oil will improve the quality of our own civilization or our engagement with the natural world upon which we depend.

Sincerely,

Michael Stocker
Director
Ocean Conservation Research

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The Cornell Lab of Ornithology

Acoustic Ecology of North Atlantic Right Whales off of the Virginia Coast:

Data Quality and Initial Right Whale Presence Results

October 1, 2013

Prepared for:

Matthew Huelsenbeck
Oceana North America
1350 Connecticut Ave. NW, 5th Floor
Washington, DC 20036

Cornell University

Deployment and Recovery Information

6 marine autonomous recording units (MARU's) were used in two separate deployments to provide acoustic coverage ranging from June 3, 2012 – June 13, 2013. See Table 1 and 2 for deployment information including drop coordinates, recording start/end time and recording bandwidth. For the first deployment, (June – November 2012), 5 of the 6 units were successfully recovered (Table 1). For the second deployment (November 2012 – June 2013), 4 of the six units were recovered (Table 2), and of those 4 recovered, 3 experienced some unexpected data loss (Table 3).

See Figures 1 for a map of MARU locations. Table 3 outlines any hardware and recording malfunctions that occurred. Note all times are in Eastern Standard Time (EST).

Table 1: MARU deployment information for Deployment 01.

MARU #	Site #	Bandwidth (Hz)	Latitude Decimal Degrees	Longitude Decimal Degrees	Record Start Date/Time YYYY-MM-DD HH:MM:SS (EST)	Record End Date/Time YYYY-MM-DD HH:MM:SS (EST)
PU190	1	2000	36.8640400	-75.6652167	2012-05-31 15:09:53	2012-11-10 14:31:32
PU153	2	2000	36.9340933	-75.4249150	2012-05-31 15:00:43	2012-11-10 14:30:33
PU168	3	2000	36.8679350	-75.2749583	2012-05-31 15:14:55	2012-11-10 14:31:10
PU136	4	2000	36.9213933	-75.1036950	2012-05-31 15:18:37	2012-11-10 14:32:30
PU191	5	2000	36.9184917	-74.8384283	2012-05-31 15:22:12	2012-11-10 14:33:13
PU218	6	2000	36.9170000	-74.4786200	2012-05-31 15:27:44	Unit not recovered.

Table 2: MARU deployment information for Deployment 02.

MARU #	Site #	Bandwidth (Hz)	Latitude Decimal Degrees	Longitude Decimal Degrees	Record Start Date/Time YYYY-MM-DD HH:MM:SS (EST)	Record End Date/Time YYYY-MM-DD HH:MM:SS (EST)
PU195	1	2000	36.86475	-75.66588	2012-11-09 12:47:56	2013-05-26 07:05:54
PU193	2	2000	36.94466	-75.42702	2012-11-09 12:42:00	Unit not recovered.
PU163	3	2000	36.86773	-75.27485	2012-11-09 12:37:02	2013-06-04 21:27:10
PU130	4	2000	36.92127	-75.10345	2013-05-13 19:03:06	2013-06-08 07:53:09
PU217	5	2000	36.91748	-74.83757	2012-11-09 12:24:45	2012-06-13 16:57:41
PU227	6	2000	36.90081	-74.47935	2012-11-09 12:18:45	Unit not recovered.

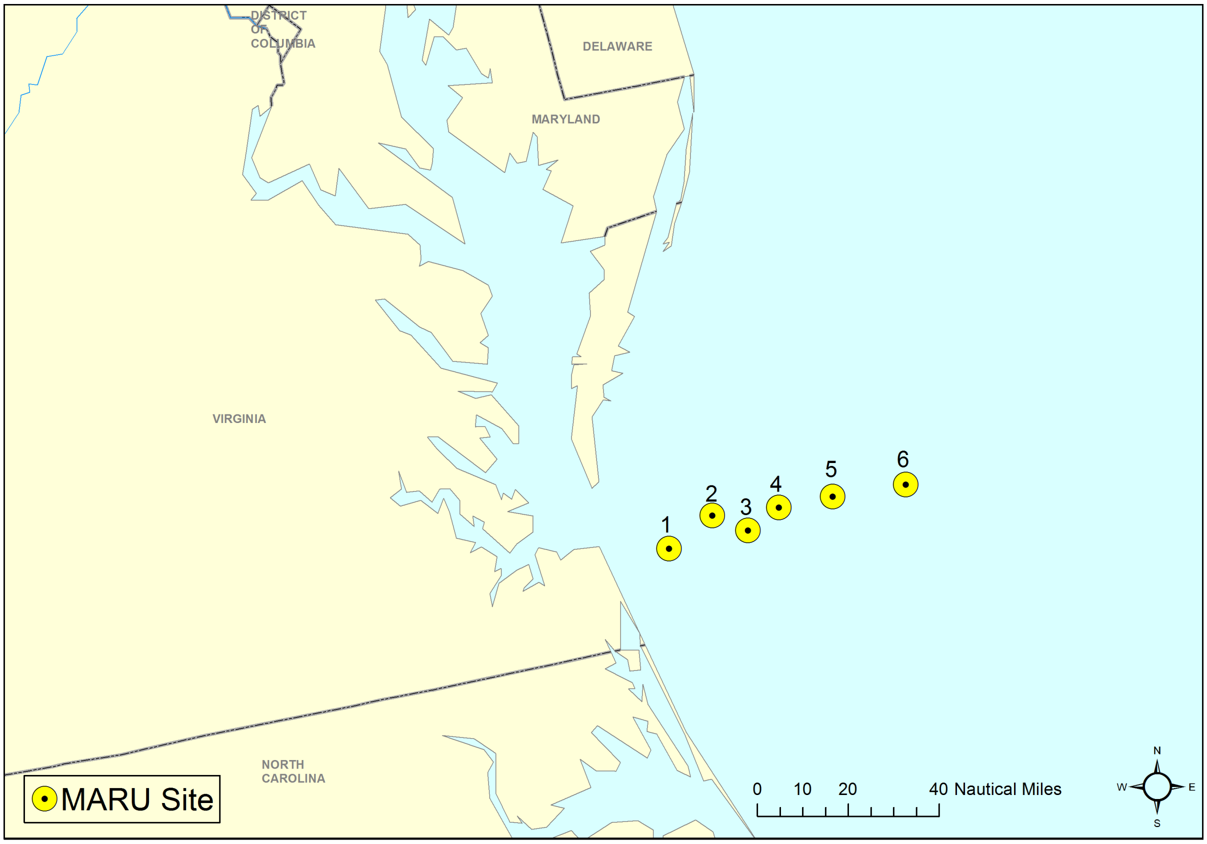

Figure 1: Deployment Site Map. For deployment 01 (June 3 – November 9, 2012), no data were available for MARU Site 6. For deployment 02 (November 10, 2012 – June 13, 2013), no data were available for MARU Site 2 and 6.

Hardware and Recording Failures:

During the course of the recording period, six MARU's experienced hardware and or recording failures. See Table 3 for a summary of each unit's issue.

Table 3: MARU hardware and recording failures.

MARU #	Site #	Hardware Issue
PU218	6 Dep 01	MARU was not recovered.
PU195	1 Dep 02	MARU stopped recording early on 2013-05-26.
PU193	2 Dep 02	MARU was not recovered.
PU163	3 Dep 02	MARU stopped recording properly on 2013-06-04.
PU130	4 Dep 02	MARU failed to record properly from 2012-11-09 through 2013-05-13. Data coverage for this unit is only from 2013-05-13 through 2013-06-08.
PU227	6 Dep 02	MARU was not recovered.

North Atlantic Right Whale Presence - Initial Data Analysis

Methods:

Daily presence of North Atlantic right whales (*Eubalaena glacialis*) was determined by the detection and verification of their contact calls (Morano et al., 2012a), the most commonly produced right whale call (Parks & Tyack 2005; Parks & Clark 2007). Analysis was performed on 9,024 hours of sound, from 376 days using an automated signal detection algorithm designed to detect contact calls (Urazghildiiev & Clark 2007; Urazghildiiev et al. 2009). Human analysts visually confirmed or rejected every detection event, resulting in no false positives and a low false negative rate. Every true positive upcall was verified by a human analyst and tabulated to be displayed in various daily and hourly plots.

Results:

North Atlantic right whales were found throughout the year, with an increased daily presence from mid-January 2013 through late March 2013. See Figure 2A and 2B for daily presence results.

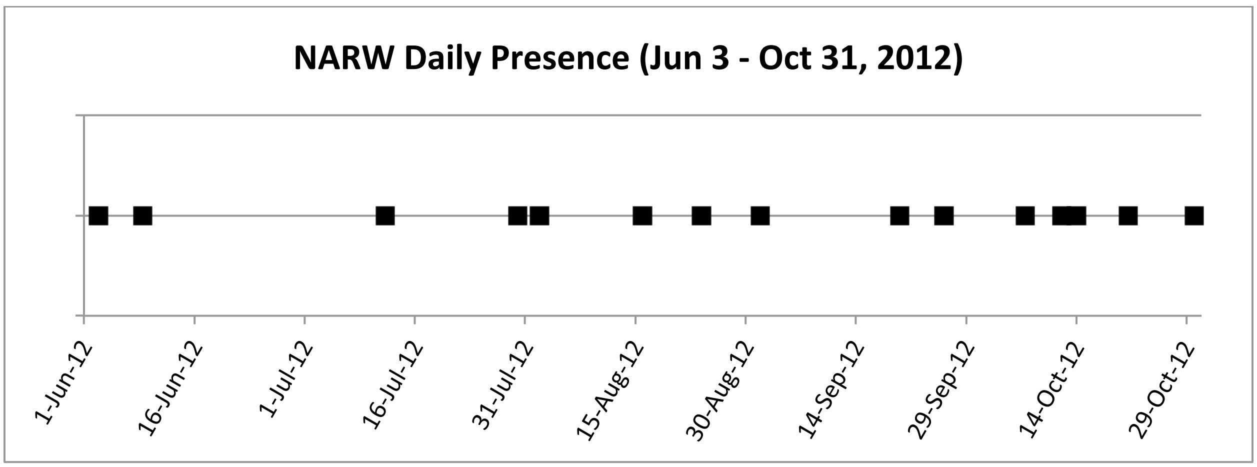

Figure 2A: Daily North Atlantic right whale presence for June 3, 2012 – October 31, 2012. Black squares represent right whale presence for that day.

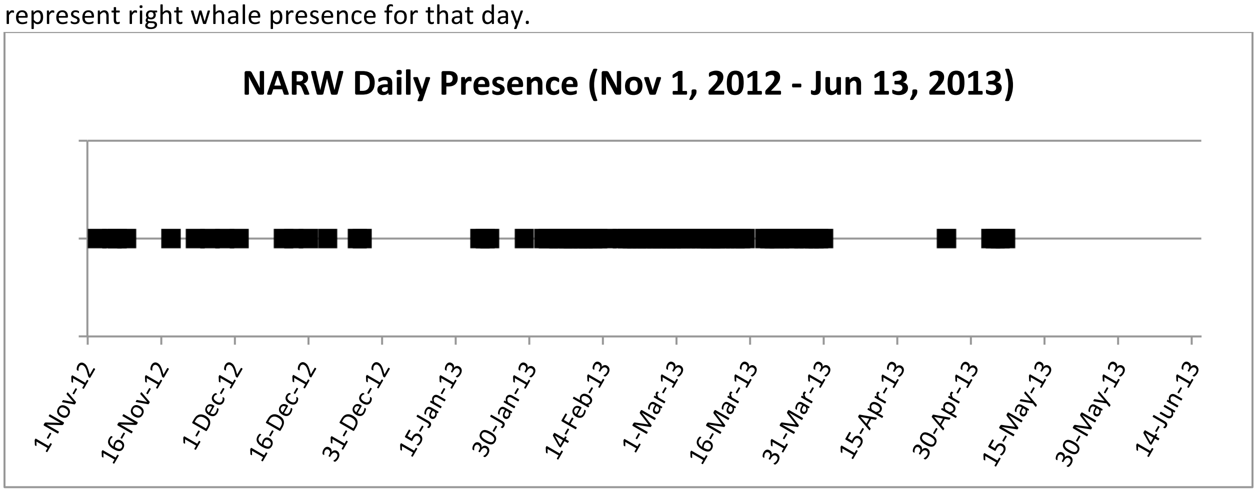

Figure 2B: Daily North Atlantic right whale presence for November 1, 2012 – June 13, 2013. Black squares represent right whale presence for that day.

Right whale presence was compared across MARU sites to give insight into the relative location of calling activity in the area. During the peak season of right whale daily and hourly presence from late January to late March, a significant portion of the upcalls were found at MARU sites 3 and 5, with a smaller percent found at MARU site 1. This differs with the rest of the year, where right whales were found to be randomly distributed across all MARU sites. See Figures 3A and 3B for daily presence based on MARU site location.

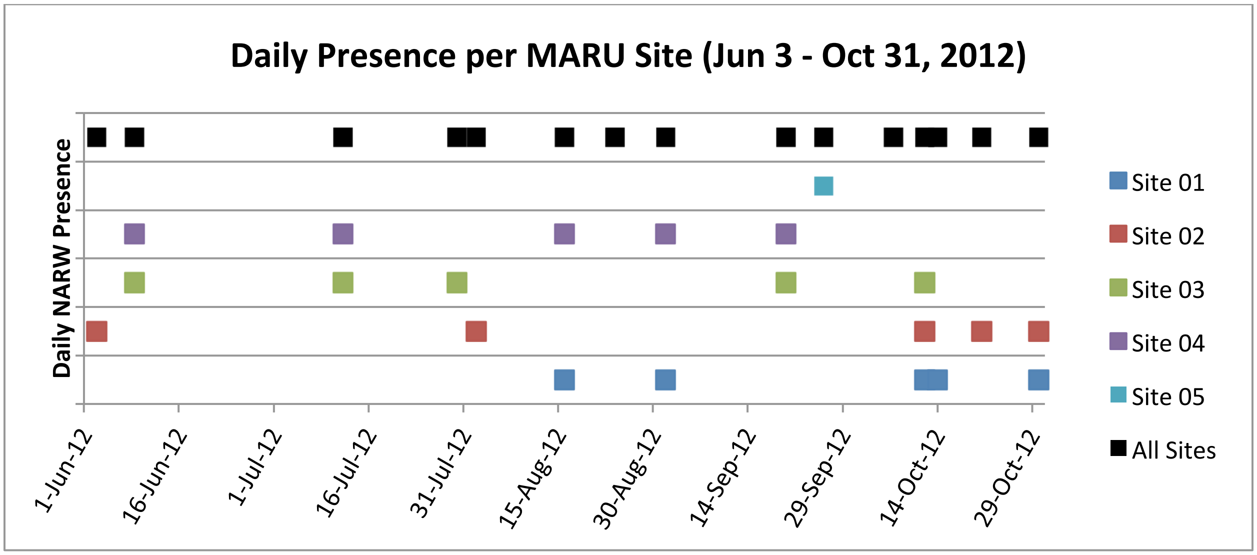

Figure 3A: Daily presence per MARU site from June 3 – October 31, 2012.

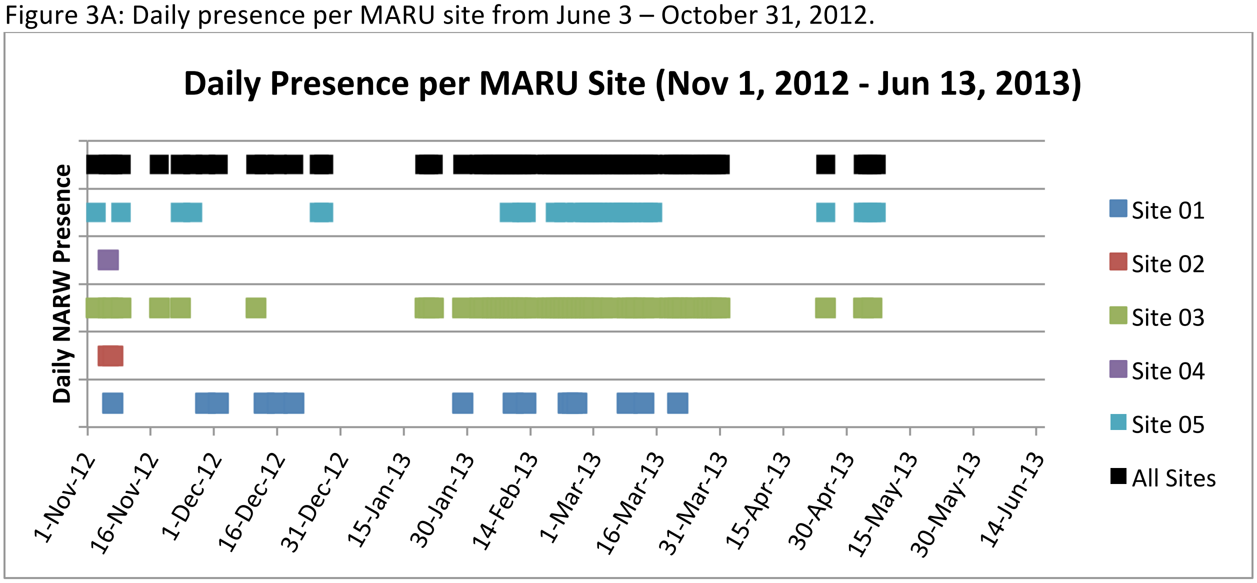

Figure 3B: Daily presence per MARU site from November 1, 2012 – June 13, 2013.

Increasing the resolution of analysis to consider hourly presence, a similar increase in hours containing North Atlantic right whale upcalls can be seen for the mid-January to late March time period. This illustrates a higher abundance of upcalls during this period as well. See Figure 3A and 3B for hourly presence results.

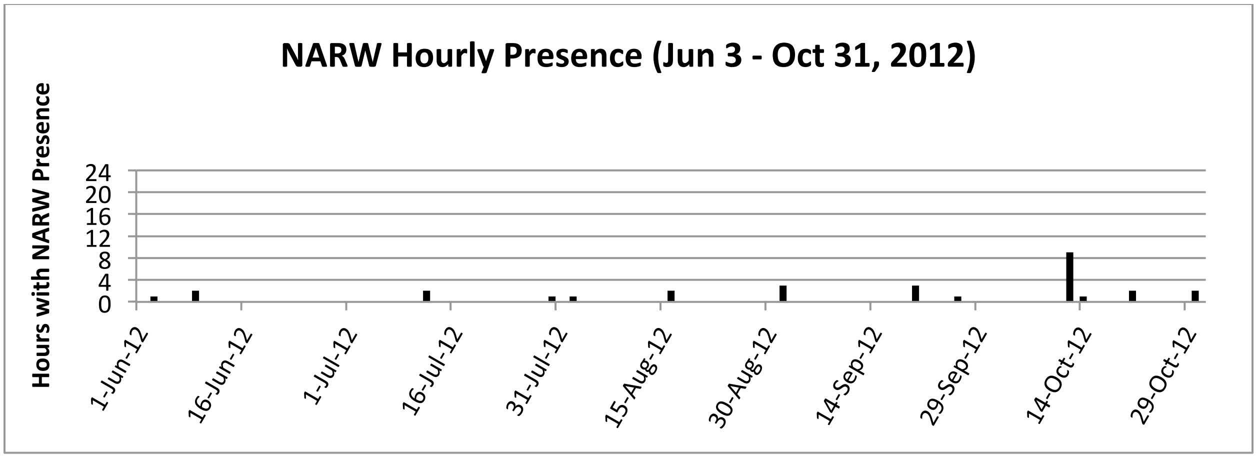

Figure 4A: Hourly North Atlantic right whale presence for June 3, 2012 – October 31, 2012. Total number of hours with right whale presence is represented on the y-axis.

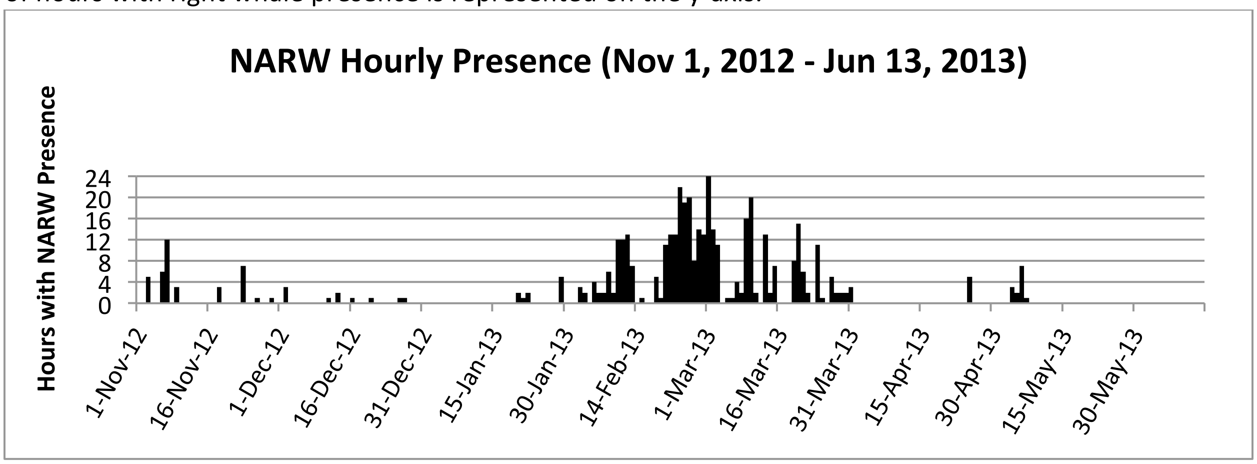

Figure 4B: Hourly North Atlantic right whale presence for November 1, 2012 – June 13, 2013. Total number of hours with right whale presence is represented on the y-axis.

Daily patterns of calling activity were determined by totaling the number of right whale upcalls per hour across the entire sample period. This confirmed that similar to patterns observed in Massachusetts Bay and Cape Cod Bay (Morano et al. 2012), the majority of calling activity occurs in the evening from 17:00 – 21:00 hours. See Figure 5.

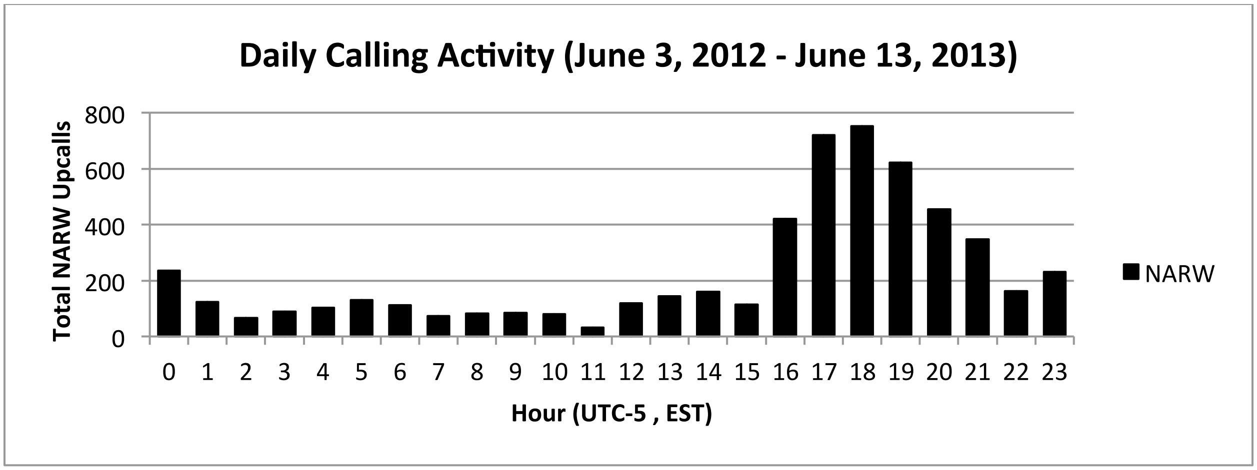

Figure 4: Daily pattern of right whale calling activity. All verified upcalls were totaled for each hour of the day throughout the entire recording period of June 3, 2012 – June 13, 2013.

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The documents cited in *Exhibit 2*, except for *Nowacek et al. (in press)*, which is not yet published, were compiled on a thumb drive and were delivered by mail to Jolie Harrison, Chief, Permits and Conservation Division, Office of Protected Resources, National Marine Fisheries Service, 1315 East-West Highway, Silver Spring, MD 20910. Publication of *Nowacek et al. (in press)* is expected next week and will be submitted shortly after publication.

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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,

Christopher Clark, Ph.D.
Senior Scientist
Bioacoustics Research Program
Cornell University

Scott Kraus, Ph.D.
Vice President of Research
John H. Prescott Marine Laboratory
New England Aquarium

Doug Nowacek, Ph.D.
Repass-Rodgers Chair of Marine Conservation Technology
Nicholas School of the Environment & Pratt School of Engineering
Duke University

Andrew J. Read, Ph.D.
Stephen Toth Professor of Marine Biology
Division of Marine Science and Conservation
Nicholas School of the Environment
Duke University

Aaron Rice, Ph.D.
Science Director
Bioacoustics Research Program
Cornell University

Howard C. Rosenbaum, Ph.D.
Director, Ocean Giants Program
Global Conservation Programs

Wildlife Conservation Society

Natacha Aguilar, Ph.D.
Director of Cetacean and Bioacoustics Research
University of La Laguna
Canary Islands, Spain

Simon Allen
Research Fellow
Murdoch University Cetacean Research Unit

S. Elizabeth Alter, Ph.D.
Professor, Department of Biology
York College, City University of New York

Ricardo Antunes, Ph.D.
Ocean Giants Program
Wildlife Conservation Society

Marta Azzolin, Ph.D.
Lecturer, Life Sciences and Systems, Biology Department
University of Torino

David Bain, Ph.D.
Marine Biologist
Washington

Robin Baird, Ph.D.
Research Biologist
Cascadia Research Collective

Kenneth C. Balcomb III
Executive Director and Principal Investigator
Center for Whale Research

Giovanni Bearzi, Ph.D.
Science Director, Dolphin Biology and Conservation
Faculty Member and Research Associate
Texas A&M University

Kerstin Bilgmann, Ph.D.
Research Scientist
Cetacean Ecology Behaviour and Evolution Lab
Flinders University, South Australia

Barbara A. Block, Ph.D.
Prothro Professor of Marine Sciences
Department of Biology
Stanford University

John Calambokidis
Senior Research Biologist and Co-Founder
Cascadia Research Collective

Merry Camhi, Ph.D.
Director, New York Seascape
Wildlife Conservation Society

Diane Claridge, Ph.D
Executive Director
Bahamas Marine Mammal Research Organisation

Annie B. Douglas
Research Biologist
Cascadia Research Collective

Sylvia Earle, Ph.D.
Founder and Chair
Mission Blue

Erin A. Falcone
Research Biologist
Cascadia Research Collective

Michael L. Fine, Ph.D.
Professor of Biology
Department of Biology
Virginia Commonwealth University

Sylvia Frey, Ph.D.

Director, Science & Education
OceanCare

Edmund Gerstein, Ph.D.
Director Marine Mammal Research
Charles E. Schmidt College of Science
Florida Atlantic University

Caroline Good, Ph.D.
Adjunct Research Professor
Nicholas School of the Environment
Duke University

Frances Gulland, Vet M.B., Ph.D.
Senior Scientist
The Marine Mammal Center

Denise Herzing, Ph.D.
Research Director, Wild Dolphin Project
Department of Biological Sciences
Florida Atlantic University

Holger Klinck, Ph.D.
Technology Director
Bioacoustics Research Program
Cornell University

Dipl. Biol. Sven Koschinski
Meereszoologie, Germany

Russell Leaper
Honorary Research Fellow
University of Aberdeen

Susan Lieberman, Ph.D.
Vice President, International Policy
Wildlife Conservation Society

Klaus Lucke, Ph.D.
Research Associate

Centre for Marine Science and Technology
Curtin University, Western Australia

Joseph J. Luczkovich, Ph.D.
Associate Professor
Department of Biology
Institute for Coastal Science and Policy
East Carolina University

William McClellan
NC State Stranding Coordinator
Large Whale Necropsy Team Leader
Department of Biology and Marine Biology
University of North Carolina, Wilmington

David McGuire, M.E.H.
Director, Shark Stewards

Sean McQuilken
Biologist and Endangered Species Observer

David K. Mellinger, Ph.D.
Associate Professor, Senior Research
Cooperative Institute for Marine Resources Studies
Oregon State University

Olaf Meynecke, Ph.D.
Chief Scientist
Humpbacks & High-Rises

T. Aran Mooney, Ph.D.
Associate Scientist
Woods Hole Oceanographic Institution

Michael Moore, Ph.D.
Director, Marine Mammal Center
Woods Hole Oceanographic Institution

Cynthia F. Moss, Ph.D.
Professor, Department of Psychological and Brain Sciences

Johns Hopkins University

Wallace J. Nichols, Ph.D.
Marine Biologist

Sharon Nieukirk
Senior Faculty Research Assistant
Marine Bioacoustics
Oregon State University

Giuseppe Notarbartolo di Sciara, Ph.D.
President
Tethys Research Institute

D. Ann Pabst, Ph.D.
Professor of Biology and Marine Biology
University of North Carolina, Wilmington

Susan E. Parks, Ph.D.
Assistant Professor
Department of Biology
Syracuse University

Chris Parsons, Ph.D. FRGS FSB
Professor
Department of Environmental Science & Policy
George Mason University

Roger Payne, Ph.D.
Founder and President
Ocean Alliance

Marta Picciulin, Ph.D.
Marine Biologist

Wendy Dow Piniak, Ph.D.
Assistant Professor of Environmental Studies
Gettysburg College

Randy R. Reeves, Ph.D.

Chairman
IUCN/ SSC Cetacean Specialist Group
International Union for the Conservation of Nature

Luke Rendell, Ph.D.
Lecturer, Sea Mammal Research Unit
University of St. Andrews, Scotland

Denise Risch, Ph.D.
Postdoctoral Research Associate
Scottish Association for Marine Science (SAMS)
Scottish Marine Institute

Dipl.-Biol. Fabian Ritter
Director of Research
MEER e.V., Berlin, Germany

Mario Rivera-Chavarria
Marine Biologist
University of Costa Rica

Marie A. Roch, Ph.D.
Professor of Computer Science
San Diego State University

Rosalind M. Rolland, D.V.M.
Senior Scientist
John H. Prescott Marine Laboratory
New England Aquarium

Naomi Rose, Ph.D.
Marine Mammal Scientist
Animal Welfare Institute

Heather Saffert, Ph.D.
Marine Scientist
Strategy Blue

Carl Safina, Ph.D.
Endowed Professor for Nature and Humanity
Stony Brook University

Gregory S. Schorr
Research Biologist
Cascadia Research Collective

Eduardo Secchi, Ph.D.
Professor
Instituto de Oceanografia
Universidade Federal do Rio Grande, Brazil

Mark W. Sprague, Ph.D.
Associate Professor
Department of Physics
East Carolina University

Richard Steiner
Professor (ret.)
University of Alaska

Jan Stel, Ph.D.
Professor Emeritus of Ocean Space and Human Activity
International Centre for Integrated Assessment and Sustainable Development
Maastricht University, The Netherlands

Michael Stocker
Executive Director
Ocean Conservation Research

Lisa Suatoni, Ph.D.
Senior Scientist
Natural Resources Defense Council

Sean K. Todd, Ph.D.
Steve K. Katona Chair in Marine Science
Director, Allied Whale
Associate Academic Dean for Graduate Studies
College of the Atlantic

Scott Veirs, Ph.D.
President
Beam Reach Science & Sustainability School

Val Veirs, Ph.D.
Professor of Physics, Emeritus
Colorado College

Linda Weilgart, Ph.D.
Adjunct, Department of Biology
Dalhousie University

Hal Whitehead, Ph.D.
Professor of Biology
Dalhousie University

George M. Woodwell, Ph.D.
Founder and Director Emeritus
Woods Hole Research Center

OCEANA Protecting the World's Oceans

1350 Connecticut Ave. NW, 5th Floor
Washington, DC 20036 USA

+1.202.833.3900
OCEANA.ORG

August 28, 2015

Ms. Jolie Harrison
Chief, Permits and Conservation Division
Office of Protected Resources
National Marine Fisheries Service
1315 East-West Highway
Silver Spring, MD 20910

RE: Notice of Receipt of Applications for Incidental Harassment Authorization ("IHA") for Geophysical Surveys in the Atlantic Ocean, 80 Fed. Reg. 45,195 (July 29, 2015).

Dear Ms. Harrison:

We welcome the opportunity to comment on the "[b]est available scientific information and appropriate use of such information in assessing potential effects of the specified activities on marine mammals and their habitat; [a]pplication approaches to estimating acoustic exposure and take of marine mammals; [and] [a]ppropriate mitigation measures and monitoring requirements for these activities."[1] Oceana, Inc., and the undersigned groups are profoundly concerned about the harm to marine mammals, including critically endangered North Atlantic right whales ("right whales"), from these proposed high-energy seismic surveys in the Atlantic Ocean. In the Programmatic Environmental Impact Statement ("PEIS") for these seismic surveys, the Bureau of Ocean Energy Management ("Bureau") concedes that these activities risk non-acoustic interactions, such as ship strikes, that could ***seriously injure or kill*** marine mammals.[2] As the Fisheries Service explained in its Programmatic Biological Opinion for this activity, "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***."[3] The Bureau estimates in its

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[1] Notice of Receipt of Applications for Incidental Harassment Authorization for Geophysical Surveys in the Atlantic Ocean, 80 Fed. Reg. 45,195 (July 29, 2015).
[2] BOEM, *Atlantic OCS Proposed Geological and Geophysical Activities Mid-Atlantic and South Atlantic Planning Areas Final Programmatic Environmental Impact Statement*, *Vol. I*, at 2-40 ("There is a potential risk that survey vessels could strike and injure or kill marine mammals.").
[3] 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 (emphasis added). However, the Programmatic Biological Opinion does not estimate the number of whales that "might be exposed to vessel traffic

PEIS that without mitigation,[4] sound from seismic activity[5] could result in ***up to 138,000*** marine mammal injuries, including ***up to nine injuries*** to critically endangered right whales, whose Potential Biological Removal rate is ***less than one***.[6]

Under the Marine Mammal Protection Act ("MMPA"), the Fisheries Service may issue an IHA only if a proposed activity takes a "small number" of marine mammals and will have only a "negligible impact on the species or stock."[7] When issuing an IHA, the agency must use "the best scientific evidence available."[8] However, if a proposed activity could cause serious injuries or deaths to marine mammals, then the Fisheries Service must require a Letter of Authorization ("LOA").[9] Because of the evidence that the high-energy seismic surveys could cause serious injuries or death through ship strikes or other interactions and because of the status of right whales, where the death of ***even one*** right whale affects the entire population, the Fisheries Service must consider rejecting these IHA applications and requiring the companies to submit LOA applications.

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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 right whales); *id.* at 283 (same for sei whales). And the Biological Opinion does not analyze the number of whales that may become entangled by seismic survey equipment.

[4] For a discussion of the inadequacy of the PEIS's mitigation measures, see Comment from Michael Jasny et al., to Gary D. Goeke, BOEM (July 2, 2012) (attached as Exhibit 2) & Comment from Eric A. Bilsky et al., to Gary D. Goeke, BOEM (May 7, 2014) (attached as Exhibit 3).

[5] The Bureau estimated only the potential number of injuries and behavioral disturbances caused by sound impacts from seismic surveying. 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.

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

[7] 16 U.S.C. § 1371(a)(5).

[8] *Id.* § 1371(a)(3)(A).

[9] 50 C.F.R. § 216.106.

Further, the proposed activities could cause population-level effects through behavioral disturbances. The Bureau estimates that the proposed activities could cause up to ***13.5 million*** behavioral disturbances to marine mammals, including ***up to 950*** behavioral disturbances to right whales,[10] whose population is approximately 455 individuals.[11] Where, as here, the number of potential behavioral disturbances is more than double the number of individuals in a population, the Fisheries Service should recognize the real and present threat of population-level effects from the proposed activity.[12]

Because of the serious concerns presented by these proposed activities and the need for meaningful public comment, the Fisheries Service should take the time it needs to review comments received through this comment period. The Administrative Procedure Act ("APA") requires an agency to "give interested persons an opportunity to participate in [a] rule making through submission of written data, views, or arguments with or without opportunity for oral presentation."[13] And, "[a]fter *consideration* of the relevant matter presented, the agency shall incorporate in the rules adopted a concise general statement of their basis and purpose."[14] Currently, the Fisheries Services proposes to complete the draft IHAs in September 2015.[15] However, given that this comment period ends on August 28, 2015, the Fisheries Service gives itself very little time to read, consider, and incorporate the information received during this comment period.

To ensure compliance with the MMPA, the undersigned groups request that the Fisheries Service take the following steps:

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[10] BOEM, *supra* note 2, at tbl. 42, 44. 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 the proposed seismic activity. Oceana input the data from the PEIS into a spreadsheet and summed up the total anticipated takes. *See* attached Exhibit 4. Because these species are protected and the agency must give the "benefit of the doubt" to protected species, *Miccosukee Tribe of Indians of Fla. v. United States*, 566 F.3d 1257, 1267 (11th Cir. 2009), Oceana uses the most conservative estimates.
[11] NMFS, *North Atlantic Right Whale: Western Atlantic Stock* (Dec. 2012), *available at* http://www.nmfs.noaa.gov/pr/pdfs/sars/ao2012whnr-w.pdf.
[12] Letter from marine mammal scientists sent to President Obama in 2015 about population-level effects of noise on marine mammals (attached as Exhibit 1).
[13] 5 U.S.C. § 553(c).
[14] *Id.* (emphasis added).
[15] Email from Craig Woolcott, Congressional Affairs Specialist, NOAA, to Congressional Offices, July 25, 2015 (attached as Exhibit 5).

- Take the time to review comments received during this comment period.
- Consider rejecting the IHA applications and requiring applications for LOAs.
- Carefully consider the risk of lethal takes and population-level effects from behavioral disturbances;
- Use the best available science to analyze the IHA applications, including not using the 160 dB threshold for Level B takes and instead, use a threshold based on the best available science.

I. TAKE THE TIME NECESSARY TO CONSIDER PUBLIC COMMENTS.

The Fisheries Service should make sure that it takes sufficient time to incorporate the comments it receives during this public comment period into its consideration of whether to require LOA applications instead of IHA applications and into its analyses for the draft IHAs for the proposed activities.[16] The APA requires an agency to "give interested persons an opportunity to participate in [a] rule making," "*consider[ ]* . . . the relevant matter presented," and "incorporate in the rules adopted a concise general statement of their basis and purpose."[17] Thus, the Fisheries Service must give the public the opportunity to comment, and the agency must consider the public's comments.[18]

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[16] The MMPA does set forth a timeframe for consideration of IHAs, but that timeline only begins when the agency considers the applications complete. Here, the applications that the Fisheries received are plainly not complete.
[17] 5 U.S.C. § 553(c).
[18] *See, e.g.*, *Lloyd Noland Hospital & Clinic v. Heckler*, 619 F. Supp. 1, 7 (N.D. Ala. 1984) ("This statute requires the agency to consider relevant comments and then incorporate a 'concise general statement' of the rule's 'basis and purpose.' The courts have interpreted this 'basis and purpose' requirement to mean that the agency must address, and if necessary rebut, significant comments made regarding a proposed rule."); *Home Box Office v. FCC*, 567 F.2d 9, 35 (D.C. Cir. 1977) ("The opportunity to comment is meaningless unless the agency responds to significant points raised by the public."), *cert. denied*, 434 U.S. 829 (1977); *Western Coal Traffic League v. United States*, 677 F.2d 915, 927 (D.C. Cir. 1982) ("An agency decision may not be reasoned if the agency ignores vital comments regarding relevant factors, rather than providing an adequate rebuttal."), *cert. denied* 459 U.S. 1086 (1982).

In an email to congressional offices announcing this public comment period, the Fisheries Services proposed to complete the draft IHAs in September 2015.[19] However, the current comment period ends on August 28, 2015. This timeline leaves the Fisheries Service only a matter of a few weeks to read, incorporate, and conduct its analyses for the draft IHAs. In effect, the Fisheries Service leaves itself virtually no time to consider the public's comments before deciding whether to approve those proposed authorizations for release.

The IHA applications and comments are highly technical, requiring sufficient time for consideration. Taken together, these four IHA applications contain nearly 700 pages of technical information that the agency must analyze carefully. Additionally, the entire Area of Interest for geological and geophysical exploration in the Atlantic Ocean totals 854,779 km,^{2} which represents a large area within which impacts can occur. The technical comments on these long and complicated documents are no less difficult to analyze. To evaluate fully these four IHA applications and technical public comments, the agency must provide itself sufficient time.

Therefore, because the rushed proposed timeline to evaluate highly technical and lengthy documents is insufficient, the Fisheries Service should adjust its timeline and take the time it needs to consider fully these comments and its analyses before issuing draft IHAs for these applications.

II. CONSIDER REJECTING THE IHA APPLICATIONS AND REQUIRING LOA APPLICATIONS.

Since the proposed activities could seriously injure or kill marine mammals, the Fisheries Service should consider rejecting the IHA applications and requiring the companies to submit LOA applications. Under the MMPA, if a proposed activity could cause serious injuries or deaths to marine mammals, then the actor—here, the seismic surveying companies—must obtain an LOA rather than an IHA because an IHA is exclusively designed only for incidental takes through injuries or harassment.[20]

Sound is not the only source of harassment, injury, and death from the proposed activities. As the Bureau and Fisheries Service recognized in each of their independent programmatic analyses, "There is a potential risk that survey vessels could strike and *injure or kill* marine mammals."[21]

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[19] Email from Craig Woolcott, *supra* note 15.
[20] 16 U.S.C. § 216.106.
[21] BOEM, *supra* note 2 at 2-40 ("There is a potential risk that survey vessels could strike and injure or kill marine mammals.") (emphasis added); *see also* NMFS, *supra* note 3, at 158, 188

Seismic surveying vessels moving to and from their surveying areas, and potentially during surveying, may strike, injure, and/or kill marine mammals. The Programmatic Biological Opinion recognizes that Atlantic seismic surveying activities could cause injuries and death to marine mammals through non-acoustic sources, such as ship strikes.[22] As the Programmatic Biological Opinion states, "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."[23] And right whales are of extreme concern because they are particularly prone to ship strikes. [24]

Additionally, sound from seismic surveying can cause behavioral disturbances, including causing marine mammals to move away from their usual habitats and/or migratory routes. For example, seismic surveying can cause baleen whales to abandon habitat over an area at least 100,000 square nautical miles in size.[25] Further, harbor porpoises, known to be acutely sensitive to a range of anthropogenic sources, including airguns, 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 harbor porpoises abandoning habitat in response to pulsed sounds at very low received levels. [26]

("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."); *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 right whales); *id.* at 283 (same for sei whales).

[22] NMFS, *supra* note 3, at 158, 188.

[23] *Id.* at 158.

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

[25] C.W. Clark and G.C. Gagnon, *Considering the Temporal and Spatial Scales of Noise Exposures from Seismic Surveys on Baleen Whales* (2006); C.W. Clark, pers. comm. with M. Jasny, NRDC (Apr. 2010); *see also* K. MacLeod et al., *Abundance of Fin (*Balaenoptera physalus*) and Sei Whales (*B. Borealis*) Amid Oil Exploration and Development off Northwest Scotland*, 8 J. Cetacean Res. & Mgmt. 247 (2006).

[26] *E.g.*, D.E. Bain & R. Williams, *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); R.A. Kastelein et al., *Behavioral Avoidance Threshold Level of a Harbor*

The risk of behavioral disturbances driving marine mammals into areas outside of their typical range is of particular concern with right whales. In 2008, the Fisheries Service issued a rule to protect right whales from ship strikes by limiting vessel speed to less than ten knots in certain areas, known as Seasonal Management Areas and Dynamic Management Areas.[27] The agency issued this rule because the "primary cause of the species' failure to recover is believed to be mortality caused by collisions with ships and entanglement in commercial fishing gear."[28] Right whales are prone to ship strikes because many of their tendencies, such as swimming slowly, living in near-shore waters, and spending extended periods of time near the surface, put right whales in danger of being struck by a traversing vessel.[29] Thus, *if* sound from seismic surveying pushes a right whale out of a Seasonal Management Area or Dynamic Management Area, *then* that right whale may enter an area where vessels are traveling at a greater speed, presenting a greater danger of ship strikes.

Therefore, because of the potential for marine mammal serious injuries and deaths, the Fisheries Service **should consider rejecting the IHA applications** and instead requiring LOA applications.

III. CAREFULLY CONSIDER EFFECTS ON MARINE MAMMALS.

The Fisheries Service should carefully analyze the risk of lethal takes and population-level effects from behavioral disturbances to marine mammals, particularly the right whale. Under the MMPA, the Fisheries Service may issue an IHA only if the activities take a "small number" of marine mammals and will have only a "negligible impact on the species or stock."[30]

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*Porpoise (*Phocoena phocoena*) for a Continuous 50 kHz Pure Tone*, 123 J. Acoustical Soc'y America 1858 (2008); R.A. Kastelein et al., *The Influence of Acoustic Emissions for Underwater Data Transmission on the Behavior of Harbour Porpoises (*Phocoena phocoena*) in a Floating Pen*, 59 Mar. Enviro. Res. 287 (2005); P.F. Olesiuk et al., *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*, 18 Mar. Mamm. Sci. 843 (2002).

[27] Endangered Fish and Wildlife; Final Rule To Implement Speed Restrictions to Reduce the Threat of Ship Collisions With North Atlantic Right Whales, 73 Fed. Reg. 60,173 (Dec. 9, 2008) (codified at 50 C.F.R. § 224).

[28] *Id.*

[29] Comment from Margaret Cooney, IFAW, to Mary Colligan, Assistant Regional Administrator of NMFS Protected Resources Division, Apr. 21, 2015 (attached as Exhibit 6).

[30] 16 U.S.C. § 1371(a)(5).

Because of the highly sensitive nature of the right whale population, where even ***one*** right whale death would affect the population, the Fisheries Service must carefully analyze effects on this species. The Fisheries Service should carefully assess the potential effect of seismic surveying, from both acoustic and non-acoustic sources, on right whales because of (1) the status of the right whale population; (2) the location of critical habitat and biologically important areas for right whales; and (3) the risk to right whales from ship strikes.[31]

A single seismic source can significantly reduce right whale communication range on a population scale.[32] Recent modeling from Cornell and NOAA shows the right whale to be particularly vulnerable to masking effects from airguns and other low-frequency noise because of the acoustic and behavioral characteristics of the whale's calls.[33] Seismic surveys in the North and Mid-Atlantic areas could 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—and which significantly increases their metabolic stress levels.[34]

First, the Fisheries Service should carefully consider these effects on right whales because the right whale is one of the most endangered species of large whales in the world. Indeed, as the Fisheries Service has stated repeatedly, "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.[35] And the right whale's Potential Biological Removal rate is 0.9,[36] meaning that ***even one*** right whale death caused by humans will significantly harm the entire population and frustrate the goals of the MMPA. However, from 2008 through 2012, each year, humans caused a minimum of 4.75 right whale deaths and

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[31] *See supra* Section II.
[32] 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.
[33] *Id.*
[34] Rosalind M. Rolland et al., *Evidence that Ship Noise Increases Stress in Right Whales*, Proc. R. Soc. B (2012), *available at* doi:10.1098/rspb.2011.2429.
[35] 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).
[36] NMFS, *Marine Mammal Stock Assessment Reports (SARs)* 10 (2013), *available at* http://www.nmfs.noaa.gov/pr/sars/2013/ao2013_rightwhale-west-atl.pdf; NMFS, *Draft Marine Mammal Stock Assessment Reports (SARs)* 8 (2015), *available at* http://www.nmfs.noaa.gov/pr/sars/draft.htm.

serious injuries, including 3.85 entanglements from fishing gear and 0.9 ship strikes per year.[37] Even while failing to consider significant adverse indirect effects, and grossly underestimating the potential for disturbance, the Bureau's PEIS estimated ***up to nine*** injuries and ***up to 950*** behavioral disturbances to the critically endangered North Atlantic right whale for seismic surveys overall.[38] Because of these large numbers, which includes predicted behavioral disturbances that are twice the number of the entire North Atlantic right whale population; the Fisheries Service should analyze carefully the effects of seismic surveying, including both acoustic and non-acoustic sources, on North Atlantic right whales.

Second, the Fisheries Service should carefully consider the sensitivity of the right whale population because the affected study area abuts and overlaps with the right whale year-round feeding, mating, and migration areas. The Fisheries Service has designated critical habitat, consisting of critical nursery and calving habitat, for right whales off the coast of Florida and Georgia.[39] Currently, the agency is revising this critical habitat designation to expand the protected area to include areas within approximately forty miles of the coastline stretching from Cape Fear, North Carolina to forty-three miles north of Cape Canaveral, Florida.[40] The proposed designation would protect these waters for right whale calving, nursing, and rearing.[41] The agency explained that the calving, nursing, and rearing areas off the coasts of Florida, Georgia, South Carolina, and North Carolina are part of "the *only* known calving ground for right whales, and that the *most biologically valuable portion* of the species' population is utilizing this habitat."[42] Additionally, a working group established by the National Oceanic and Atmospheric Administration recently identified biologically important areas for the right whale that span from central Florida to Georges Bank, totaling 269,448 square kilometers.[43]

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[37] Waring et al., *2014 Draft Marine Mammal Stock Assessment Reports* (2014), *available at* http://www.nmfs.noaa.gov/pr/sars/pdf/atl2014_draft.pdf.
[38] BOEM, *supra* note 2, at tbl. 42, 44.
[39] NMFS, Designated Critical Habitat; Northern Right Whale, 59 Fed. Reg. 28,793, 28,795 (June 3, 1994). A map of this area is included as Exhibit 7.
[40] NMFS, Endangered and Threatened Species; Critical Habitat for Endangered North Atlantic Right Whale, 80 Fed. Reg. 9,313, 9,319 (proposed Feb. 20, 2015). A map of the proposed area is included as Exhibit 8. *See also* Comment from Margaret Cooney, IFAW, to Mary Colligan, Assistant Regional Administrator of NMFS Protected Resources Division, Apr. 21, 2015.
[41] 80 Fed. Reg. at 9,342, 9319 ("[W]e conclude that facilitating successful calving by protecting the species' calving area is a key conservation objective.").
[42] *Id.* (emphasis added).
[43] NOAA, Cetacean & Sound Mapping Working Group, *Biologically Important Areas*, http://cetsound.noaa.gov/biologically-important-area-map (last visited Aug. 28, 2015).

Finally, the Fisheries Service should carefully consider the potential effects to right whales from ship strikes, as discussed in detail above.[44]

Therefore, the Fisheries Service must carefully consider how the acoustic and non-acoustic sources from the proposed seismic surveying could affect marine mammals, particularly the right whale.

IV. USE THE BEST SCIENTIFIC EVIDENCE AVAILABLE.

The Fisheries Service should ensure that it complies with the MMPA and uses the "best scientific evidence available."[45] To ensure compliance with the MMPA, the Fisheries Service must carefully consider the potential takes of marine mammals before issuing a draft IHA and while considering if a LOA is required instead. Under the MMPA, the Fisheries Service must

[44] *See supra* Section II.
[45] For a detailed discussion of the best scientific evidence available, see Oceana et al.'s technical comments. Comments from Ingrid Biedron, Oceana, Inc., et al., to Jolie Harrison, NMFS (Aug. 28, 2015).

use “the best scientific evidence available”[46] during these analyses. Thus, to comply with the MMPA, the agency should take the following steps:

1. Consider behavioral disruptions occurring in response to noise at levels below the current Acoustic Guidelines for Level B takes because the 160 dB threshold for Level B takes no longer represents the best available science;

2. Consider potential serious injuries and mortalities caused by non-acoustic sources, such as ship strikes and gear entanglement;

3. Analyze masking effects or set thresholds for masking;

4. Set proper thresholds for hearing loss;

5. Set proper thresholds for high- and mid-frequency acoustic sources, such as multibeam echosounders;

6. Carefully assess impacts on the critically endangered right whale;

7. Analyze cumulative impacts; and

8. Use the same models for all four IHA applications.

CONCLUSION

Seismic airgun testing and oil and gas exploration could significantly harm marine mammal populations in the Atlantic Ocean. The MMPA gives the Fisheries Service the duty and authority to protect these marine mammal populations. To comply with the requirements of the MMPA, the Fisheries Service, relying on the “best scientific evidence available,” may issue an IHA only if an activity takes a “small number” of marine mammals and will have only a “negligible impact on the species or stock.”[47] If an activity could cause serious injuries or mortalities for marine mammals, then the Fisheries Service must require a LOA instead of an IHA.[48] Accordingly, to ensure that the Fisheries Service complies with the MMPA during its analysis of the IHA

[46] 16 U.S.C. § 1371(a)(3)(A).
[47] *Id.* § 1371(a)(5), (a)(3)(A).
[48] 50 C.F.R. § 216.106.

applications and its consideration of whether to require a LOA for these activities, the undersigned groups recommend the following actions:

- Take the time to review the technical comments carefully.
- Consider rejecting the IHA applications and requiring applications for LOAs.
- Carefully consider the risk of lethal takes and population-level effects from behavioral disturbances;
- Use the best available science to analyze the IHA applications, including not using the 160 dB threshold for Level B takes and instead, use a threshold based on the best available science.

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,

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

Stephen D. Mashuda
Managing Attorney for Oceans, Earthjustice

Sierra Weaver
Senior Attorney, Southern Environmental Law Center

Michael Stocker
Director, Ocean Conservation Research

Larissa Liebmann
Staff Attorney, Waterkeeper Alliance, Inc.

Dede Shelton
Executive Director, Hands Across the Sand

Katie Zimmerman
Program Director, South Carolina Coastal Conservation League

Doug Fetterly
Co-chair, Sierra Club Marine Action Team

Sharon B. Young
Marine Issues Field Director, The Humane Society of the U.S.

Pete Stauffer
Environmental Director, Surfrider Foundation

Regina Asmutis-Silvia
Executive Director, Whale and Dolphin Conservation

Mike Senatore
Vice President, Conservation Law, Defenders of Wildlife

Alice Keyes
Associate Director, One Hundred Miles

Ben Gregg
Executive Director, South Carolina Wildlife Federation

Heather Deck
Pamlico-Tar Riverkeeper, Sound Rivers, Inc.

Matthew Starr
Upper Neuse Riverkeeper, Sound Rivers, Inc.

Travis Graves
Lower Neuse Riverkeeper, Sound Rivers, Inc.

Todd Miller
Executive Director, NC Coastal Federation

Carrie Clark
Executive Director, NC League of Conservation Voters

David Rogers
State Director, Environment North Carolina

Marcie Keever
Director of Oceans & Vessels Program, Friends of the Earth

Cindy Zipf
Executive Director, Clean Ocean Action

Jane Davenport
Senior Staff Attorney, Conservation Law, Defenders of Wildlife

Peter Nichols
National Director , Waterkeeper Alliance

Tonya Bonitatibus
Executive Director/Riverkeeper, Savannah Riverkeeper

Kathy Phillips
Executive Director /Assateague COASTKEEPER, Assateague Coastal Trust

Emma Gerald Boyer
Waccamaw RIVERKEEPER, Winyah Rivers Foundation

Debbie Mans
Baykeeper , NY/NJ Baykeeper

Jen Hilburn
Riverkeeper, Altamaha Riverkeeper

Neil A. Armingeon
Riverkeeper, Matanzas Riverkeeper

Harrison Langley
Waterkeeper, Collier County Waterkeeper

EXHIBIT 1

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 60 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. We respectfully urge you, Mr. President, to reverse the Interior Department's decision and bar the introduction of seismic oil and gas surveys in the Atlantic.

Sincerely,

Christopher Clark, Ph.D.
Senior Scientist
Bioacoustics Research Program
Cornell University

Scott Kraus, Ph.D.
Vice President of Research
John H. Prescott Marine Laboratory
New England Aquarium

Doug Nowacek, Ph.D.
Repass-Rodgers Chair of Marine Conservation Technology
Nicholas School of the Environment & Pratt School of Engineering
Duke University

Andrew J. Read, Ph.D.
Stephen Toth Professor of Marine Biology
Division of Marine Science and Conservation
Nicholas School of the Environment
Duke University

Aaron Rice, Ph.D.
Director
Bioacoustics Research Program
Cornell University

EXHIBIT 2

By Regular and Electronic Mail

July 2, 2012

Mr. Gary D. Goeke
Chief, Regional Assessment Section
Office of Environment (MS 5410)
Bureau of Ocean Energy Management
Gulf of Mexico OCS Region
1201 Elmwood Park Boulevard
New Orleans, Louisiana 70123-2394
GGEIS@boem.gov

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.

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[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] Nieukirk, 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.okeanos-stiftung.org/okeanos/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

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[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., Effecter 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.

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[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

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[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

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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.okeanos-stiftung.org/okeanos/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

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[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., 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) (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/lsesale/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 µPa (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]

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[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., Reponses 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

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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

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[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 μPa 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

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[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.

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[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 km^2 of ocean floor. Big Rock encompasses 93 km^2 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

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[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

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[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.

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[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

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[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

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[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-Quieting 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 μPa (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 μPa^2(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

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[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 ceteaceans, *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

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[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.okeanos-stiftung.org/okeanos/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]

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[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).

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[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 µPa (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 µPa (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 µPa 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]

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[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. 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).

[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

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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

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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.

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[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 aftteis.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

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[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

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[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.

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[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

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[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., 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); 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 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, 300 *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

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www.st.nmfs.noaa.gov/cetsound (previewed 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

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[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 PDEIS 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

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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.

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[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

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[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.

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[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 ecosystemshifts 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 of 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,

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[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.

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[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 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")

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[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 polies 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,

Michael Jasny
Senior Policy Analyst
NRDC

Miyoko Sakashita
Senior Attorney and Oceans Director
Center for Biological Diversity

Harold Shepherd
Executive Director
Center for Water Advocacy

Cindy Zipf
Executive Director
Clean Ocean Action

Sierra Weaver
Attorney
Defenders of Wildlife

Steve Roady
Senior Attorney
Earthjustice

Michael Stocker
Director
Ocean Conservation Research

Matthew Huelsenbeck
Marine Scientist
Oceana

Catherine Wannamaker
Senior Attorney
Southern Environmental Law Center

Pete Stauffer
Ocean Program Manager
Surfrider Foundation

Sharon Young
Marine Issues Field Director
The Humane Society of the U.S.

Sarah Dolman
Noise Pollution Campaign Manager
Whale and Dolphin Conservation Society

EXHIBIT 3

OCEANA | Protecting the World's Oceans

MEMORANDUM

1350 Connecticut Ave. NW, 5th Floor
Washington, DC 20036 USA
Toll free +1.877.7.OCEANA
P| +1.202.833.3900
F| +1.202.833.2070
oceana.org

May 7, 2014

Via Federal e-Rulemaking Portal
Mr. Gary D. Goeke
Chief, Environmental Assessment Section
Office of Environment
Bureau of Ocean Energy Management
1201 Elmwood Park Boulevard,
New Orleans, Louisiana 70123-2394
ggeis@boem.gov

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 area[2] 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

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[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

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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

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[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.

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[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.

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[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 offsore 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

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[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

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[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.

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[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.

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,

Eric A Bilsky
Assistant General Counsel
Oceana
ebilsky@oceana.org

Sara Young
Marine Scientist
Oceana
syoung@oceana.org

Adam Pearse
Law Fellow
Oceana
apearse@oceana.org

Elizabeth Allgood
U.S. Campaigns Director
International Fund for Animal Welfare
eallgood@ifaw.org

Margaret Cooney
Campaigns Officer
International Fund for Animal Welfare
mcooney@ifaw.org

EXHIBIT 4

Annual Level A Take Estimates from Seismic Airgun Sources Using Southall et al. (2007) Criteria for Marine Mammal Species during the Project Period

Order Cetacea	*2012*	*2013*	*2014*	*2015*	*2016*	*2017*	*2018*	*2019*	*2020*	**Total by Species**
Baleen Whales										
Common Minke Whale	0	0	0.083	0.161	0.017	0.067	0.047	0.022	0.024	0.421
Sei Whale	0	0	0.208	0.402	0.047	0.17	0.121	0.061	0.068	1.077
Bryde's Whale	0	0	0.632	1.237	0.144	0.714	0.535	0.364	0.173	3.799
Blue Whale	0	0	0.831	1.622	0.18	0.908	0.672	0.443	0.215	4.871
Fin Whale	0	0	0	0	0	0	0	0	0	0
North Atlantic Right Whale	0	0	0.036	0.071	0.008	0.045	0.034	0.024	0.009	0.227
Humpback Whale	0	0	3.046	5.931	0.674	3.102	2.279	1.415	0.848	17.295
Toothed Whales, Dolphins, Porpoises										
Short-beaked Common Dolphin	0	0	116.584	225.454	18.848	96.111	64.095	28.714	23.101	572.907
Pygmy Killer Whale	0	0	0.161	0.312	0.061	0.158	0.129	0.082	0.091	0.994
Short-Finned Pilot Whale	0	0	11.616	22.498	74.416	55.161	93.694	123.153	153.571	534.109
Long-Finned Pilot Whale	0	0	59.577	117.528	13.886	79.691	61.042	45.685	14.791	392.2
Risso's Dolphin	0	0	370.55	731.439	87.14	501.58	385.115	290.103	92.466	2458.393
Northern Bottlenose Whale	0	0	0.004	0.007	0.001	0.003	0.002	0.001	0.001	0.019
Pygmy Sperm Whale	0	0	0	0	0.081	0.041	0.08	0.083	0.138	0.423
Dwarf Sperm Whale	0	0	2.819	5.564	1.326	4.2	3.676	3.169	2.01	22.764
Atlantic White-sided Dolphin	0	0	1.347	2.659	0.522	1.965	1.659	1.415	0.768	10.335
Fraser's Dolphin	0	0	0.208	0.402	0.032	0.161	0.105	0.041	0.04	0.989
Sowerby's Beaked Whale	0	0	0	0	0.006	0.004	0.007	0.009	0.012	0.038
Blainville's Beaked Whale	0	0	1.459	2.816	0.225	1.126	0.731	0.282	0.282	6.921
Gervais' Beaked Whale	0	0	1.459	2.816	0.225	1.126	0.731	0.282	0.282	6.921
True's Beaked Whale	0	0	1.459	2.816	0.225	1.126	0.731	0.282	0.282	6.921
Killer Whale	0	0	0.052	0.1	0.033	0.054	0.052	0.04	0.056	0.387
Melon-Headed Whale	0	0	0.161	0.312	0.061	0.158	0.129	0.082	0.091	0.994
Harbor Porpoise	0	0	2.064	3.995	0.655	1.913	1.509	0.963	1.012	12.111
Sperm Whale	0	0	0.095	0.184	0.015	0.076	0.05	0.021	0.019	0.46
False Killer Whale	0	0	0.155	0.3	0.126	0.194	0.204	0.186	0.224	1.389
Pantropical Spotted Dolphin	0	0	135.938	263.432	35.378	127.155	96.513	61.914	53.839	774.169
Clymene Dolphin	0	0	64.945	125.855	16.902	60.749	46.109	29.58	25.722	369.862
Striped Dolphin	0	0	527.416	1020.455	157.93	486.916	383.424	258.754	256.777	3091.672
Atlantic Spotted Dolphin	0	0	771.308	1496.301	201.604	741.31	564.738	369.59	303.44	4448.291
Spinner Dolphin	0	0	0.611	1.184	0.159	0.571	0.434	0.278	0.242	3.479
Rough-Toothed Dolphin	0	0	0	0	0.036	0.023	0.043	0.061	0.075	0.238
Bottlenose Dolphin	0	0	14.775	28.936	21.683	28.545	34.819	39.072	42.117	209.947
Cuvier's Beaked Whale	0	0	10.213	19.709	1.577	7.883	5.119	1.972	1.972	48.445
TOTAL	**0**	**0**	**2099.812**	**4084.498**	**634.223**	**2203.006**	**1748.628**	**1258.143**	**974.758**	13003.07
									13003.07	

Annual Level A Takes Estimates from Seismic Airgun Sources Uing 180-dB Criteria for Marine Mammal Species during the Porject Period

Order Cetacea	*2012*	*2013*	*2014*	*2015*	*2016*	*2017*	*2018*	*2019*	*2020*	**Total by species**
Baleen Whales										
Common Minke Whale	0.000	0.000	0.342	0.666	0.101	0.364	0.285	0.196	0.144	**2.098**
Sei Whale	0.000	0.000	1.965	3.855	0.648	2.473	2.009	1.567	0.925	**13.442**
Bryde's Whale	0.000	0.000	1.948	3.820	0.642	2.445	1.986	1.548	0.918	**13.307**
Blue Whale	0.000	0.000	2.182	4.274	0.700	2.653	2.139	1.632	1.000	**14.580**
Fin Whale	0.000	0.000	4.400	8.638	1.507	5.679	4.657	3.705	2.180	**30.766**
North Atlantic Right Whale	0.000	0.000	1.162	2.290	0.611	1.757	1.595	1.464	0.858	**9.737**
Humpback Whale	0.000	0.000	5.897	11.542	1.853	7.071	5.671	4.275	2.632	**38.941**
Toothed Whales, Dolphins, Porpoises										
Short-beaked Common Dolphin	0.000	0.000	3,121.383	6,146.553	1,114.258	4,282.933	3,551.165	2,919.887	1,611.226	**22,747.405**
Pygmy Killer Whale	0.000	0.000	2.253	4.410	0.705	2.708	2.170	1.635	0.997	**14.878**
Short-Finned Pilot Whale	0.000	0.000	2,354.300	4,631.133	840.256	3,170.157	2,627.151	2,145.343	1,224.552	**16,992.892**
Long-Finned Pilot Whale	0.000	0.000	297.400	582.360	96.845	362.017	292.887	224.439	139.821	**1,995.769**
Risso's Dolphin	0.000	0.000	1,619.672	3,180.466	551.169	2,095.819	1,717.190	1,367.649	796.896	**11,328.861**
Northern Bottlenose Whale	0.000	0.000	0.127	0.250	0.043	0.174	0.143	0.116	0.061	**0.914**
Pygmy Sperm Whale	0.000	0.000	2.371	4.592	0.559	2.140	1.562	0.872	0.770	**12.866**
Dwarf Sperm Whale	0.000	0.000	14.844	29.005	4.264	16.955	13.300	9.592	5.939	**93.899**
Atlantic White-sided Dolphin	0.000	0.000	4.668	9.152	1.467	5.795	4.657	3.573	2.063	**31.375**
Fraser's Dolphin	0.000	0.000	0.242	0.468	0.055	0.210	0.151	0.079	0.076	**1.281**
Sowerby's Beaked Whale	0.000	0.000	0.203	0.397	0.060	0.233	0.184	0.134	0.085	**1.296**
Blainville's Beaked Whale	0.000	0.000	39.568	77.313	11.835	45.464	35.978	26.232	16.739	**253.129**
Gervais' Beaked Whale	0.000	0.000	39.568	77.313	11.835	45.464	35.978	26.232	16.739	**253.129**
True's Beaked Whale	0.000	0.000	39.568	77.313	11.835	45.464	35.978	26.232	16.739	**253.129**
Killer Whale	0.000	0.000	1.965	3.843	0.602	2.309	1.839	1.363	0.852	**12.773**
Melon-Headed Whale	0.000	0.000	2.523	4.942	0.818	3.098	2.505	1.924	1.168	**16.978**
Harbor Porpoise	0.000	0.000	7.054	13.798	2.245	8.376	6.733	5.072	3.235	**46.513**
Sperm Whale	0.000	0.000	158.828	309.723	44.502	173.124	134.518	93.561	62.258	**976.514**
False Killer Whale	0.000	0.000	2.801	5.491	0.930	3.501	2.848	2.218	1.334	**19.123**
Pantropical Spotted Dolphin	0.000	0.000	446.741	876.082	145.967	559.932	454.020	352.985	208.113	**3,043.840**
Clymene Dolphin	0.000	0.000	207.184	406.191	67.382	258.155	209.054	161.919	96.038	**1,405.923**
Striped Dolphin	0.000	0.000	2,038.848	3,993.224	650.891	2,483.607	2,000.683	1,526.327	928.896	**13,622.476**
Atlantic Spotted Dolphin	0.000	0.000	2,978.964	5,847.582	988.880	3,813.267	3,105.692	2,446.233	1,406.107	**20,586.725**
Spinner Dolphin	0.000	0.000	1.949	3.821	0.634	2.429	1.967	1.523	0.903	**13.226**
Rough-Toothed Dolphin	0.000	0.000	13.755	26.888	4.279	16.048	12.821	9.510	6.112	**89.413**
Bottlenose Dolphin	0.000	0.000	5,977.039	11,748.210	2,090.846	7,908.443	6,521.887	5,266.486	3,022.262	**42,535.173**
Cuvier's Beaked Whale	0.000	0.000	276.973	541.189	82.842	318.247	251.849	183.622	117.174	**1,771.896**
TOTAL	**0.000**	**0.000**	**19,668.687**	**38,636.794**	**6,732.066**	**25,648.511**	**21,043.252**	**16,819.145**	**9,695.812**	**138,244.267**
									138,244.267	

Annual Level B Take Estimates (160-dB criteria) from Airgun Surveys for Marine Mammal Species during the Project Period

Order Cetacea	*2012*	*2013*	*2014*	*2015*	*2016*	*2017*	*2018*	*2019*	*2020*	Total by species
Baleen Whales										
Common Minke Whale	0.000	0.000	33.522	65.282	9.857	35.718	27.956	19.257	14.116	**205.708**
Sei Whale	0.000	0.000	192.625	377.801	63.466	242.395	196.917	153.588	90.689	**1,317.481**
Bryde's Whale	0.000	0.000	190.896	374.359	62.904	239.608	194.649	151.692	89.980	**1,304.088**
Blue Whale	0.000	0.000	213.901	418.875	68.622	259.980	209.629	159.949	98.045	**1,429.001**
Fin Whale	0.000	0.000	431.204	846.583	147.732	556.574	456.478	363.111	213.637	**3,015.319**
North Atlantic Right Whale	0.000	0.000	113.846	224.490	59.848	172.225	156.298	143.499	84.052	**954.258**
Humpback Whale	0.000	0.000	577.964	1,131.230	181.646	692.987	555.789	419.002	257.919	**3,816.537**
Toothed Whales, Dolphins, Porpoises										
Short-beaked Common Dolphin	0.000	0.000	305,926.755	602,423.698	109,208.426	419,770.312	348,049.714	286,178.116	157,916.298	**2,229,473.319**
Pygmy Killer Whale	0.000	0.000	220.776	432.193	69.105	265.443	212.700	160.267	97.713	**1,458.197**
Short-Finned Pilot Whale	0.000	0.000	230,744.930	453,897.344	82,353.473	310,707.070	257,487.079	210,265.101	120,018.336	**1,665,473.333**
Long-Finned Pilot Whale	0.000	0.000	29,148.152	57,077.138	9,491.739	35,481.323	28,705.807	21,997.239	13,703.882	**195,605.280**
Risso's Dolphin	0.000	0.000	158,744.009	311,717.478	54,020.063	205,411.212	168,301.811	134,043.314	78,103.785	**1,110,341.672**
Northern Bottlenose Whale	0.000	0.000	12.462	24.544	4.259	17.031	13.994	11.395	6.003	**89.688**
Pygmy Sperm Whale	0.000	0.000	232.353	450.073	54.784	209.782	153.072	85.460	75.450	**1,260.974**
Dwarf Sperm Whale	0.000	0.000	1,454.885	2,842.740	417.949	1,661.508	1,303.577	940.144	582.097	**9,202.900**
Atlantic White-sided Dolphin	0.000	0.000	457.481	896.987	143.826	567.919	456.474	350.144	202.187	**3,075.018**
Fraser's Dolphin	0.000	0.000	23.717	45.882	5.427	20.593	14.819	7.782	7.470	**125.690**
Sowerby's Beaked Whale	0.000	0.000	19.910	38.905	5.903	22.874	18.068	13.148	8.286	**127.094**
Blainville's Beaked Whale	0.000	0.000	3,878.016	7,577.415	1,159.902	4,455.915	3,526.252	2,570.966	1,640.602	**24,809.068**
Gervais' Beaked Whale	0.000	0.000	3,878.016	7,577.415	1,159.902	4,455.915	3,526.252	2,570.966	1,640.602	**24,809.068**
True's Beaked Whale	0.000	0.000	3,878.016	7,577.415	1,159.902	4,455.915	3,526.252	2,570.966	1,640.602	**24,809.068**
Killer Whale	0.000	0.000	192.589	376.649	59.002	226.289	180.233	133.567	83.546	**1,251.875**
Melon-Headed Whale	0.000	0.000	247.240	484.381	80.135	303.674	245.516	188.604	114.448	**1,663.998**
Harbor Porpoise	0.000	0.000	691.367	1,352.385	219.996	820.894	659.933	497.063	317.088	**4,558.726**
Sperm Whale	0.000	0.000	15,566.706	30,355.996	4,361.663	16,967.893	13,184.100	9,169.873	6,101.896	**95,708.127**
False Killer Whale	0.000	0.000	274.527	538.213	91.113	343.104	279.084	217.358	130.741	**1,874.140**
Pantropical Spotted Dolphin	0.000	0.000	43,785.058	85,864.840	14,306.228	54,878.902	44,498.535	34,596.047	20,397.152	**298,326.762**
Clymene Dolphin	0.000	0.000	20,306.091	39,810.739	6,604.129	25,301.751	20,489.358	15,869.727	9,412.707	**137,794.502**
Striped Dolphin	0.000	0.000	199,827.536	391,375.882	63,793.815	243,418.330	196,086.989	149,595.327	91,041.146	**1,335,139.025**
Atlantic Spotted Dolphin	0.000	0.000	291,968.246	573,121.475	96,920.094	373,738.318	304,388.840	239,755.284	137,812.574	**2,017,704.831**
Spinner Dolphin	0.000	0.000	191.026	374.513	62.127	238.022	192.750	149.292	88.549	**1,296.279**
Rough-Toothed Dolphin	0.000	0.000	1,348.103	2,635.268	419.376	1,572.892	1,256.603	932.059	599.076	**8,763.377**
Bottlenose Dolphin	0.000	0.000	585,809.587	1,151,442.029	204,923.786	775,106.463	639,210.107	516,168.326	296,211.886	**4,168,872.184**
Cuvier's Beaked Whale	0.000	0.000	27,146.110	53,041.902	8,119.316	31,191.403	24,683.766	17,996.764	11,484.217	**173,663.478**
TOTAL	**0.000**	**0.000**	**1,927,727.622**	**3,786,792.119**	**659,809.515**	**2,513,810.234**	**2,062,449.401**	**1,648,444.397**	**950,286.777**	**13,549,320.065**
									13,549,320.065	

Annual Level A Take Estimtes from All Non-Airgun High-Resolution Geophysical Surveys Using Southall et al. (2007) Criteria for Marine Mammal Species during the Project Perioc

Order Cetacea	*2012*	*2013*	*2014*	*2015*	*2016*	*2017*	*2018*	*2019*	*2020*	**Total by Species**
Baleen Whales										
Common Minke Whale	0.0003	0.0004	0.0004	0.0004	0.0004	0.0003	0	0	0	**0.0022**
Sei Whale	0.002	0.0024	0.0024	0.0024	0.0024	0.0021	0.0004	0	0	**0.0141**
Bryde's Whale	0.0023	0.003	0.003	0.003	0.003	0.0027	0.0007	0	0	**0.0177**
Blue Whale	0.0002	0.0005	0.0005	0.0005	0.0005	0.0005	0.0003	0	0	**0.003**
Fin Whale	0.0155	0.0208	0.0208	0.0208	0.0208	0.0185	0.0053	0	0	**0.1225**
North Atlantic Right Whale	0.0021	0.0026	0.0026	0.0026	0.0026	0.0022	0.0005	0	0	**0.0152**
Humpback Whale	0	0	0	0	0	0	0	0	0	**0**
Toothed Whales, Dolphins, Porpoises										
Short-beaked Common Dolphin	4.0936	5.2235	5.2235	5.2235	5.2235	4.546	1.1299	0	0	**30.6635**
Pygmy Killer Whale	0.0004	0.001	0.001	0.001	0.001	0.0009	0.0006	0	0	**0.0059**
Short-Finned Pilot Whale	0.0053	0.0106	0.0106	0.0106	0.0106	0.0106	0.0053	0	0	**0.0636**
Long-Finned Pilot Whale	0	0	0	0	0	0	0	0	0	**0**
Risso's Dolphin	1.863	2.2287	2.2287	2.2287	2.2287	2.0205	0.3658	0	0	**13.1641**
Northern Bottlenose Whale	0	0	0	0	0	0	0	0	0	**0**
Pygmy Sperm Whale	0.0048	0.0064	0.0064	0.0064	0.0064	0.0059	0.0016	0	0	**0.0379**
Dwarf Sperm Whale	0.0145	0.0192	0.0192	0.0192	0.0192	0.0178	0.0047	0	0	**0.1138**
Atlantic White-sided Dolphin	0	0	0	0	0	0	0	0	0	**0**
Fraser's Dolphin	0.0001	0.0003	0.0004	0.0004	0.0004	0.0003	0.0003	0	0	**0.0022**
Sowerby's Beaked Whale	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0	0	0	**0.0012**
Blainville's Beaked Whale	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0	0	0	**0.0012**
Gervais' Beaked Whale	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0	0	0	**0.0012**
True's Beaked Whale	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0	0	0	**0.0012**
Killer Whale	0.0025	0.0061	0.0061	0.0061	0.0061	0.0058	0.0036	0	0	**0.0363**
Melon-Headed Whale	0.0001	0.0004	0.0004	0.0004	0.0004	0.0003	0.0003	0	0	**0.0023**
Harbor Porpoise	0.0005	0.0007	0.0007	0.0007	0.0007	0.0006	0.0002	0	0	**0.0041**
Sperm Whale	0.0008	0.0009	0.0009	0.0009	0.0009	0.0008	0.0001	0	0	**0.0053**
False Killer Whale	0.0001	0.0004	0.0004	0.0004	0.0004	0.0003	0.0003	0	0	**0.0023**
Pantropical Spotted Dolphin	0.4477	0.5868	0.62	0.62	0.62	0.5432	0.1677	0.0287	0.0287	**3.6628**
Clymene Dolphin	0.2139	0.2803	0.2962	0.2962	0.2962	0.2595	0.0801	0.0137	0.0137	**1.7498**
Striped Dolphin	0.5954	0.7674	0.8121	0.8121	0.8121	0.7114	0.2107	0.0386	0.0386	**4.7984**
Atlantic Spotted Dolphin	5.3991	6.9574	7.3614	7.3614	7.3614	6.4414	1.898	0.3397	0.3397	**43.4595**
Spinner Dolphin	0.002	0.0026	0.0028	0.0028	0.0028	0.0024	0.0008	0.0001	0.0001	**0.0164**
Rough-Toothed Dolphin	0.0099	0.0145	0.0145	0.0145	0.0145	0.0134	0.0047	26.1283	0	**26.2143**
Bottlenose Dolphin	1.2977	2.1422	2.3608	2.3608	2.3608	1.9922	1.04	0.1955	0.1955	**13.9455**
Cuvier's Beaked Whale	0.0013	0.0015	0.0015	0.0015	0.0015	0.0013	0.0003	0	0	**0.0089**
TOTAL	**13.9759**	**18.2814**	**18.9981**	**18.9981**	**18.9981**	**16.6017**	**4.9222**	**26.7446**	**0.6163**	**138.1364**
									138.1364	

Annual Level A Take Estimates from All Non-Airgun High-Resolution Geophysical Surveys Using 180-dB Criteria for Marine Mammal Species during the Project Period

Order Cetacea	*2012*	*2013*	*2014*	*2015*	*2016*	*2017*	*2018*	*2019*	*2020*	**Total by Species**
Baleen Whales										
Common Minke Whale	0.0002	0.0003	0.0003	0.0003	0.0003	0.0003	0.0002	0.0001	0.0004	**0.0024**
Sei Whale	0.0004	0.0005	0.0005	0.0005	0.0005	0.0006	0.0012	0.0008	0.0024	**0.0074**
Bryde's Whale	0.0004	0.0005	0.0005	0.0005	0.0005	0.0006	0.0012	0.0008	0.0024	**0.0074**
Blue Whale	0.0007	0.001	0.0011	0.0011	0.0011	0.0011	0.0015	0.0009	0.0026	**0.0111**
Fin Whale	0.0012	0.0016	0.0017	0.0017	0.0017	0.0018	0.0031	0.0019	0.0055	**0.0202**
North Atlantic Right Whale	0.002	0.0025	0.0025	0.0025	0.0025	0.0027	0.0051	0.0031	0.0089	**0.0318**
Humpback Whale	0.0025	0.0034	0.0035	0.0035	0.0035	0.0034	0.0037	0.0022	0.0066	**0.0323**
Toothed Whales, Dolphins, Porpoises										
Short-beaked Common Dolphin	1.2187	1.4589	1.4946	1.4946	1.4946	1.5087	2.0876	1.3143	3.8682	**15.9402**
Pygmy Killer Whale	0.0004	0.0005	0.0005	0.0005	0.0005	0.0006	0.0011	0.0008	0.0024	**0.0073**
Short-Finned Pilot Whale	0.0132	0.0166	0.0171	0.0171	0.0171	0.1358	1.2475	0.805	2.3163	**4.5857**
Long-Finned Pilot Whale	0.0027	0.0033	0.0033	0.0033	0.0033	0.0153	0.1295	0.0932	0.2808	**0.5347**
Risso's Dolphin	0.0913	0.1118	0.1118	0.1118	0.1118	0.1826	0.8666	0.5861	1.7367	**3.9105**
Northern Bottlenose Whale	0	0	0	0	0	0	0.0001	0	0.0001	**0.0002**
Pygmy Sperm Whale	0.0011	0.0015	0.0015	0.0015	0.0015	0.0014	0.0007	0.0005	0.0017	**0.0114**
Dwarf Sperm Whale	0.0034	0.0046	0.0046	0.0046	0.0046	0.0046	0.0057	0.0038	0.0119	**0.0478**
Atlantic White-sided Dolphin	0	0.0001	0.0001	0.0001	0.0001	0.0002	0.0017	0.0014	0.0044	**0.0081**
Fraser's Dolphin	0.0004	0.0006	0.0007	0.0007	0.0007	0.0006	0.0003	0.0001	0.0002	**0.0043**
Sowerby's Beaked Whale	0	0	0	0	0	0	0.0001	0.0001	0.0002	**0.0004**
Blainville's Beaked Whale	0	0	0	0	0	0.0013	0.0134	0.0104	0.032	**0.0571**
Gervais' Beaked Whale	0	0	0	0	0	0.0013	0.0134	0.0104	0.032	**0.0571**
True's Beaked Whale	0	0	0	0	0	0.0013	0.0134	0.0104	0.032	**0.0571**
Killer Whale	0.0005	0.0007	0.0007	0.0007	0.0007	0.0007	0.001	0.0007	0.0021	**0.0078**
Melon-Headed Whale	0.0004	0.0005	0.0005	0.0005	0.0005	0.0006	0.0014	0.0009	0.0029	**0.0082**
Harbor Porpoise	0.0016	0.0018	0.0018	0.0018	0.0018	0.0019	0.0031	0.0023	0.0068	**0.0229**
Sperm Whale	0.0002	0.0002	0.0002	0.0002	0.0002	0.0041	0.043	0.0377	0.1213	**0.2071**
False Killer Whale	0.0004	0.0006	0.0006	0.0006	0.0006	0.0007	0.0016	0.001	0.0029	**0.009**
Pantropical Spotted Dolphin	0.3036	0.4453	0.4509	0.4509	0.4509	0.4381	0.3559	0.161	0.4798	**3.5364**
Clymene Dolphin	0.145	0.2127	0.2154	0.2154	0.2154	0.2088	0.1643	0.0729	0.217	**1.6669**
Striped Dolphin	0.3964	0.5755	0.5831	0.5831	0.5831	0.6088	0.9086	0.5299	1.5825	**6.351**
Atlantic Spotted Dolphin	3.4607	4.9269	4.9955	4.9955	4.9955	4.7511	3.0827	1.2151	3.5657	**35.9887**
Spinner Dolphin	0.0013	0.0019	0.002	0.002	0.002	0.0019	0.0015	0.0007	0.002	**0.0153**
Rough-Toothed Dolphin	0.0057	0.0074	0.0075	0.0075	0.0075	0.0073	0.008	0.0052	0.0164	**0.0725**
Bottlenose Dolphin	0.9382	1.4056	1.465	1.465	1.465	1.6672	3.8323	2.2521	6.4434	**20.9338**
Cuvier's Beaked Whale	0.0002	0.0002	0.0002	0.0002	0.0002	0.009	0.0939	0.0726	0.2243	**0.4008**
TOTAL	**6.5928**	**9.187**	**9.3677**	**9.3677**	**9.3677**	**9.5644**	**12.8944**	**7.1984**	**21.0148**	**94.5549**
									94.5549	

Annual Level A Take Estiamtes from All Non-Airgun High-Resolution Geophysical Surveys Using 160-dB Criteria for Marine Mammal Species during the Project Period

Order Cetacea	*2012*	*2013*	*2014*	*2015*	*2016*	*2017*	*2018*	*2019*	*2020*	**Total by Species**
Baleen Whales										
Common Minke Whale	0.0225	0.0287	0.03	0.03	0.03	0.0282	0.02	0.0135	0.0419	**0.2448**
Sei Whale	0.0358	0.0476	0.0511	0.0511	0.0511	0.0557	0.1152	0.0784	0.2328	**0.7188**
Bryde's Whale	0.0355	0.047	0.0505	0.0505	0.0505	0.0553	0.1169	0.079	0.2338	**0.719**
Blue Whale	0.0659	0.098	0.1037	0.1037	0.1037	0.1048	0.1448	0.0871	0.2568	**1.0685**
Fin Whale	0.1153	0.1598	0.1665	0.1665	0.1665	0.1722	0.3083	0.1847	0.5384	**1.9782**
North Atlantic Right Whale	0.1945	0.2461	0.2491	0.2491	0.2491	0.269	0.5016	0.3002	0.8702	**3.1289**
Humpback Whale	0.2454	0.3285	0.3444	0.3444	0.3444	0.3313	0.3597	0.2189	0.6492	**3.1662**
Toothed Whales, Dolphins, Porpoises										
Short-beaked Common Dolphin	119.444	142.9833	146.4839	146.4839	146.4839	147.8699	204.6009	128.8144	379.127	**1562.291**
Pygmy Killer Whale	0.0345	0.0494	0.0494	0.0494	0.0494	0.0549	0.1097	0.0759	0.237	**0.7096**
Short-Finned Pilot Whale	1.292	1.6287	1.6711	1.6711	1.6711	13.3054	122.2637	78.8942	227.0254	**449.4227**
Long-Finned Pilot Whale	0.2621	0.3201	0.3267	0.3267	0.3267	1.4975	12.6893	9.1359	27.5252	**52.4102**
Risso's Dolphin	8.9444	10.9577	10.9577	10.9577	10.9577	17.8981	84.9354	57.4417	170.2112	**383.2616**
Northern Bottlenose Whale	0	0	0	0	0	0.0006	0.0063	0.0041	0.0118	**0.0228**
Pygmy Sperm Whale	0.1119	0.1503	0.1503	0.1503	0.1503	0.141	0.0732	0.0472	0.1675	**1.142**
Dwarf Sperm Whale	0.3358	0.4508	0.4508	0.4508	0.4508	0.4557	0.5592	0.3686	1.1655	**4.688**
Atlantic White-sided Dolphin	0.0027	0.0055	0.0055	0.0055	0.0055	0.0208	0.168	0.1357	0.4275	**0.7767**
Fraser's Dolphin	0.0345	0.0568	0.0637	0.0637	0.0637	0.0575	0.0304	0.0098	0.0183	**0.3984**
Sowerby's Beaked Whale	0.0023	0.0026	0.0026	0.0026	0.0026	0.003	0.0073	0.0056	0.0175	**0.0461**
Blainville's Beaked Whale	0.0023	0.0026	0.0026	0.0026	0.0026	0.1259	1.3153	1.0167	3.14	**5.6106**
Gervais' Beaked Whale	0.0023	0.0026	0.0026	0.0026	0.0026	0.1259	1.3153	1.0167	3.14	**5.6106**
True's Beaked Whale	0.0026	0.0032	0.0032	0.0032	0.0032	0.1265	1.3156	1.0167	3.14	**5.6142**
Killer Whale	0.0509	0.0642	0.0678	0.0678	0.0678	0.068	0.0952	0.0667	0.2021	**0.7505**
Melon-Headed Whale	0.0361	0.0525	0.0525	0.0525	0.0525	0.0604	0.1362	0.0921	0.2839	**0.8187**
Harbor Porpoise	0.1543	0.1717	0.1812	0.1812	0.1812	0.1894	0.299	0.2206	0.6643	**2.2429**
Sperm Whale	0.0182	0.0215	0.0215	0.0215	0.0215	0.4051	4.2127	3.6965	11.8913	**20.3098**
False Killer Whale	0.0389	0.0582	0.0582	0.0582	0.0582	0.0674	0.1524	0.0959	0.2885	**0.8759**
Pantropical Spotted Dolphin	29.7529	43.6445	44.1968	44.1968	44.1968	42.9366	34.8805	15.7818	47.022	**346.6087**
Clymene Dolphin	14.2145	20.8513	21.1152	21.1152	21.1152	20.46	16.1068	7.1416	21.2706	**163.3904**
Striped Dolphin	38.8529	56.4013	57.1529	57.1529	57.1529	59.6638	89.0555	51.9312	155.0979	**622.4613**
Atlantic Spotted Dolphin	339.1818	482.888	489.6133	489.6133	489.6133	465.651	302.1377	119.089	349.4761	**3527.264**
Spinner Dolphin	0.1306	0.1899	0.1924	0.1924	0.1924	0.1862	0.1484	0.0672	0.2001	**1.4996**
Rough-Toothed Dolphin	0.5554	0.7281	0.7355	0.7355	0.7355	0.7138	0.7853	0.5128	1.6114	**7.1133**
Bottlenose Dolphin	91.9501	137.76	143.5851	143.5851	143.5851	163.3981	375.6071	220.7238	631.5169	**2051.711**
Cuvier's Beaked Whale	0.0158	0.0181	0.0181	0.0181	0.0181	0.881	9.2072	7.1172	21.9798	**39.2734**
TOTAL	**646.1387**	**900.4186**	**918.1559**	**918.1559**	**918.1559**	**937.38**	**1263.78**	**705.4814**	**2059.682**	**9267.348**
									9267.348	

EXHIBIT 5

Reichert, Christina

To: Reichert, Christina
Subject: FW: Notification: Receipt of Applications for Multiple IHAs in the Atlantic Ocean
Attachments: 7-27-15_Notice of receipt of multiple IHA apps for Atlantic activities_as filed.pdf

Subject: FW: Notification: Receipt of Applications for Multiple IHAs in the Atlantic Ocean

From: Craig Woolcott - NOAA Federal [mailto:craig.woolcott@noaa.gov]
Sent: Monday, July 27, 2015 4:22 PM
To: Craig Woolcott - NOAA Federal <craig.woolcott@noaa.gov>
Cc: Meagan Dunphy-Daly - NOAA Federal <meagan.dunphy-daly@noaa.gov>
Subject: Notification: Receipt of Applications for Multiple IHAs in the Atlantic Ocean

Good afternoon colleagues -

NOAA has received four Incidental Harassment Authorization (IHA) requests under the Marine Mammal Protection Act (MMPA) for proposed oil and gas geophysical survey activity in the Atlantic Ocean. The filed notification of receipt is attached to this email, and I have included additional background information below. Once the notification is published in the Federal Register, there will be an initial public review comment period of 30 days. This initial public review period is not typical for the issuance of IHAs, but it is required for more complex actions authorized through a different section of the statute.

Please feel free to contact me with any questions at
Craig.Woolcott@noaa.gov
or 202-482-
7940
.

Regards,
Craig

Background information:

- Under the MMPA, NOAA Fisheries is charged with the conservation and protection of marine mammals, including the appropriate authorization of incidental take.
  - NOAA Fisheries works with applicants to produce adequate and complete applications before publishing notice of the proposed authorizations for public comment. We then consider input from the public, make our final determinations, and issue or deny the authorization.
  - Typically, this process takes six to nine months, but may take longer for projects that are more complex.
  - NOAA Fisheries' responsibility is to consider the anticipated effects of the action to individual marine mammals in a population-level context and determine whether those consequences reflect a negligible impact on the relevant stocks. NOAA Fisheries may authorize the incidental taking

of "small numbers" of marine mammals if the taking will have no more than a negligible impact on the species/stock.
    - Behavioral disturbance of individual marine mammals by seismic surveys is well-documented, meaning that an MMPA authorization is required. The potential impacts to marine mammal populations grow with the scale of the proposed survey activity. It is difficult to document population level effects, but recent science has demonstrated connections between disturbance and energetic costs that can affect vital rates and, ultimately, population.
- This group of actions is not typical as the proposed surveys are very large in scale and complicated.
    - The scale of the proposed surveys is unprecedented in U.S. waters, with some surveys involving multiple source vessels and occurring year-round throughout a broad section of the Atlantic Ocean.
    - These proposed surveys are much larger than the typical academic seismic survey and involve much larger acoustic sources that produce more noise.
    - NOAA has been working diligently with the applicant companies to produce adequate applications and to address fundamental MMPA issues.
- This initial public review period is not typical for the issuance of IHAs, but it is required for more complex actions authorized through a different section of the statute.
    - NOAA Fisheries believes a public comment period will be productive in identifying information that should be considered in the decision-making process for these complex proposed surveys.
    - This public comment period does not represent additional time in the process; the public will gain an extra review period while the proposed authorizations are concurrently in development.
    - The regular public comment period will occur when we publish the proposed authorizations (targeted for September 2015).
- NOAA Fisheries is committed to careful review and to ensuring appropriate use of the best available information in satisfying the requirements of the MMPA and NOAA Fisheries' implementing regulations for these proposed surveys.

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Craig A. Woolcott
Congressional Affairs Specialist
Office of Legislative and Intergovernmental Affairs
National Oceanic and Atmospheric Administration (NOAA)
U.S. Department of Commerce - Herbert C. Hoover Building
14th and Constitution Ave., NW
Washington, DC 20230
Tel: (202) 482-7940
Cell: (202) 306-4704
Craig.Woolcott@noaa.gov

EXHIBIT 6

April 21, 2015

Mary Colligan
Assistant Regional Administrator
NMFS Protected Resources Division
Greater Atlantic Regional Office
55 Great Republic Drive
Gloucester, MA 01930

RE: Endangered and Threatened Species; Critical Habitat for Endangered North Atlantic Right Whale

Dear Ms. Colligan,

I am writing on behalf of the International Fund for Animal Welfare (IFAW), the Natural Resources Defense Council (NRDC), Oceana, Inc., and millions of our concerned supporters on the proposed rule to expand the critical habitat for the endangered North Atlantic right whale. We are very supportive of the proposed rule to expand the critical habitat for North Atlantic right whales with two new areas – approximately 29,945 nm^2 of marine habitat in the Gulf of Maine and Georges Bank region (Unit 1) and off the Southeast U.S. coast (Unit 2). It is our request that the National Marine Fisheries Service also

1. Include the mid-Atlantic migratory corridor and the southernmost portion of the current critical habitat in the right whale critical habitat expansion; and

2. Increase right whale protection measures to provide the protection necessary to allow for the recovery and long-term survival of right whales, including

    a. Expanding Seasonal Management Areas that reduce ship strikes to include all portions of the proposed critical habitat in the northeast and critical habitat in the mid-Atlantic migratory corridor out to 30 nms as well as areas in the Southeast Atlantic;

    b. Protect right whales from gear entanglement through expanded SMAs and expanding entanglement regulations to encourage the use of gear innovations such as sinking or neutrally buoyant line to reduce and prevent entanglement, and to promote science-based catch quotas; and

    c. Protecting right whales from proposed oil and gas exploration and development in the Atlantic Ocean through rules that prevent or limit the seismic airgun activity.

Conservation of North Atlantic right whales is imperative. With a population of about only 500, it is paramount that necessary precautions are taken to ensure species growth and prohibit further detriment to their existence. The most recent NMFS draft stock assessment for North Atlantic right whales, puts the species' annual Potential Biological Removal (PBR) level at 0.9 individuals, but for the period of 2008 through 2012, the minimum rate of annual human-caused mortality and serious injury to right whales averaged 4.75 per year, with incidental fishery entanglement reports at 3.85 per year, and ship strike records at 0.9 per year.[1] This level of mortality and serious injury is four times greater than the species' PBR. This means there are no unnatural right whale mortalities that can be deemed "insignificant" to their endangered population. NOAA is the United States agency responsible for protecting and recovering endangered marine species, and therefore, it is your duty to provide the protection required to safeguard this critically endangered population.

We Support Proposed Rule to Expand Critical Habitat for North Atlantic Right Whale

We applaud the National Marine Fisheries Service's (NMFS) efforts towards expanding North Atlantic right whale critical habitat. The designation and protection of critical habitat is one of the primary ways in which the fundamental purpose of the ESA, "to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved," is achieved.[2] When designating critical habitat, NMFS considers the following characteristics: (1) space for individual and population growth, and for normal behavior; (2) food, water, air, light, minerals, or other nutritional or physiological requirements; (3) cover or shelter; (4) sites for breeding, reproduction, rearing of offspring, germination, or seed dispersal; and (5) habitats that are protected from disturbance or are representative of the historic geographical and ecological distributions of species.[3] Right whale critical habitat has not been revised since 1994 and since that time, our understanding of their seasonal habitat use has grown exponentially. Now that it is widely known that right whale critical habitat is much broader than originally believed, it is only right that the critical habitat boundaries reflect that modernized knowledge and the best science available.

In 1994, at the time when the North Atlantic right whale critical habitat was designated, right whale foraging grounds were thought to be solely located in the Great South Channel and the Cape Cod Bay. Now various studies and analysis of right whale sightings data in U.S. northwest Atlantic waters indicate foraging habitat important to the conservation of right whales is much more extensive than originally perceived. In fact, a study conducted in 2008 found that there is no statistically significant difference between the Sightings Per Unit Effort (SPUE) of right whales inside the current Cape Cod Bay critical habitat and the areas to the east (P=0.669).[4] Instead of two essential feeding grounds, six areas in the region are now understood to be seasonally important for right whale foraging purposes: Cape Cod Bay (January-April), Great South Channel (April-June), the western Gulf of Maine (April-May and July-October), the northern edge of Georges Bank (May-July), Jordan Basin (August-October), and Wilkinson Basin (April-July).

Jordan and Wilkinson Basins are also essential for right whales because they serve as overwintering areas for their prey, copepods. Right whales can be found foraging in these Basins year-round, but they

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[1] Waring *et al*. 2014 Draft Marine Mammal Stock Assessment Reports. Retrieved from: http://www.nmfs.noaa.gov/pr/sars/pdf/atl2014_draft.pdf

[2] 16 U.S.C. § 1536(a)(2).

[3] 50 C.F.R. § 424.12(b)(1)–(5).

[4] Nichols, O. C., Kenney, R. D., & Brown, M. W. (2008). Spatial and temporal distribution of North Atlantic right whales (Eubalaena glacialis) in Cape Cod Bay, and implications for management. Fishery Bulletin, 106(3), 270-280. Retrieved from http://0-web.ebscohost.com.library.colgate.edu/ehost/detail?sid=84ec6e2f-a35a-4c65-a80e-369c291643f9%40sessionmgr115&vid=1&hid=128&bdata=JnNpdGU9ZWhvc3QtbGl2ZQ%3d%3d#db=aph&AN=34474673

feed in especially high numbers during the fall and early winter months.[5] For example, right whale surveys conducted in Jordan Basin during the winter of 2004-2005 reported up to 24 foraging whales at a time[6] and in the winter of 2008, NOAA's Northeast Fisheries Science Center (NEFSC) observed 44 individual right whales on December 3rd and 41 on December 14th – about 14% of the total estimated population at the time.[7] After the overwintering period is over, the copepods in these Basins distribute to the other aforementioned areas in abundance and become the right whales food source throughout their foraging habitat. Right whale foraging activity is triggered by these high concentrations of copepods and a standard analysis of metabolic needs suggests that they require these dense patches to survive.[8] It is essential that all of the areas within the Gulf of Maine and Georges Bank region are included in the expansion as proposed so the dense copepod concentrations needed for right whale survival cannot be easily disturbed by harmful activities. Each of the listed areas make up North Atlantic right whale foraging habitat and are crucial to the long-term survival of right whales; because of this, these areas should be designated as critical habitat to right whales as proposed according to the Endangered Species Act (ESA).

The best science currently available also indicates that the existing North Atlantic right whale critical habitat boundaries in the southeast Atlantic Ocean are underrepresenting vital right whale habitat necessary to their species' conservation. As the location of the only calving grounds for right whales, this region is paramount to their population's growth and ultimate survival. Recent studies indicate that the current critical habitat boundaries need to be expanded to include areas farther offshore and substantially further north off the coast of Georgia.[9] As stated by the NMFS, southern North Carolina waters are a "substantial and core portion of the right whale calving area".[10] This expanse includes suitable average environmental conditions and has a high predicted sightings rate of calving right whales. Also by using a developed model to mean sea surface temperature (SST) throughout December-March, with right whale sightings per unit effort (SPUE) averaged across years, one study predicted suitable calving habitat for right whales over much of the continental shelf south of Cape Fear, North Carolina. It is clearly evident that right whale critical habitat should be expanded to encompass the proposed expansion. [11]

Therefore, the proposed expanded critical habitat for right whales represents important foraging, calving, and reproduction areas.

Inclusion of the Mid-Atlantic Migratory Corridor and the Southernmost Portion of the Current Critical Habitat in the New Right Whale Critical Habitat Expansion

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[5] Pace RM III, Merrick RL. (2008.) Northwest Atlantic Ocean Habitats Important to the Conservation of North Atlantic Right Whales (Eubalaena glacialis). Northeast Fish Sci Cent Ref Doc. 08-07; 24 p. Retrieved from http://www.nefsc.noaa.gov/publications/crd/crd0807/

[6] Ibid.

[7] Dawicki, Shelley. (January 2009). High numbers of right whales seen in Gulf of Maine. NOAA National Marine Fisheries Service. Retrieved from http://www.eurekalert.org/pub_releases/2009-01/nnmf-hno010209.php

[8] Pace, R.M. and Merrick, R.L. (April 2008). Northwest Atlantic Ocean habitats important to the conservation of North Atlantic right whales (*Eubalaena glacialis*). Retrieved from http://www.nefsc.noaa.gov/publications/crd/crd0807/crd0807.pdf

[9] Keller, C.A., Garrison, L., Baumstark, R., Ward-Geiger, L.I., and Hines, E. (2012). Application of a habitat model to define calving habitat of the North Atlantic right whale in the southeastern United States. Endangered Species Research, doi: 10.3354/esr00413. Retrieved from http://www.int-res.com/articles/esr_oa/n018p073.pdf

[10] NMFS (2012). U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments –North Atlantic right whale. Retrieved from http://www.nmfs.noaa.gov/pr/sars/pdf/ao2012.pdf

[11] Keller, C.A., Garrison, L., Baumstark, R., Ward-Geiger, L.I., and Hines, E. (2012). Application of a habitat model to define calving habitat of the North Atlantic right whale in the southeastern United States. Endangered Species Research, doi: 10.3354/esr00413. Retrieved from http://www.int-res.com/articles/esr_oa/n018p073.pdf

While we are very pleased with the proposed critical habitat expansion, we request that you consider including the mid-Atlantic migratory corridor and the entire currently designated critical habitat in the southeast in the proposal as well. As mentioned above, when designating critical habitat, NMFS considers space for normal behavior and sites for breeding and reproduction.[12] Here, the mid-Atlantic migratory corridor represents an area of normal species behavior because whales use the corridor to move between the species' southern calving sites and northern foraging sites. Further, the southernmost portion of the current critical habitat is essential for breeding and reproduction. Thus, NMFS should include both the mid-Atlantic migratory corridor and the southernmost portion of the current critical habitat in the expanded right whale critical habitat.

The mid-Atlantic migratory corridor connects both essential habitats and is traversed by the most important and vulnerable members of the population – mothers and calves. It is crucial that these essential foraging and calving grounds receive the increased protection and special management consideration necessary to allow the North Atlantic right whales devastatingly low population to recover. Including this area in the expansion would help to safeguard their migratory route and ensure that mothers and calves are able to access their calving and foraging grounds. If this area is not included, detrimental activities could take place in the corridor and put mothers and calves at an increased risk of injury and mortality. Complete protection of mothers and calves is crucial to population growth. It is already apparent that NMFS acknowledges right whale use of this high risk area by allotting Seasonal Management Areas (SMAs) out to 20 nautical miles from mid-Atlantic ports. As a known, necessary area to right whales it should be included in the critical habitat expansion.

Also, in order to provide the best possible protection, the southern tip of the existing Southeast Atlantic critical habitat should not be decreased or narrowed as proposed. The safety of calving habitat is crucial to right whale success and should not be downsized by any means if we are to provide right whales with the best protection possible. At their current endangered status, the right whale population is not at a point where protection should be decreased for their species. By including the existing southern tip in the proposed critical habitat boundaries, as previously indicated, 91% of analyzed sightings would be included in the expansion. This would provide right whales with nearly full habitat coverage.

Therefore, NMFS should include the mid-Atlantic migratory corridor because the species normally uses it to move between the southern calving sites and northern foraging sites. And NMFS should include the southernmost portion of the current critical habitat because this area is essential for breeding and reproduction.

Expanding Protective Measures to Strengthen Right Whale Protection within the Newly Designated Critical Habitat

We request that NMFS expand protective measures within existing and newly designated critical habitat to strengthen whale protection. NMFS also states that critical habitat provides a benefit to species by focusing federal, state, and private conservation and management efforts in areas designated critical habitat.[13] Recovery efforts can then address special considerations needed in critical habitat areas,

[12] 50 C.F.R. § 424.12(b)(1)–(5).
[13] *See Palila v. Hawaii Department of Land and Natural Resources*, 852 F. 2d 1106 (9th Cir. 1988).

including conservation regulations to restrict private as well as federal activities.[14] Therefore, to provide the necessary protections for right whales, NMFS should

1. Expand Seasonal Management Areas (SMAs) that reduce ship strikes to include all portions of the proposed critical habitat in the northeast and critical habitat in the mid-Atlantic migratory corridor out to 30 nms as well as areas in the Southeast Atlantic;

2. Protect right whales from gear entanglement through expanded SMAs and expanding entanglement regulations to encourage the use of gear innovations such as sinking or neutrally buoyant line to reduce and prevent entanglement, and to promote science-based catch quotas; and

3. Protect right whales from proposed oil and gas exploration and development in the Atlantic Ocean through rules that prohibit or limit seismic airgun activity.

First, NMFS should expand SMAs[15] that reduce ship strikes to include all portions of the proposed critical habitat in the northeast. Ship strikes currently remain one of the greatest known causes of North Atlantic right whale mortality.[16] Many of their physiological tendencies, such as swimming slowly, living in near-shore waters, and spending extended periods of time near the surface, put them in extreme jeopardy of being struck by a traversing vessel. Given the vulnerability of the right whale population, the loss of even one whale reduces the species chance of long-term survival.

The feeding behavior of pregnant or breeding females and their calves put them at a particularly high risk of vessel collision. Surface intervals for calves and females with calves average 5.69 minutes, whereas surface intervals for all other individuals, excluding the pregnant female, average 3.13 minutes. Pregnant females have the highest average surface interval at 11.08 minutes.[17] Therefore, ships are most likely to hit the individuals most essential in reviving the population. Females have an average lifetime calf production total of 5.25 calves; killing a reproductive female has a potentially critical impact on the population's recovery.[18]

Considering right whale vulnerability to ship strikes and their critically endangered status, SMAs should be expanded to include all portions of the proposed critical habitat in the northeast. Also, in the mid-Atlantic SMAs should be extended out to at least 30 nm as whales have been detected further offshore than current regulations reach. Reduced ship speeds of 10 knots or lower have proven to decrease the likelihood of ship strikes to right whales. In fact, since the Ship Speed Rule went into effect in 2008, none of the 5 reported ship strike serious injury and mortalities of North Atlantic right whales in U.S. waters occurred in SMAs. Modeling studies indicate that in these areas, the probability of fatal vessel

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[14] *Id.*

[15] SMAs should include both restrictions on vessel speed and restrictions on the use of fishing gear that can interact with and entangle North Atlantic right whales.

[16] Recovery Plan for the North Atlantic Right Whale, (August 2004); Prepared by the National Marine Fisheries Service Department of Commerce; page IG-1

[17] Baumgartner, M.F., Mate, B.R. (2003). Summertime foraging ecology of North Atlantic right whales. Mar Ecol Prog Ser. 264:123–135. Retrieved from http://ir.library.oregonstate.edu/xmlui/bitstream/handle/1957/27353/SummertimeForagingEcologyOf.pdf?sequence=1

[18] Kraus, S. D., Brown, M. W., Caswell, H., Clark, C. W., & al, e. (2005). North atlantic right whales in crisis. *Science, 309*(5734), 561-2. Retrieved from http://search.proquest.com/docview/213603412?accountid=10207

strikes to right whales has been reduced by 80 to 90 percent.[19] On the contrary, though fewer vessel strike mortalities have occurred inside active SMAs, their prevalence has increased outside of these areas, meaning that more area should be protected to reduce vessel strike mortalities. Specifically, about 32% of pre-Ship Speed Rule right whale vessel strike mortalities occurred outside of SMAs during their active times, showing that the spatial extent of SMAs is insufficient in certain seasons.[20] Dynamic Management Areas (DMAs)[21] may pop up where there are multiple right whale sightings outside of SMAs, but relying on this measure alone in such prevalent right whale habitat provides inadequate protection to this endangered species. DMAs are only subject to voluntary speed restrictions and unfortunately receive low compliance. They may have had some tacit benefit in raising awareness of mariners to the problem of right whale vulnerability to ship strikes, but when measured by vessels either avoiding an area or restricting speed within it, the DMA program has likely had little or no impact in reducing ship strike occurrences.[22] Studies suggest that due to a large number of right whale observations that have occurred incidentally outside SMAs – like in Jordan Basin where at least 3 DMAs were issued in 2009,[23] at least 5 in 2010,[24] at least 3 in 2011,[25] and finally at least 1 in 2012 [26] – consideration should be given to either expanding the sizes of the SMAs to encompass a large portion, if not all, of the recurring DMAs or to establishing new SMAs. In order to fully take advantage of the effectiveness of this protection measure, SMAs need to be expanded to include larger portions of right whale habitat.

As the migratory corridor between the right whale calving grounds in the southern Atlantic and their feeding grounds in the north, the mid-Atlantic should not only be included in the proposed critical habitat expansion, but also deserves ship speed regulations to be expanded there as well. Analysis indicates that SMAs only cover a small portion of essential right whale habitat, a fact that is also made evident by the proposed rule to expand their critical habitat extensively. By expanding the existing SMAs in the mid-Atlantic migratory corridor out to 30 nm instead of 20 nm, an additional 15,453 km^2 of protection would be allotted to this critically endangered species.[27] Studies have shown that in the mid-Atlantic a 20 nm buffer from each port typically picks up less than half the sightings that pass the ports'

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[19] NOAA (2013). NOAA proposal extends rule reducing risk of whale ship strikes along U.S. East Coast. Retrieved from http://www.noaanews.noaa.gov/stories2013/20130605_rightwhale.html

[20] van der Hoop, J. M., Vanderlaan, A. S. M., Cole, T. V. N., Henry, A. G., Hall, L., Mase-Guthrie, B., Wimmer, T. and Moore, M. J. (2015), Vessel Strikes to Large Whales Before and After the 2008 Ship Strike Rule. Conservation Letters, 8: 24–32. doi: 10.1111/conl.12105. Retrieved from http://onlinelibrary.wiley.com/doi/10.1111/conl.12105/full

[21] Areas where voluntary speed restrictions are adopted in response to aggregations of Atlantic Right Whales outside of SMAs.

[22] Ibid p. 35

[23] Khan, C, Cole, T, Duley, P, Glass, A, Gatzke, J. (2010). North Atlantic Right Whale Sighting Survey (NARWSS) and Right Whale Sighting Advisory System (RWSAS) 2009 Results Summary. US Dept Commer, Northeast Fish Sci Cent Ref Doc. Retrieved from http://www.nefsc.noaa.gov/publications/crd/crd1007/crd1007.pdf

[24] Khan, C, Cole, T, Duley, P, Henry, A, Gatzke, J. (2011). North Atlantic Right Whale Sighting Survey (NARWSS) and Right Whale Sighting Advisory System (RWSAS) 2010 Results Summary. US Dept Commer, Northeast Fish Sci Cent Ref Doc. Retrieved from http://www.nefsc.noaa.gov/publications/crd/crd1105/1105.pdf

[25] Khan C, Cole T, Duley P, Henry A, Gatzke J, Corkeron. (2012). North Atlantic Right Whale Sighting Survey (NARWSS) and Right Whale Sighting Advisory System (RWSAS) 2011 Results Summary. US Dept Commer, Northeast Fish Sci Cent Ref Doc. Retrieved from http://www.nefsc.noaa.gov/publications/crd/crd1209/

[26] Gatzke J, Khan C, Henry A, Cole T, Duley P. (2013). North Atlantic Right Whale Sighting Survey (NARWSS) and Right Whale Sighting Advisory System (RWSAS) 2012 Results Summary. US Dept Commer, Northeast Fish Sci Cent Ref Doc. Retrieved from http://www.nefsc.noaa.gov/publications/crd/crd1308/

[27] Schick, R. S., Halpin, P. N., Read, A. J., Slay, C. K., Kraus, S. D., Mate, B. R., & ... Clark, J. S. (2009). Striking the right balance in right whale conservation. Canadian Journal Of Fisheries & Aquatic Sciences, 66(9), 1399-1403. doi:10.1139/F09-115. Retrieved from http://0-web.ebscohost.com.library.colgate.edu/ehost/detail?sid=53199adf-1de7-4fde-bcd8-2b53e9af1cc6%40sessionmgr111&vid=1&hid=128&bdata=JnNpdGU9ZWhvc3QtbGl2ZQ%3d%3d#db=aph&AN=44183936

entrances. With a 25 nm buffer, over 50% of right whale sightings are included at five of the nine ports. At 30 nm, only the Delaware Bay port, which has few sightings, includes less than 50% of sightings. The other eight ports include between 55% and 94% of all sightings and 80% of tagged animal sightings at this inclusion distance. At 35 nm, sighting inclusion is close to 100% at all nine ports.[28] The mid-Atlantic migratory corridor has the highest right whale ship strike incidence and mortality density.[6]

Therefore, it is paramount that ship speed regulations be applied more extensively to this area and buffers at least extend out to 30 nm in order for the SMAs to be effective.

Second, NMFS should expand protections against entanglement to fully safeguard the right whale population so they may achieve long-term survival. Entanglement is another leading cause of right whale mortality, with nearly three-quarters of all known North Atlantic right whales inflicted with scars from past entanglements with commercial fishing gear[29]. North Atlantic right whales' migratory route and foraging and calving habitats coincide with a variety of fisheries, putting them in grave danger of entanglement. Similar to ship strikes, entanglements are most likely to occur with calves, juveniles, and pregnant females – vulnerable members of the population that are essential to growth.[30]

Several measures can be taken to help prevent entanglement occurrences. These measures include regulating or prohibiting in SMAs the use of fishing gear that interact with and lead to entanglement of North Atlantic right whales. Appropriate measures also include promoting, and as appropriate, requiring adoption of gear innovations like sinking or neutrally buoyant line, and encouraging science-based catch quotas, which can promote efficiency, productivity, and profit, while minimizing unintended threats and "bycatch" of marine species.

Entanglements are inhibiting the North Atlantic right whale population from reaching the Marine Mammal Protection Act's (MMPA) mandate to reach the Zero Mortality Rate Goal (ZMRG) and the ESA recovery mandate 16 U.S.C. § 1531(b). According to NMFS over half of all identified right whale deaths have been caused by entanglement in commercial fishing gear.[31] Also, it is estimated that more than 75% of North Atlantic right whales have been entangled at some time in their lives[32] – a percentage that has risen considerably from 57% in 1990,[33] 61.6% in 1998,[34] and may have even risen again within the past few years. Fishermen take advantage of the biological productivity and advantageous conditions found within right whale habitat the same as the whales do, creating a potentially harmful co-occurrence of right whale presence and fishing gear.

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[28] Knowlton, A.R., Ring, J.B., Russell, B. (July 2002). Right whale sightings and survey effort in the mid Atlantic region: migratory corridor, time frame, and proximity to port entrances. Report submitted to NMFS ship strike working group. Retrieved from http://www.greateratlantic.fisheries.noaa.gov/shipstrike/ssr/midatanticreportrFINAL.pdf

[29] Knowlton, A.R., Marx, M.K., Pettis, H.M., Hamilton, P.K., & Kraus, S.D. (February 2005). Analysis of scarring on North Altantic Right Whales (Eubalaena Glacialis): Monitoring rates of entanglement interaction: 1980-2002. Retrieved from http://docs.lib.noaa.gov/noaa_documents/NOAA_related_docs/Analysis_Scarring_North_Atlantic_Right_Whales.pdf

[30] Knowlton, A. R., Hamilton, P. K., Marx, M. K., Pettis, H. M., and Kraus, S. D. (2012). Monitoring North Atlantic right whale (*Eubalanena glacialis)* entanglement rates: a 30 yr retrospective. Marine Ecology Progress Series, 466, 293-302.

[31] NMFS (2012). U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments –North Atlantic right whale. Retrieved from http://www.nmfs.noaa.gov/pr/sars/pdf/ao2012.pdf

[32] Knowlton, A.R., M.K. Marx, H.M. Pettis, P.K. Hamilton and S.D. Kraus. (2005). Analysis of scarring on North Atlantic right whales (Eubalaena glacialis): monitoring rates of entanglement interaction 1980-2002. National Marine Fisheries Service. Contract #43EANF030107. Final Report.

[33] National Marine Fisheries Service. (2013). Draft Recovery Plan for the North Pacific Right Whale (Eubalaena japonica). National Marine Fisheries Service, Office of Protected Resources, Silver Spring, MD. (citing Kraus, S.D. 1990. Rates and potential causes of mortality in North Atlantic right whales. Marine Mammal Science 6(4):278-291).

[34] Hamilton, P.K., M.K. Marx, and S.D. Kraus. (1998). Scarification analysis of North Atlantic right whales (Eubalaena glacialis) as a method of assessing human impacts. Northeast Fisheries Science Center. Contract No. 4EANF-6-0004. Final Report.

Therefore, NFMS should expand entanglement regulations, including through SMAs and through gear technology requirements, to more effectively mitigate entanglement incidences.

Third, NMFS should protect right whales from the proposed expansion of oil and gas development in the Atlantic Ocean through rules that limit the sonic impact from seismic activity. The Bureau of Ocean Energy Management (BOEM) has proposed to authorize geological and geophysical activities to support its oil and gas development, renewable energy, and marine minerals programs in the Federal waters of the mid- and south Atlantic Outer Continental Shelf – completely engulfing right whale calving grounds and the mid-Atlantic migratory corridor.[35] Their Environmental Impact Statement (EIS) discusses strategies to minimize right whale takes, but with such a small population size, no right whale death can be deemed insignificant to the population's survival. Accordingly, NMFS should look to the best available science, including the acoustic guidelines currently under development, in developing protective regulations to prohibit in critical habitat damaging sonic impacts from seismic exploration. These regulations might include buffer zones distancing seismic activity outside of critical habitat to make sure that the noise level inside critical habitat is not too high, or other appropriate science-based protections tailored to the particular kind of threat posed by different seismic activities.

Therefore, to fully protect the right whale within existing and newly designated critical habitat, NMFS should

1. Expanding Seasonal Management Areas that reduce ship strikes to include all portions of the proposed critical habitat in the northeast and critical habitat in the mid-Atlantic migratory corridor out to 30 nms as well as areas in the Southeast Atlantic;

2. Protect right whales from gear entanglement through expanded SMAs and expanding entanglement regulations to encourage the use of gear innovations such as sinking or neutrally buoyant line to reduce and prevent entanglement, and to promote science-based catch quotas; and

3. Protecting right whales from proposed oil and gas exploration and development in the Atlantic Ocean through rules that prevent or limit seismic airgun activity.

Conclusion

We are in full support of the proposed rule to expand North Atlantic right whale critical habitat and also respectfully requests that you consider

1. Including the mid-Atlantic migratory corridor and the southernmost portion of the current critical habitat in the right whale critical habitat expansion; and

2. Increasing right whale protection measures to provide the protection necessary to allow for the recovery and long-term survival of right whales, including

[35] BOEM (2012). Proposed geological and geophysical activities – mid-Atlantic and south Atlantic planning areas – biological assessment. Retrieved from http://www.boem.gov/uploadedFiles/BOEM/Oil_and_Gas_Energy_Program/GOMR/Biological_Assessment_finalforwebposting_wcover_5-24-12.pdf

a. Expanding Seasonal Management Areas that reduce ship strikes to include all portions of the proposed critical habitat in the northeast and critical habitat in the mid-Atlantic migratory corridor out to 30 nms as well as areas in the Southeast Atlantic;

b. Protect right whales from gear entanglement through expanded SMAs and expanding entanglement regulations to encourage the use of gear innovations such as sinking or neutrally buoyant line to reduce and prevent entanglement, and to promote science-based catch quotas; and

c. Protecting right whales from proposed oil and gas exploration and development in the Atlantic Ocean through rules that prevent or limit seismic airgun activity.

In order to safeguard the right whale population, we must protect them and limit disturbances from current and future threatening implications to the best of our abilities. On behalf of our organizations, we thank you for considering our views and recommendations.

Sincerely,

Margaret Cooney
Campaigns Officer
International Fund for Animal Welfare

Taryn Kiekow Heimer
Senior Policy Analyst
Natural Resources Defense Council

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

EXHIBIT 7

North Atlantic Right Whale Critical Habitat: Southeast Atlantic

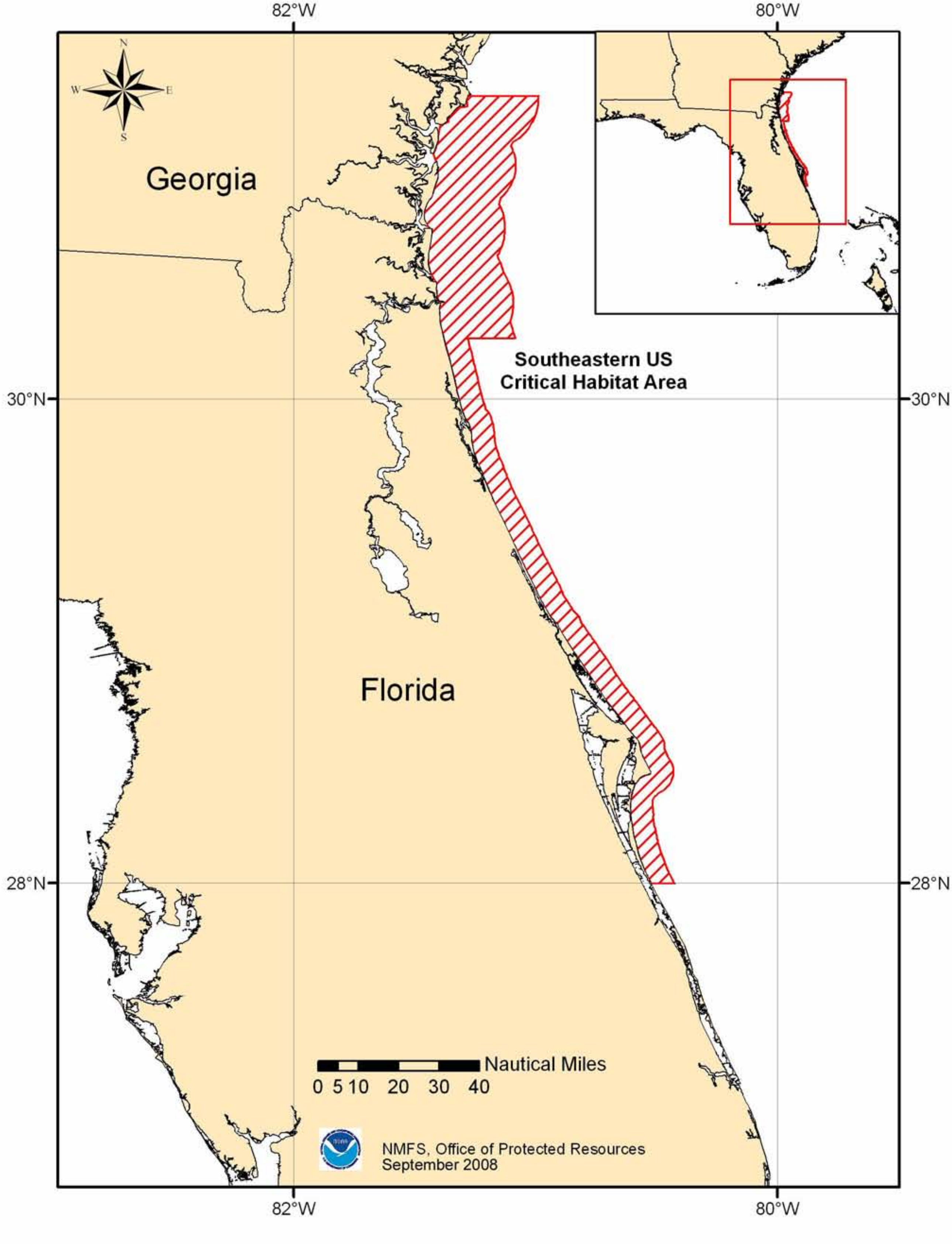


EXHIBIT 8

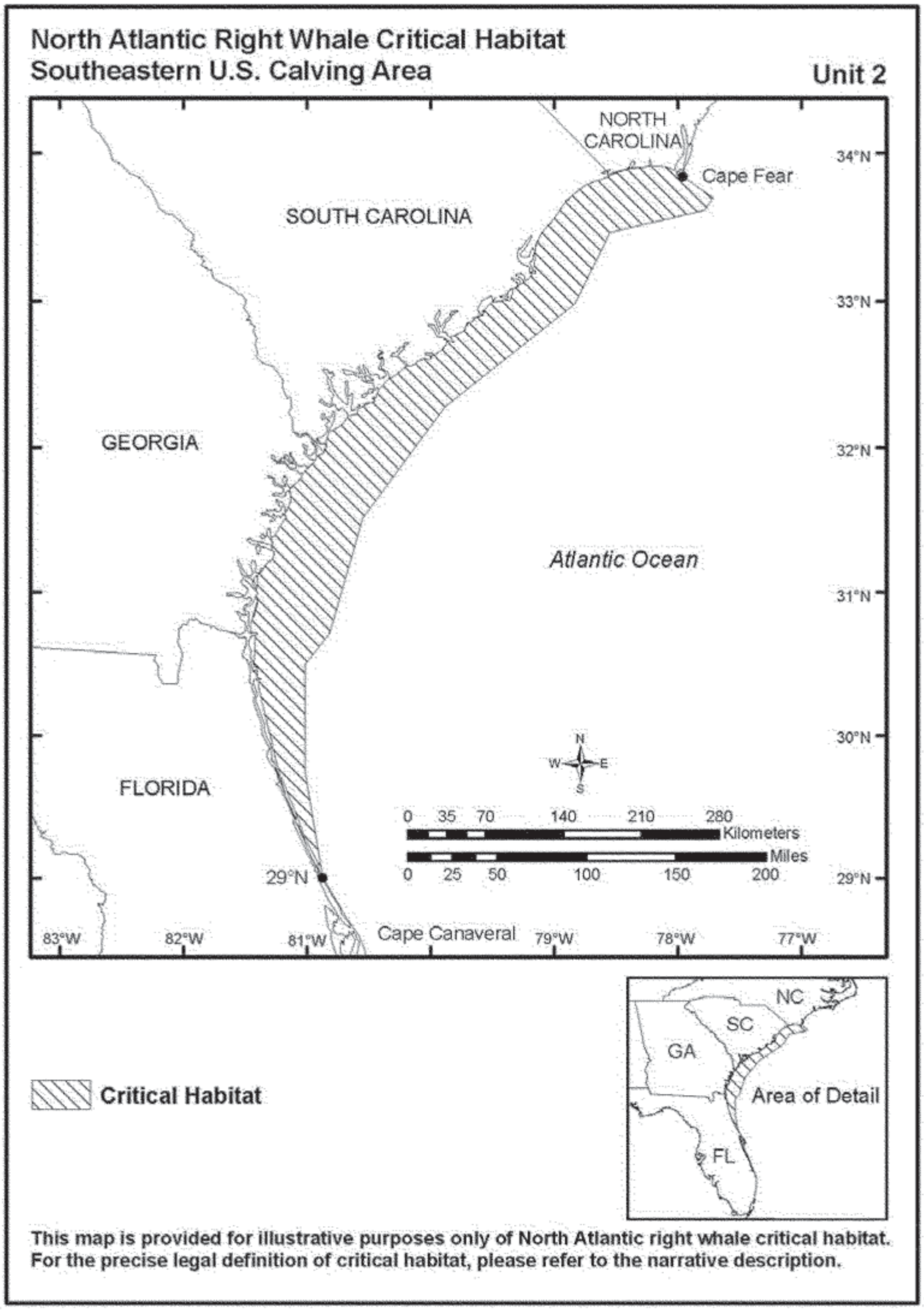


Figure 2. Area considered for designation as North Atlantic right whale southeastern calving critical habitat.

OCEANA Protecting the World's Oceans

1350 Connecticut Ave. NW, 5th Floor
Washington, DC 20036 USA

+1.202.833.3900
OCEANA.ORG

August 27, 2015

Jolie Harrison
Chief, Permits and Conservation Division
Office of Protected Resources
National Marine Fisheries Service
1315 East-West Highway
Silver Spring, MD 20910

Re: NRDC, Oceana, Inc., Ocean Conservation Research, *et al* Comments on Notice of Receipt of Applications for Incidental Harassment Authorization ("IHA") for Geophysical Surveys in the Atlantic Ocean, 80 Fed. Reg. 45,195 (July 29, 2015).

Dear Ms. Harrison:

Enclosed please find a thumb drive containing exhibits for the NRDC, Oceana, Inc., Ocean Conservation Research, *et al* Comments that were electronically filed by Michael Jasny of NRDC in the above-referenced docket on August 28, 2015. Please let me know if you have any questions regarding this submission.

Sincerely,

Ingrid Biedron

Ingrid S. Biedron, PhD
Marine Scientist, Climate and Energy

Enclosure

ITP Laws - NOAA Service Account <itp.laws@noaa.gov>

Comments on seismic exploration off of the Atlantic East Coast

1 message

Stranded No More <strandednomore@gmail.com> Thu, Aug 27, 2015 at 4:16 PM
To: ITP.Laws@noaa.gov

To:

Jolie Harrison, Chief, Permits and Conservation Division,

Office of Protected Resources, National Marine Fisheries Service,

1315 East-West Highway, Silver Spring, MD 20910

ITP.Laws@noaa.gov

From:

StrandedNoMore

strandednomore.org

August 23, 2015

We strongly encourage you to deny the request for seismic exploration off of the Atlantic East Coast, based on available scientific evidence that both seismic surveys involving air guns and sonar used in the process could not only harm marine life physically and behaviorally, but could also lead to lethal outcomes involving stranding.

Despite the Oil and Gas industry saying that seismic surveys are harmless, we have scientific evidence pointing out a potential link between seismic surveys and stranding. Below are some cases that have been documented:

1. Galapagos 2000, beaked whales, Gentry, 2002.

2. Gulf of California, 2002, beaked whales, Malakoff, 2002

3. Madagascar, 2008, melon-headed whales, IWC, 2008

We encourage NMFS to recognize that seismic surveys could affect whales and dolphins in numerous ways, both directly and indirectly. A recent study by Tal et al. (2015) demonstrated, via experimental protocol, that exposure to underwater sound can result in “Induction of neurologic damage by intense underwater sound during immersion, with a further deleterious effect when this was combined with decompression stress.” Apart from a direct impact, sudden sound exposure could lead to modification of the typical ascending behavior of deep diving whales, resulting in developing bends from a fast ascent. Panic responses (with or without decompression sickness) could lead to live stranding, where whales and dolphins could die from stress induced conditions, drowning, or euthanasia.

Whales and dolphins could be affected even at low levels of underwater noise. A study by Lyamin et al. (2011) indicated that the beluga whale started showing an extremely troubling physiological response at significantly lower levels. “Our data indicates that severe tachycardia developed in the beluga at lower noise intensities (as low as 140 dB); at higher intensities, the HR could reach a twofold excess over the control values and last for no less than 4 min” (p. 278).

The industry often argues that Marine Mammal Observers have good enough mitigation measures, even though cetaceans not only spend more than 80% of their time underwater, but also tend to go silent when exposed to stimuli they perceive as threatening or unusual. Hence, neither visual observation nor using PAM (passive acoustic monitoring) could be effective enough to make sure that there are no cetaceans in the area.

Most importantly, we would like to point out that the absence of evidence is not the evidence of absence. In the Appendix below, you can see the worldwide stranding numbers we recorded this year alone, in the vicinity of seismic surveys. None of these stranding's were systematically investigated in regard to potential connection to seismic surveys. Given that the US's Stranding network (and other international networks as well) rarely engages in comprehensive and detailed investigation of stranding events occurring in the vicinity of seismic surveys or Naval exercises, it could be argued that the connection between the anthropogenic noise and stranding is seriously underestimated.

It is also important to recognize that the same area that is being considered for seismic exploration has also been included as a range for military exercises, leading to overlapping areas where marine life will be exposed to both military anthropogenic noise and seismic exploration noise.

The US's Stranding network is poorly equipped to deal with any increase in live stranding, because even now, euthanasia of stranded whales and dolphins is widespread, dolphins and whales are denied medical attention and rescue, and rehabilitation efforts with consequent release are next to none. Any increase in stranding will put an even larger strain on a network which has very poor performance as it is.

In summation, seismic surveys can affect marine mammals in several ways (that could act separately or in conjunction), including:

Directly:

1. " Neurologic damage by intense underwater sound during immersion, with a further deleterious effect when this was combined with decompression stress."

2. Decompression sickness from modified ascent

3. Panic responses leading to live stranding (baleen and toothed whales, dolphins)

4. Pulmonary edema

Indirectly:

1. Avoidance response forcing cetaceans to abandon feeding grounds

2. Sleep interruption

3. Avoidance response forcing cetaceans to go to areas they are not familiar with, i.e. whales entering rivers and bays

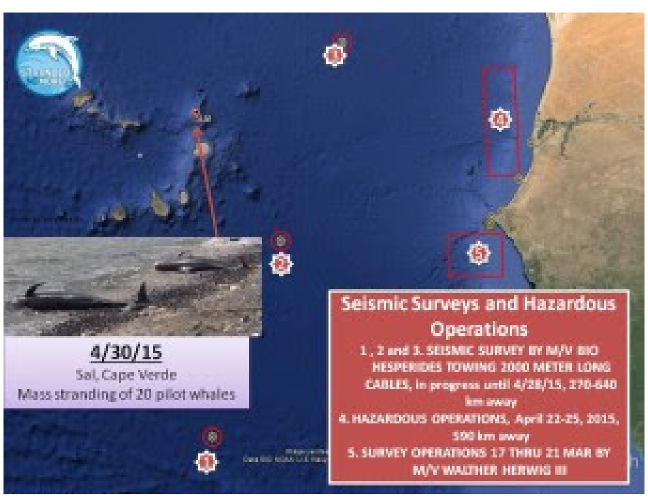
4. Separation of mothers and calves

5. Loss of key individuals in mass stranding (i.e. matriarch pilot whales, etc.) that could affect larger population survival abilities, as they carry important knowledge (Wade et al., 2012)

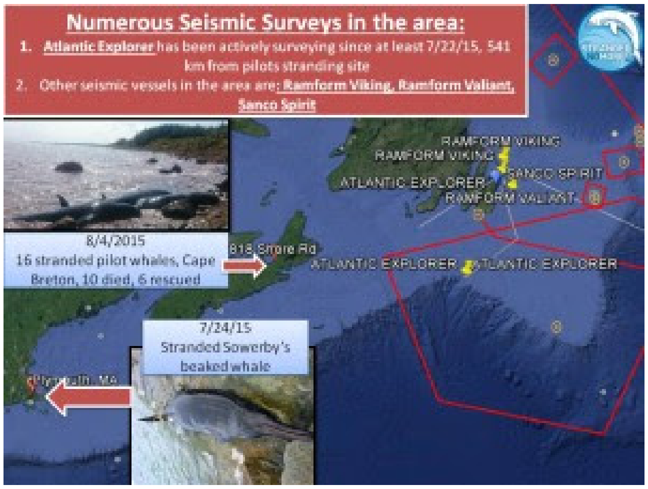
6. Impact on cetacean's prey: fish, squid.

We strongly oppose opening the entire East Coast up for seismic exploration and encourage NMFS to deny this permit.

Appendix 1.



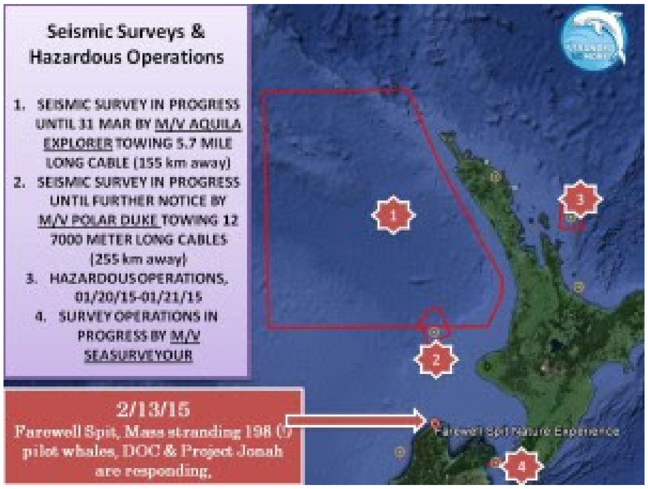
1. April 2015, Cape Verde, pilot whales

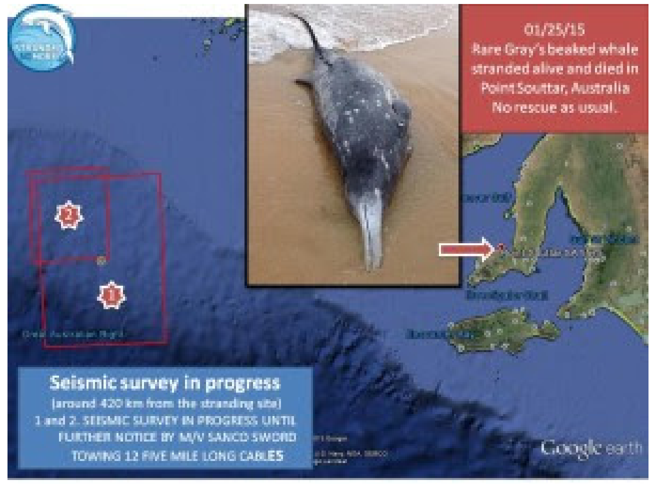


2. August, 2015, Canada, mass stranding pilot whales

3. February 2015, Namibia, pygmy right whale

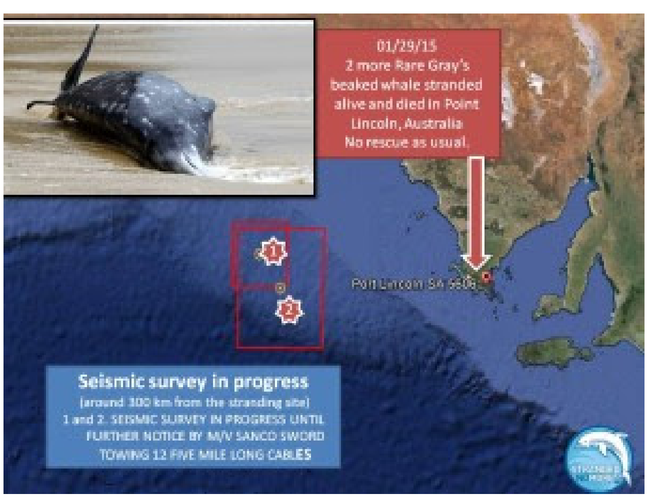
4. February 2015, New Zealand, mass stranding pilot whales



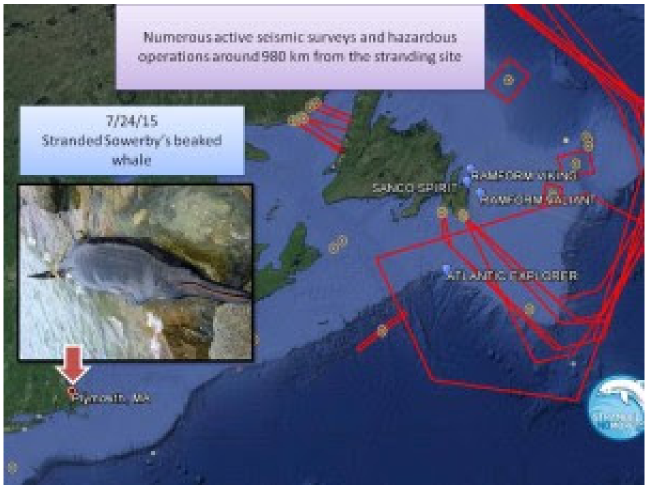


5.

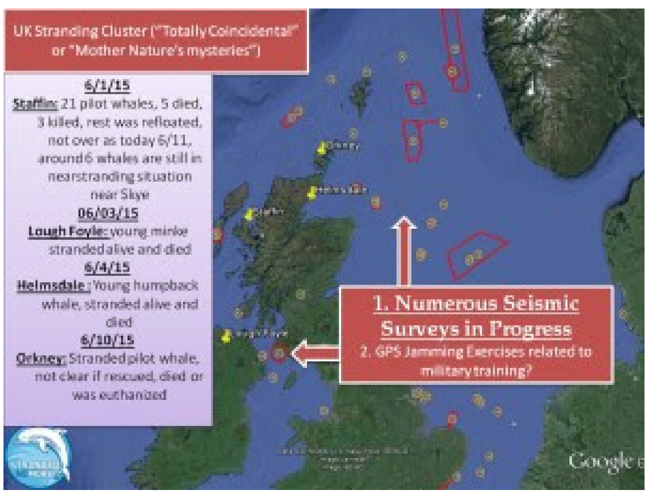
January, 2015, Australia, Beaked whale



6. January, 2015, Australia, Beaked whales

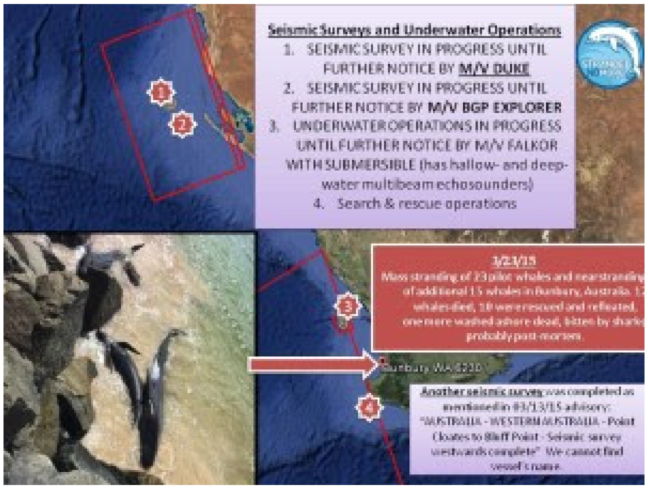


7. July, 2015, USA, beaked whale



8. June, 2015, UK, a large stranding cluster involving several species

9. March, 2015, Australia, mass stranding pilot whales



References:

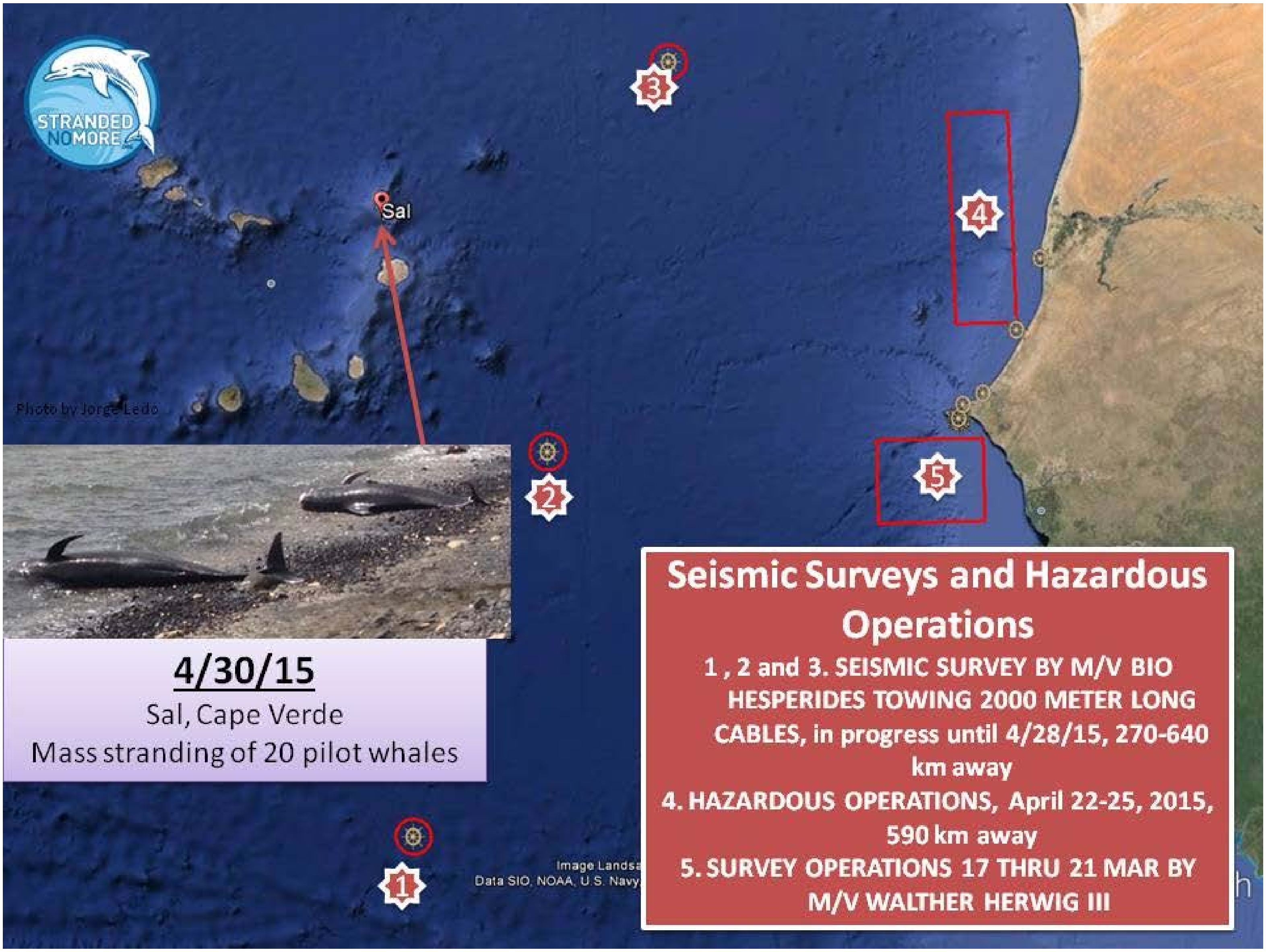
Gentry, R. (2002), Mass Stranding of Beaked Whales in the Galapagos Islands, April 2000, Reports for NMFS, Available athttp://www.nmfs.noaa.gov/pr/pdfs/health/galapagos_stranding.pdf

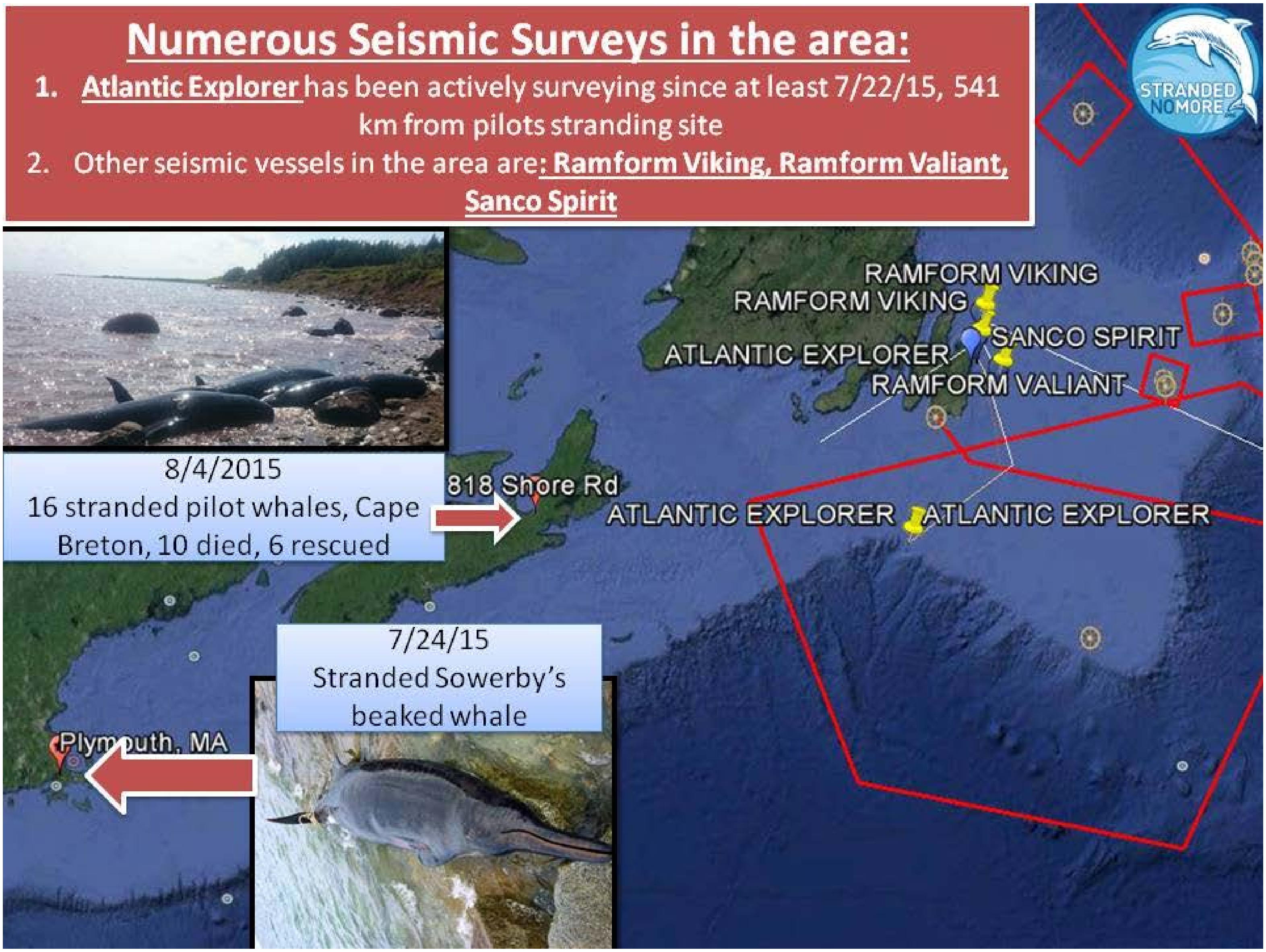
Lyamin O.I., Korneva, S.M., Rozhnov, V.V., Mukhametov, L.M. (2011), Cardiorespiratory Changes in Beluga in Response to Acoustic Noise, Doklady Biological Sciences, Vol. 440, pp. 275–278, 704-707. Available at http://beluga.sevin-expedition.ru/netcat_files/106/57/11_Lyamin_ECG_acoustic_noise_beluga_DAN_E.pdf

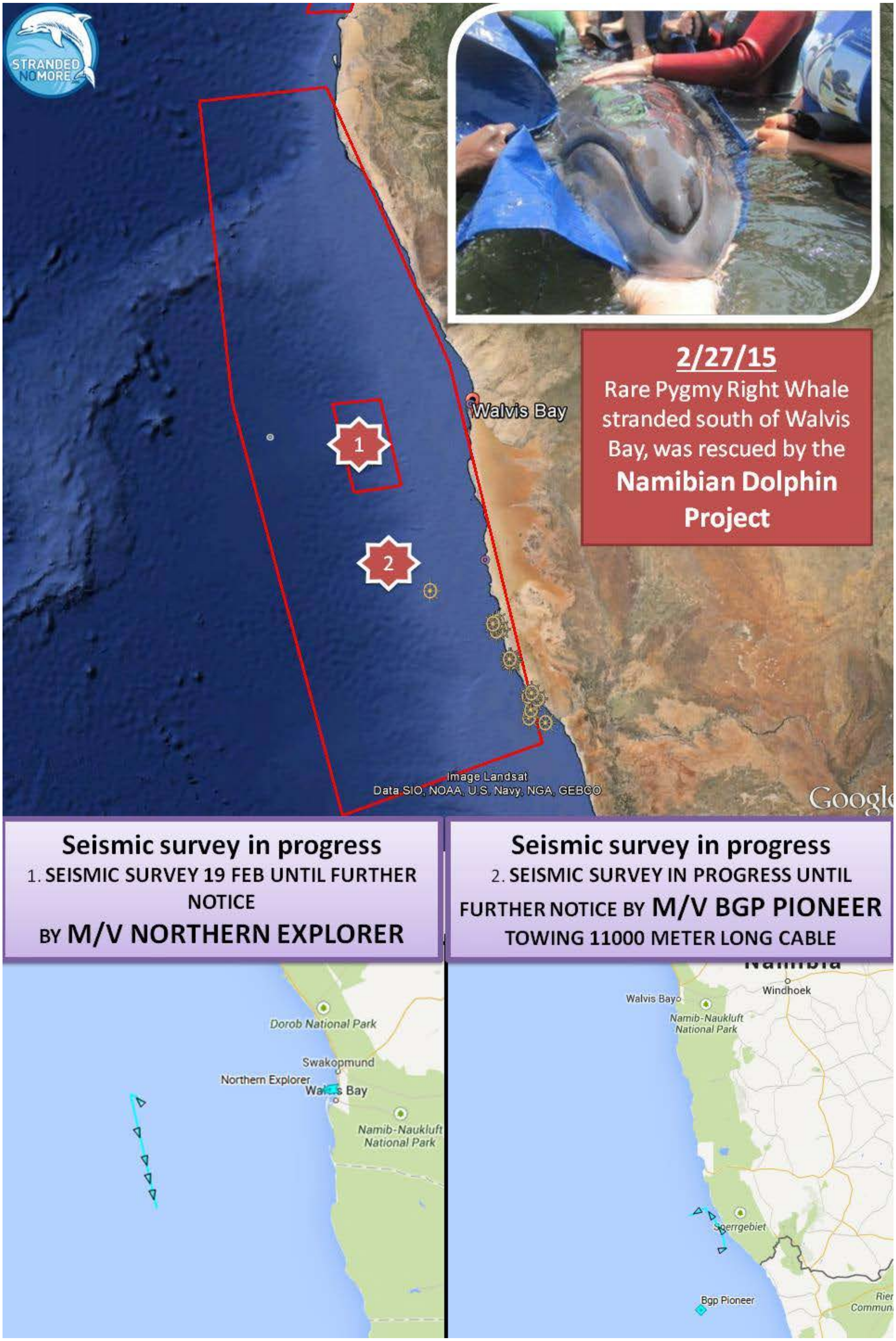
Malakoff, D. (2002), Suit Ties Whale Deaths to Research Cruise**,** Science, Vol. 298 no. 5594 pp. 722-723, Available athttp://www.sciencemag.org/content/298/5594/722.citation

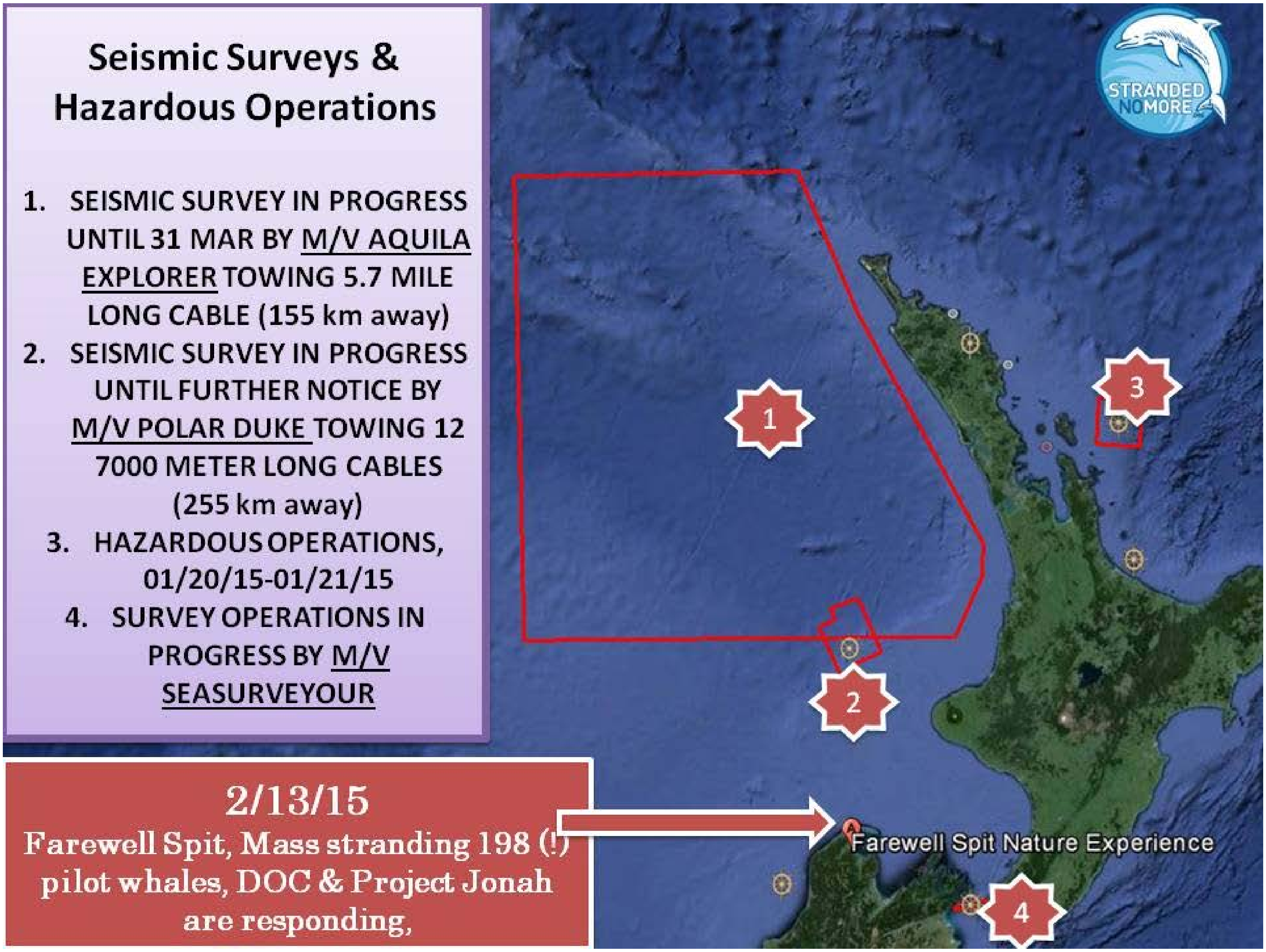
Tal, D., Shachar-Bener, H., Hershkovitz, D., Arieli, Y., & Shupak, A. (2015). Evidence for the initiation of decompression sickness by exposure to intense underwater sound. *Journal of neurophysiology*, jn-00466.

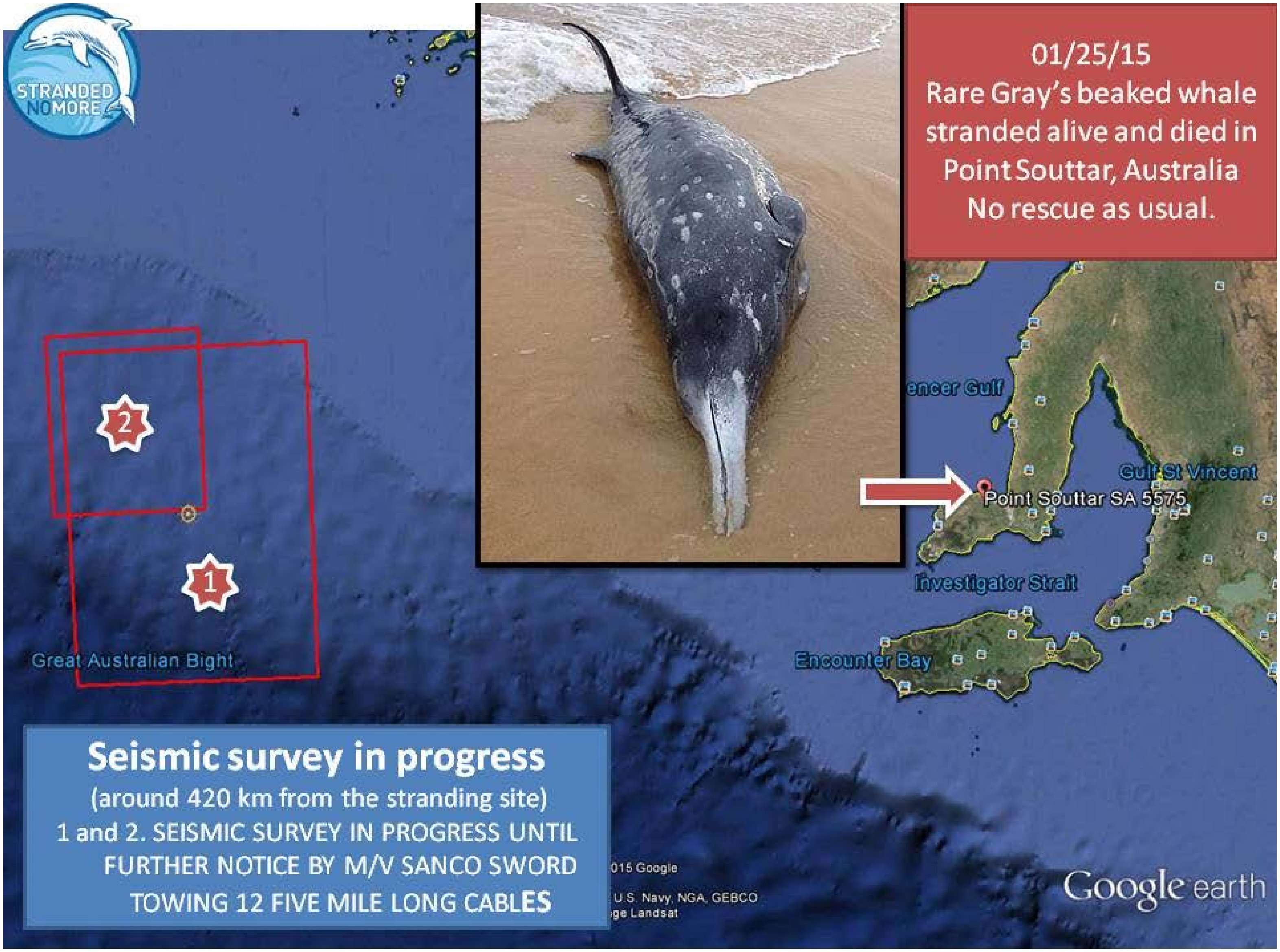
Paul R. Wade, Randall R. Reeves, and Sarah L. Mesnick, “Social and Behavioural Factors in Cetacean Responses to Overexploitation: Are Odontocetes Less “Resilient” Than Mysticetes?,” Journal of Marine Biology, vol. 2012, Article ID 567276, 15 pages, 2012. doi:10.1155/2012/567276


STRANDED NOMORE
Sal
Photo by Jorge Ledo
3
4
2
5
1
4/30/15
Sal, Cape Verde
Mass stranding of 20 pilot whales
Image Landsa
Data SIO, NOAA, U.S. Navy
Seismic Surveys and Hazardous Operations
1 , 2 and 3. SEISMIC SURVEY BY M/V BIO HESPERIDES TOWING 2000 METER LONG CABLES, in progress until 4/28/15, 270-640 km away
4. HAZARDOUS OPERATIONS, April 22-25, 2015, 590 km away
5. SURVEY OPERATIONS 17 THRU 21 MAR BY M/V WALTHER HERWIG III

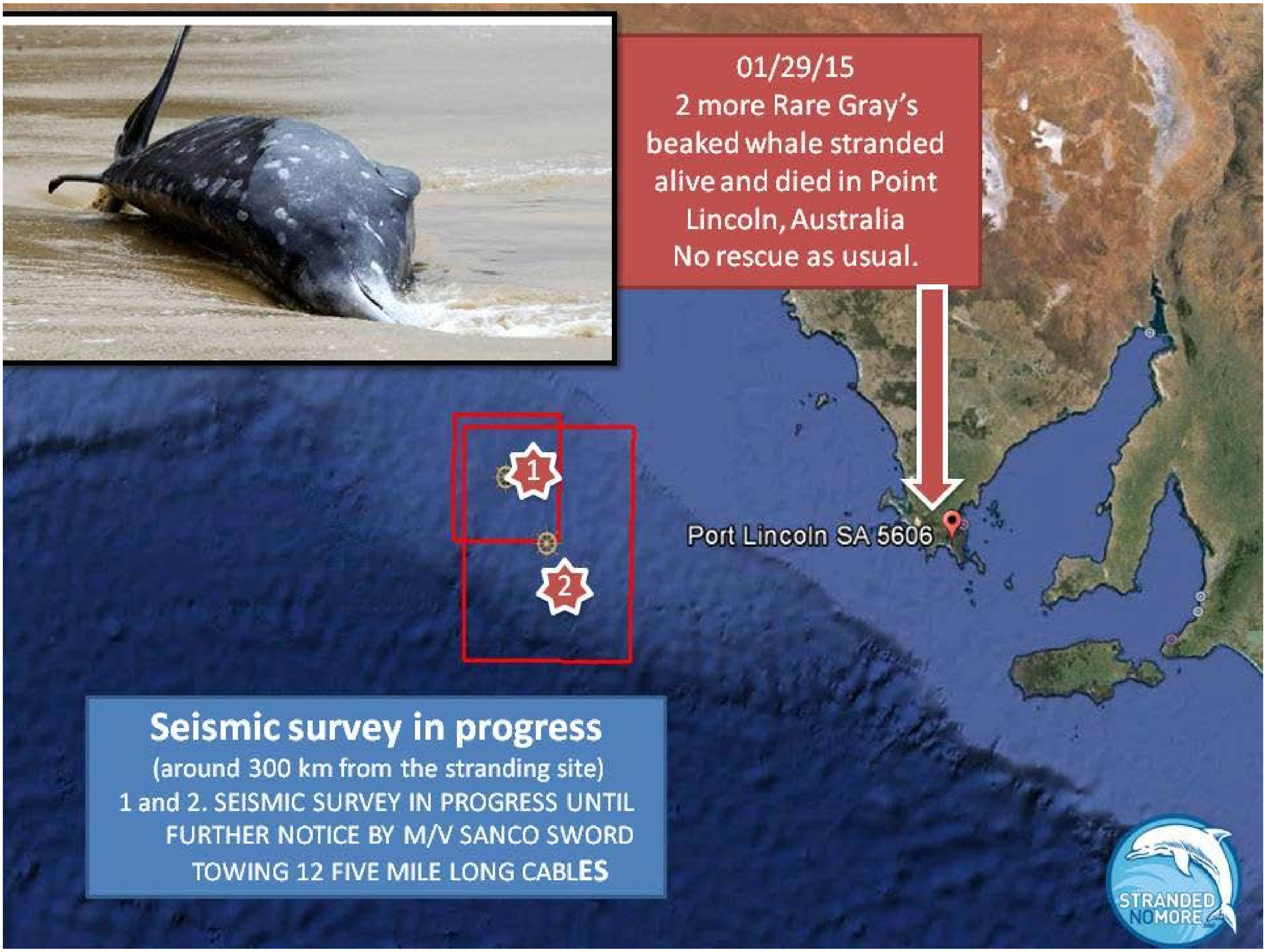

Numerous Seismic Surveys in the area:
1. Atlantic Explorer has been actively surveying since at least 7/22/15, 541 km from pilots stranding site
2. Other seismic vessels in the area are: Ramform Viking, Ramform Valiant, Sanco Spirit
STRANDED NO MORE
RAMFORM VIKING
RAMFORM VIKING
SANCO SPIRIT
ATLANTIC EXPLORER
RAMFORM VALIANT
8/4/2015
16 stranded pilot whales, Cape Breton, 10 died, 6 rescued
818 Shore Rd
ATLANTIC EXPLORER
ATLANTIC EXPLORER
7/24/15
Stranded Sowerby's beaked whale
Plymouth, MA

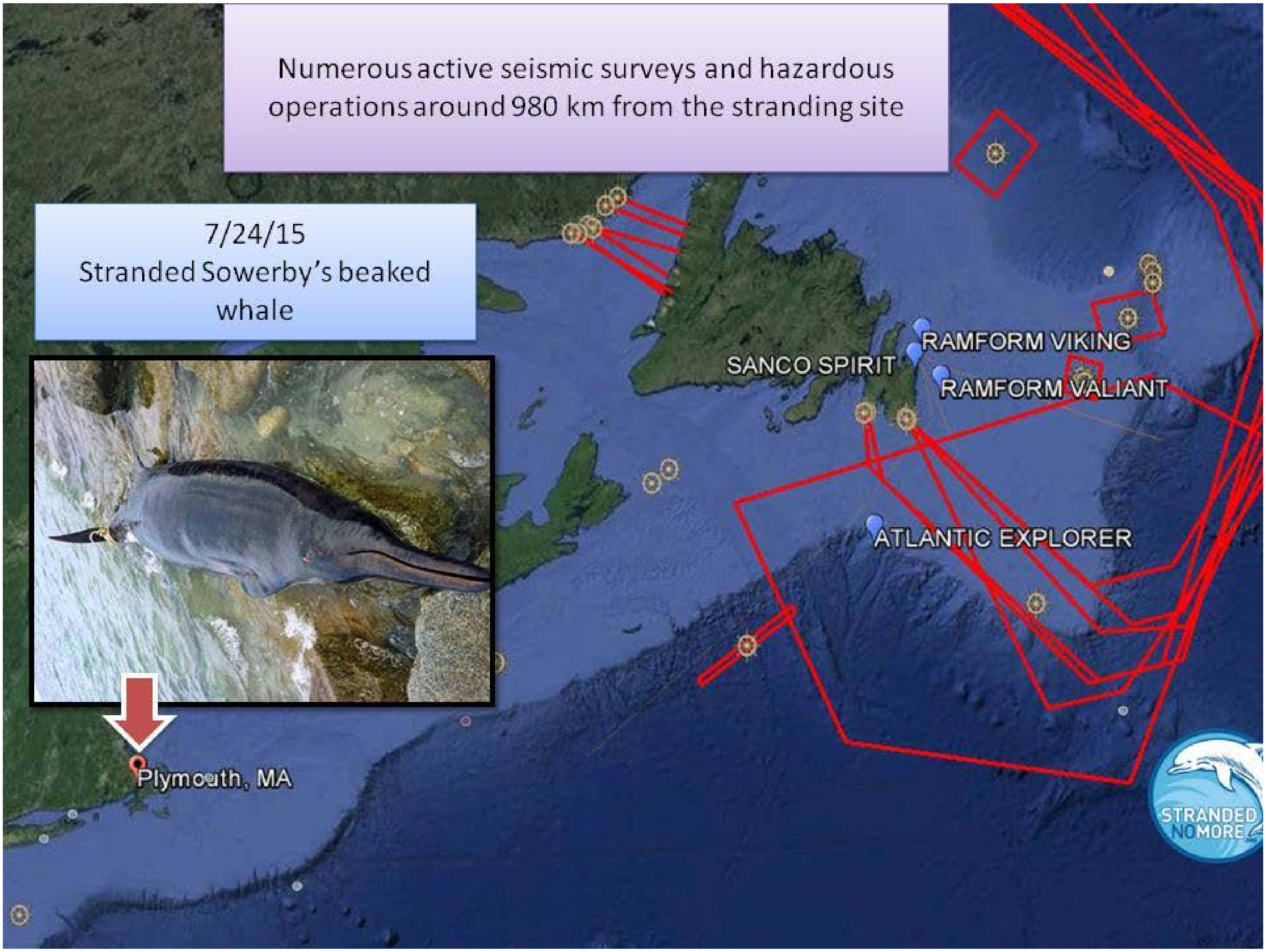

STRANDED NO MORE
Walvis Bay
1
2
Image Landsat
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Google
2/27/15
Rare Pygmy Right Whale stranded south of Walvis Bay, was rescued by the
Namibian Dolphin Project
Seismic survey in progress
1. SEISMIC SURVEY 19 FEB UNTIL FURTHER NOTICE
BY M/V NORTHERN EXPLORER
Seismic survey in progress
2. SEISMIC SURVEY IN PROGRESS UNTIL FURTHER NOTICE BY M/V BGP PIONEER
TOWING 11000 METER LONG CABLE
Dorob National Park
Swakopmund
Northern Explorer
Walvis Bay
Namib-Naukluft National Park
Windhoek
Walvis Bay
Namib-Naukluft National Park
Sperrgebiet
Bgp Pioneer


Seismic Surveys & Hazardous Operations
1. SEISMIC SURVEY IN PROGRESS UNTIL 31 MAR BY M/V AQUILA EXPLORER TOWING 5.7 MILE LONG CABLE (155 km away)
2. SEISMIC SURVEY IN PROGRESS UNTIL FURTHER NOTICE BY M/V POLAR DUKE TOWING 12 7000 METER LONG CABLES (255 km away)
3. HAZARDOUS OPERATIONS, 01/20/15-01/21/15
4. SURVEY OPERATIONS IN PROGRESS BY M/V SEASURVEYOUR
STRANDED NO MORE
1
2
3
4
Farewell Spit Nature Experience
2/13/15
Farewell Spit, Mass stranding 198 (!) pilot whales, DOC & Project Jonah are responding,

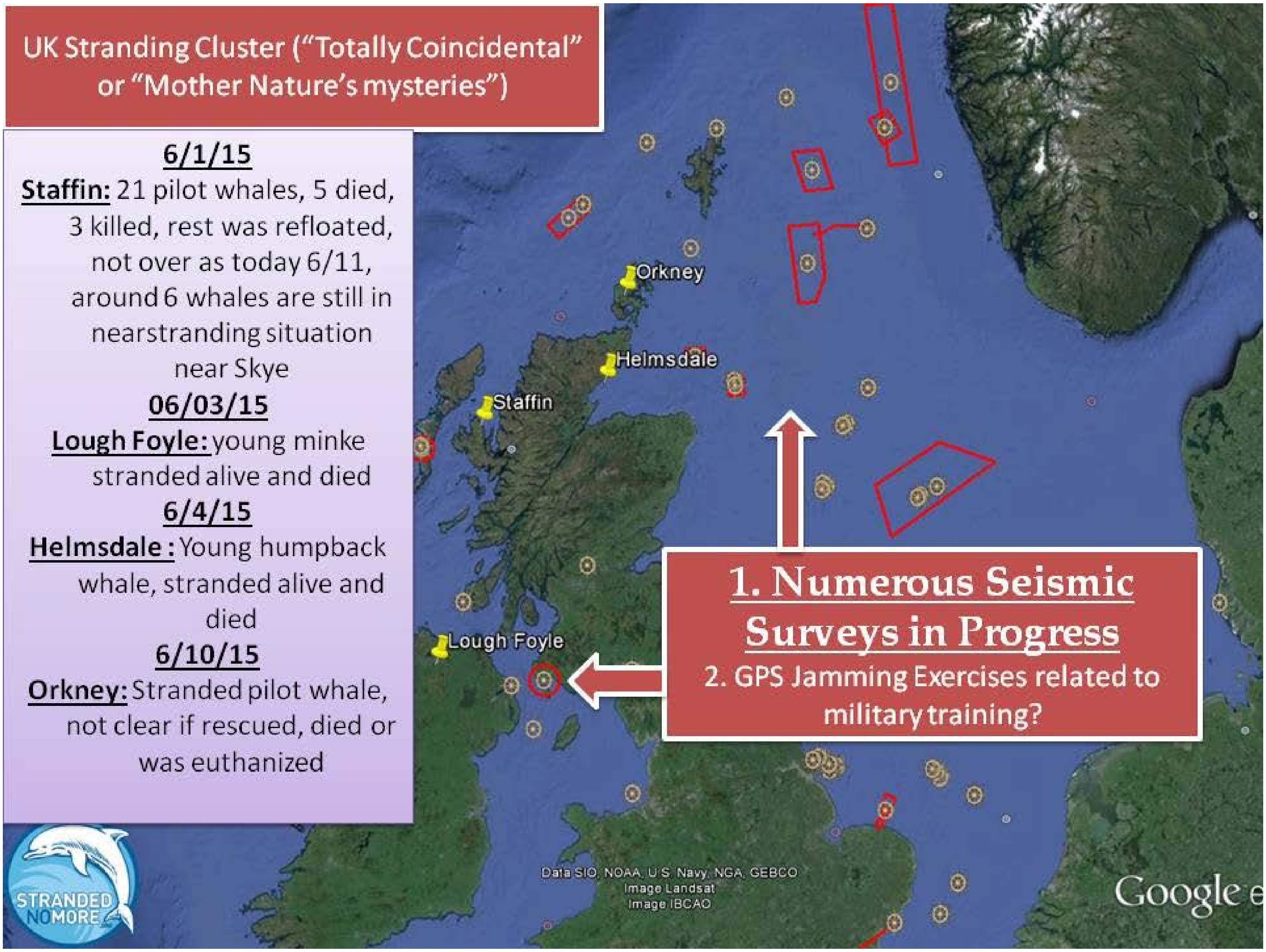

STRANDED
NO MORE
01/25/15
Rare Gray's beaked whale stranded alive and died in Point Souttar, Australia
No rescue as usual.
encer Gulf
Gulf St Vincent
Point Souttar SA 5575
Investigator Strait
Encounter Bay
Great Australian Bight
Seismic survey in progress
(around 420 km from the stranding site)
1 and 2. SEISMIC SURVEY IN PROGRESS UNTIL FURTHER NOTICE BY M/V SANCO SWORD TOWING 12 FIVE MILE LONG CABLES
015 Google
U.S. Navy, NGA, GEBCO
ge Landsat
Google earth

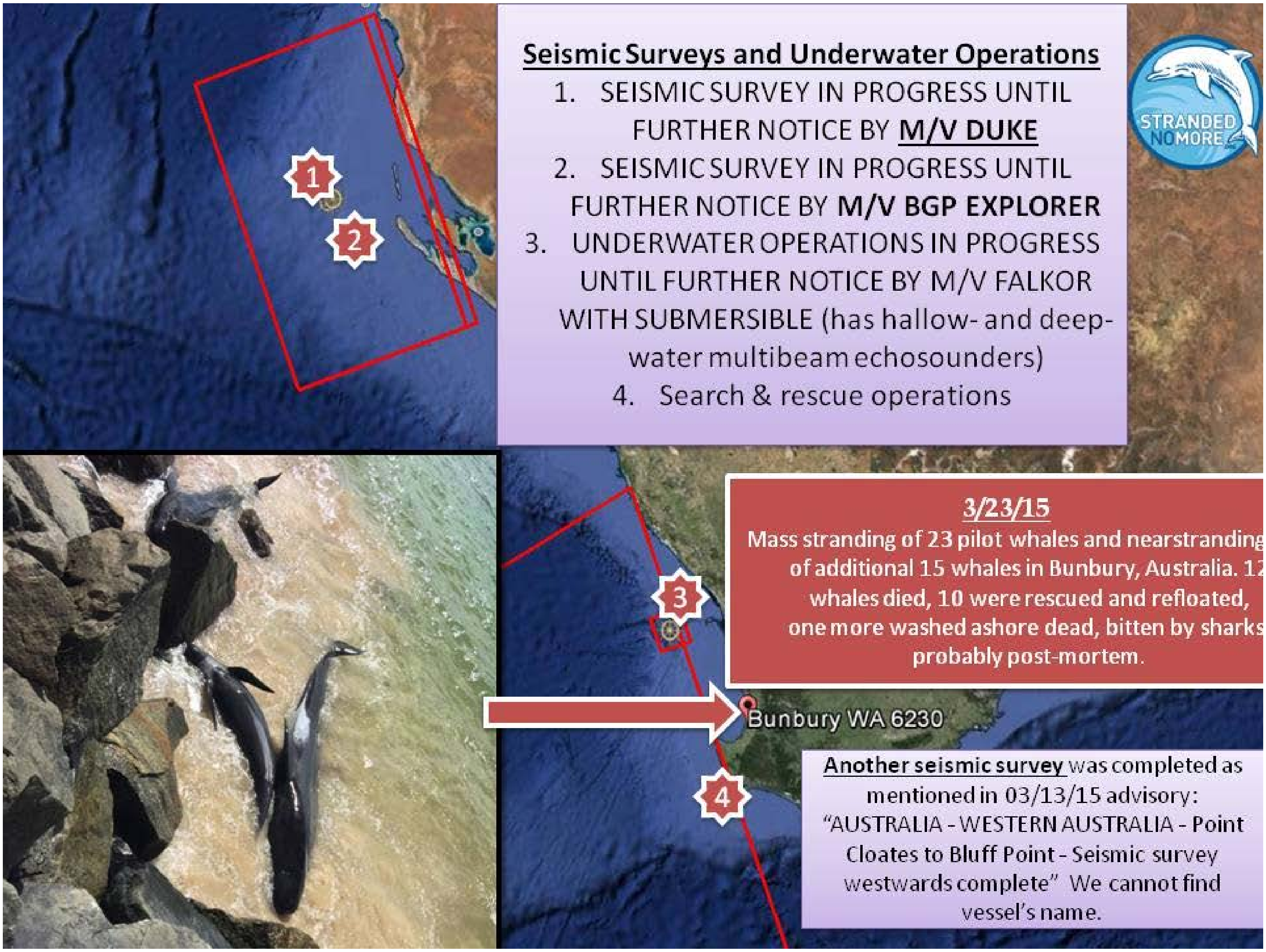
map4.jpg (JPEG Image, 960 × 720 pixels)




Numerous active seismic surveys and hazardous operations around 980 km from the stranding site
7/24/15
Stranded Sowerby's beaked whale
RAMFORM VIKING
SANCO SPIRIT
RAMFORM VALIANT
ATLANTIC EXPLORER
Plymouth, MA
STRANDED NO MORE

map6.jpg (JPEG Image, 960 × 720 pixels)




Seismic Surveys and Underwater Operations
1. SEISMIC SURVEY IN PROGRESS UNTIL FURTHER NOTICE BY M/V DUKE
2. SEISMIC SURVEY IN PROGRESS UNTIL FURTHER NOTICE BY M/V BGP EXPLORER
3. UNDERWATER OPERATIONS IN PROGRESS UNTIL FURTHER NOTICE BY M/V FALKOR WITH SUBMERSIBLE (has hallow- and deep-water multibeam echosounders)
4. Search & rescue operations
STRANDED NO MORE
1
2
3/23/15
Mass stranding of 23 pilot whales and nearstranding of additional 15 whales in Bunbury, Australia. 12 whales died, 10 were rescued and refloated, one more washed ashore dead, bitten by sharks probably post-mortem.
3
Bunbury WA 6230
4
Another seismic survey was completed as mentioned in 03/13/15 advisory: "AUSTRALIA - WESTERN AUSTRALIA - Point Cloates to Bluff Point - Seismic survey westwards complete" We cannot find vessel's name.

August 27, 2015

Jolie Harrison
Chief, Permits and Conservation Division
Office of Protected Resources, National Marine Fisheries Service.
National Oceanic and Atmospheric Administration
1315 East-West Highway
Silver Spring, MD 20910

Dear Ms. Harrison;

Please accept the following comments from the Surfrider Foundation on the *Notice of Receipt of Applications for Incidental Harassment Authorization (IHA) for Geophysical Surveys in the Atlantic Ocean, 80 Fed. Reg. 45,95* (July 29, 2015). The Surfrider Foundation is a non-profit environmental organization dedicated to the protection and enjoyment of the world's oceans, waves, and beaches through a powerful activist network. Surfrider Foundation represents over 250,000 supporters, activists, and members worldwide.

The Surfrider Foundation is deeply concerned about the potential impacts to marine mammals due to geophysical surveys in the Atlantic. Specifically, the proposed blast zone is home to humpback, sperm, pygmy sperm, and beaked whales, numerous species of dolphins, and the critically endangered North Atlantic right whale.

The North Atlantic right whale (right whale) is perhaps the most vulnerable species threatened by these proposals. To date, the population of right whales is only 455 (Waring et al., 2014). The Bureau of Ocean Energy Management's (BOEM) Biological Opinion on the Programmatic Geological and Geophysical Activities in the Mid and South Atlantic Planning Areas from 2013 to 2020 anticipates nine incidences of level A harassment and 957 instances of level B harassment of the right whale

Remarkably, this proposal is under consideration at the same time that NMFS considers expanding the critical habitat designation for the right whale to include nearly 30,000 square nautical miles of new marine habitat. NMFS has identified four biological behaviors essential to population recovery, "(1) Feeding, (2) calving, (3) migration and (4) breeding. Notably, the only known calving ground for the right whale occurs along the southeastern coast" (Kraus et al. 1986, Knowlton et al. 1994, Reeves et al 2001). The NMFS proposed rule notes, "Given that the area off the southeastern U.S. is the only known calving ground for North Atlantic right whales, and that the most biologically valuable portion of the species' population is utilizing this habitat, we conclude that facilitating successful calving by protecting the species' calving area is a key conservation objective."

Exposure to seismic airgun surveys has the potential to cause temporary threshold shift (TTS), a form of hearing impairment, and the possibility for long-term damage if the animal continues to be exposed to sound. These hearing impacts also have the potential to alter social communication, force species from feeding of breeding areas, and ultimately displace an animal from its preferred habitat. Additional, right whales are particularly vulnerable to impacts from vessel strikes, a leading cause of injury and death to large whales on the Atlantic coast (Knowlton and Kraus, 2001).
The BOEM notes, "The North Atlantic right whales appear to be either unable to detect approaching vessels or, while right whales are engaged in behavioral activities —for example, feeding, nursing, or mating — they ignore the visual or acoustic cues those vessels produce. Because right whales are buoyant and are slow swimmers, they may not be able to avoid oncoming vessels even if they are aware of its approach. 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*" (BOEM, Biological Opinion on the Programmatic Geological and Geophysical Activities in the Mid and South Atlantic Planning Areas from 2013 to 2020).

In their *NMFS Incidental Harassment Authorization Application*, Spectrum Geo Inc. estimates 14 Level A exposures and 79 Level B exposures to the right whale. Notably, the same application anticipates 587 Level A and 3,315 Level B takes of sperm whales. This is only one of four pending applications, so it is imperative to consider the cumulative impacts to species.

Lastly, as geophysical surveys are the precursor to oil and gas exploration, the vulnerable marine species in the Atlantic face a whole host of additional threats- from increased vessel traffic to oil spills and discharges. Again the NMFS proposal to expand critical habitat for the right whale notes, "Very low concentrations (from less than 1μg/l to 1 mg/l) of oil and petroleum hydrocarbons have been found to have harmful effects on various marine organisms in laboratory tests (Jacobson and Boylan 1973, Johnson 1977, Steele 1977, Kuhnhold *et al.* 1978, Howarth 1987)…. Impairment of feeding mechanisms, growth rates, development rates, energetics, reproductive output, recruitment rates and increased susceptibility to disease are some examples of the types of sublethal effects that may occur with exposure to petroleum hydrocarbons (Capuzzo 1987)."

In summary, seismic airgun testing and subsequent oil and gas exploration has the potential to significantly impact marine mammals in the Atlantic. The potential for serious injuries and even death should require a Letter of Authorization (LOA), rather than an Incidental Harassment Authorization (IHA). We encourage NMFS to reject the four pending IHA applications, and to require LOA applications instead.

The Surfrider Foundation appreciates the opportunity to provide these comments on behalf of our eleven Florida Chapters and network of over 250,000 supporters, activists, and members worldwide.

Sincerely,

Pete Stauffer
Environmental Director
Surfrider Foundation

Sea Shepherd Legal

2226 Eastlake Ave. E#108
Seattle, WA 98102-3419
+1 541-418-1780
www.seashepherdlegal.org

August 28, 2015

Via Mail Electronic Filing

Jolie Harrison
Chief, Permits and Conservation Division
Office of Protected Resources
National Marine Fisheries Service
1315 East-West Highway
Silver Spring, MD 20910

Re: Comments in Response to Applications for Incidental Harassment Authorization Related to Geophysical Survey Activity in the Atlantic Ocean

Dear Ms. Harrison:

On behalf of Sea Shepherd Legal, I submit the following comments in Response to Applications for Incidental Harassment Authorization Related to Geophysical Survey Activity in the Atlantic Ocean.

Thank you for the opportunity to comment.

Respectfully submitted,

/s/

Catherine Pruett, JD, MPA
Executive Director
Sea Shepherd Legal

Encl.

Sea Shepherd Legal (SSL) is an international, nonprofit, public interest environmental law firm with a mission to save marine wildlife and habitats by enforcing, strengthening, and developing protective laws, treaties, policies, and practices worldwide. SSL works on a range of matters from ensuring proper governmental agency action to developing innovative policy approaches to encourage greater protections for marine wildlife and ecosystems.

I. Introduction

SSL submits these comments in an effort to protect marine wildlife from significant threats associated with proposed high-intensity seismic surveys in the Atlantic Ocean. The risk of harm to threatened and endangered marine mammal species, including critically endangered right whales, as well as important habitat areas is significant. SSL's goal is to persuade the National Marine Fisheries Service (NMFS) to uphold its responsibility of "stewardship of the nation's ocean resources and their habitat."[1]

As NMFS acknowledges, "[t]he resilience of our marine ecosystems and coastal communities depend on healthy marine species, including protected species such as whales, sea turtles, corals, and salmon."[2] NMFS has been tasked with securing that resilience through, among other things, appropriately implementing the Marine Mammal Protection Act (MMPA).[3] Should NMFS permit the proposed geophysical surveys, it would fail in this duty and abandon its post as the steward of our oceans and marine wildlife.

II. Conservation Takes Highest Priority

When enacting the MMPA,[4] Congress mandated that conservation, including maintaining healthy populations of marine mammals, is of highest priority. The legislative history of the MMPA makes it clear that the precautionary principle must be applied and that any bias must favor marine mammals.[5]

The courts have agreed. In *Comm. For Humane Legislation v. Richardson*, the court stated that any action subject to the MMPA, must "proceed knowledgeably and cautiously"[6] and that the MMPA must be interpreted and applied for the benefit of marine mammals "and not for the benefit of commercial exploitation."[7] Similarly, in

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[1] NMFS mission statement at http://www.nmfs.noaa.gov/aboutus/our_mission.html (last visited July 30, 2015).
[2] *Id*.
[3] *Id.*
[4] 16 U.S.C. 1361 et seq.
[5] H.R. REP. NO. 92-707, at 24 (1971); 118 CONG. REC. S15680 (daily Ed. Oct. 4, 1971) (statement of Sen. Packwood).
[6] 414 F. Supp. 297, 310 at n. 29 (D.D.C. 1976), *aff'd,* 540 F.2d 1141 (D.C. Cir. 1976).
[7] *Id.* at 24 (emphasis added).

Kokechik Fishermen's Ass'n v. Secretary of Commerce, the District of Columbia Circuit Court of Appeals held that when balancing commercial fishing interests with the conservation goals of the MMPA, "the interest in maintaining healthy populations of marine mammals comes first."[8]

In Section 2. Findings and Declaration of Policy, the MMPA states:

> (6) marine mammals have proven themselves to be resources of great international significance, esthetic and recreational as well as economic, and it is the sense of the Congress that they should be protected and encouraged to develop to the greatest extent feasible commensurate with sound policies of resource management and that the primary objective of their management should be to maintain the health and stability of the marine ecosystem. Whenever consistent with this primary objective, it should be the goal to obtain an optimum sustainable population keeping in mind the carrying capacity of the habitat.[9]

III. The Proposed Surveys Will Have a Significant - Not Just "Negligible" Impact on Marine Mammal Populations

Pursuant to Sections 101(a)(5)(A) and (D) of the MMPA, the Secretary of Commerce may allow the incidental, but not intentional, take of small numbers of marine mammals. To permit incidental take, NMFS must find that proposed take will have only a "negligible impact" on the species or stocks. ``Negligible impact'' is defined in 50 CFR 216.103 as "an impact resulting from the specified activity that cannot be reasonably expected to, and is not reasonably likely to, adversely affect the species or stock through effects on annual rates of recruitment or survival.''

In issuing a take permit, NMFS must also ensure that the proposed take will not have an unmitigable adverse impact on the availability of the species or stock(s) for subsistence uses (where relevant), and that any permitted taking activities clearly include appropriate mitigation, monitoring and reporting protocol.

The burden of proof is borne by any party proposing to take marine mammals, or take actions contrary to the MMPA. This "is by no means a light burden."[10] The intent behind the MMPA's "set of requirements is to insist that the management of the animal populations be carried out with the interests of the animals as the prime consideration."[11]

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[8] 839 F.2d 795, 802 (D.C. Cir. 1958), *cert. denied sub nom*; *See also Verity v. Center for Envtl. Educ.*, 988 U.S. 1004 (1989).
[9] 16 U.S.C. §1361.
[10] H.R. REP. NO. 92-707, *supra*, at 4.
[11] *Id*. (emphasis added).

The survey applicants cannot realistically meet their burden of proof, nor can NMFS in good conscience permit their proposed activities. As set forth more fully below, SSL is extremely concerned that, if permitted, the proposed geophysical surveys would have far greater than a mere "negligible impact" on marine mammal species or stocks. SSL also has very grave concerns that the proposed activities fail to include any functional and effective mitigation protocols.

IV. The Proposed Surveys Pose Significant Threats to Marine Mammal Populations and Critical Habitats

The Atlantic Ocean, the target area of the subject surveys (and, ultimately, for destructive drilling), is home to a rich array of marine mammal species, including federally listed threatened and endangered species such as the fin whale, humpback whale, North Atlantic right whale, sei whale, sperm whale and West Indian manatee.[12] All of these species would be at risk if NMFS permits the proposed geophysical surveys.

The proposed surveys would involve a combination of activities that would dramatically exacerbate already problematic levels of ocean noise in the Atlantic. Ocean noise pollution from activities including sonar, shipping, mapping, air guns, installation and operation of oil rigs and seabed mining already create a deafening roar that impacts life-sustaining marine mammal behaviors. The proposed geophysical surveys will entail, in part, the towing of arrays of airguns that will be discharged incessantly - essentially around the clock. It is expected that these extremely loud devices will be fired nearly every ten seconds, 24-hours per day for possibly many months on end - if not year-round.[13]

Seismic surveys, such as the ones proposed, impact a broad range of marine mammal behaviors including breeding, feeding, communicating, navigating, and predator avoidance. In a recent submission to NMFS, Oceana and 34 other interested parties provided a long list of scientifically-supported, extremely alarming statistics regarding the impacts that seismic surveys have on marine mammals.[14] We reiterate those statistics here, with citations:

- A single seismic survey can cause fin and humpback whales to cease vocalizations, a behavior critical both reproduction and foraging[15]

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[12] National Oceanic and Atmospheric Administration, Endangered and Threatened Marine Species under NMFS' Jurisdiction, http://www.nmfs.noaa.gov/pr/species/esa/listed.htm (last visited Aug. 27, 2015).
[13] Nat'l Research Council, *Ocean Noise and Marine Mammals* (2003). For a sample of some man-made noises in the ocean, *see* Emily Anthes, *When Fish Shout*, New Yorker, Nov. 10, 2014, http://www.newyorker.com/tech/elements/when-fish-shout.
[14] *See* April 29, 2015 Letter to Bureau of Ocean Energy Management regarding Atlantic Geological and Geophysical Permit Applications for Oil and Gas Development.
[15] C.W. Clark & G.C. Gagnon, *Considering the Temporal and Spatial Scales of Noise Exposures from Seismic Surveys on Baleen Whales* (IWC Sci. Comm. Doc. IWC/SC/58/E9) (2006); Correspondence from C.W. Clark to Michael Jasny, NRDC, (Apr. 2010); *see also* K. MacLeod. Et al., *Abundance of Fin (Balaenoptera physalus) and Sei Whales (B. Borealis) Amid*

- Baleen whales have been known to completely abandon their habitat in areas where seismic surveys are being conducted[16]
- Due to the characteristics of its calls, the critically endangered North Atlantic right whale is particularly vulnerable to masking effects from airguns (where one sound affects the perception of another sound).[17]
- Sperm whale foraging success can decline significantly after exposure to airguns, with potentially serious long-term consequences.[18]
- Harbor porpoises are known to be acutely sensitive to human sound sources and have been observed engaging in avoidance responses fifty miles from a seismic airgun array.[19]
- Bowhead whales migrating through the Beaufort Sea have almost completely avoided areas where airguns were used.[20]
- Beluga whales are highly sensitive to a range of low-frequency sounds, which can displace belugas from near-coastal foraging areas.115[21]
- Scientists implicated seismic surveys as a factor contributing to the long-term loss of marine mammal biodiversity off the coast of Brazil.[22] Consistent with their

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Oil Exploration and Development off Northwest Scotland, 8 J. Cetacean Research & Mgmt. 247-54 (2006).

16 *Id*.

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

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

19 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).

20 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).

21 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.*, 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).

acoustic footprint, most of these impairments occur on an extraordinarily wide geographic scale.

- The break between airgun pulses hardly mitigates these harms, because the sound can be virtually continuous once an animal is distant from an array.[23]

V. Proposed Surveys Place Critically Endangered North Atlantic Right Whales at Risk of Extinction

Impacts on already-depleted populations of the critically endangered North Atlantic right whale (*Eubalaena glacialis*) are of heightened concern. Only a mere 455 North Atlantic right whales currently exist.[24] This small population is comprised of only 100–150 breeding-age females.[25]

Based on the foregoing population numbers, NMFS' 2013 and 2015 draft stock assessments indicate that the Potential Biological Removal ("PBR") rate for North Atlantic right whales is 0.9.[26] By definition, PBR 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 population."[27]

Unsurprisingly, NMFS acknowledges that "**the loss of even a single individual [North Atlantic right whale] may contribute to the extinction of the species."**[28] Utterly shocking, however, is the fact that NMFS would even consider permitting **survey projects that could result in up to 40 Level A and Level B takes** of North Atlantic right whales. This number is not conjecture. It is based on the estimates provided by the four survey applicants and listed in Table 1 below.[29] It is perfectly reasonable to assume

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23 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).

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

25 *Id.*

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

27 NMFS, *Protected Resources Glossary*, *available at* http://www.nmfs.noaa.gov/pr/glossary.htm#p (last visited Aug. 27, 2015).

28 *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) (emphasis added).

29 *See* Incidental Take Authorization Applications - In Process Oil & Gas Incidental Take Authorizations" *available at* http://www.nmfs.noaa.gov/pr/permits/incidental/oilgas.htm#atlgeo2015 (last visited Aug. 28, 2015).

that at least one - and certainly likely more - of the 40 taken will die as a result of survey activities, making extinction of this species a very real possibility.

TABLE 1:

Survey Applicant	Applicant's Take Estimate of North Atlantic Right Whales
Spectrum Geo, Inc.	11
TGS-NOPEC Geophysical Company	12
ION GeoVentures	16
TDI Brooks International, Inc.	1

TOTAL estimated take of North Atlantic right whales by subject surveys = 40

Each of the applicants claim that the take estimates do not take proposed mitigation efforts into account.[30] As discussed in Section VI below, the proposed mitigation efforts would not be sufficiently meaningful and effective enough to diminish the tremendous impact of the surveys.

NMFS must also consider the cumulative effect of non-acoustic impacts on North Atlantic right whale populations from other activities. Table 2 below highlights these.

TABLE 2:

Other Current Human Impacts	Other Human Impacts - Take Estimate of North Atlantic Right Whales
Fishing gear entanglement	3.9[31]
Ship strikes	.9[32]
Navy sonar activities	51[33]
U.S. Geological Survey seismic activities	3[34]

TOTAL take caused by other current human impacts = 58

The surveys would take place directly within and thereby threaten critical habitat for these extremely sensitive species. In 1994, for example, NMFS designated critical habitat for North Atlantic right whale calving and nursing habitat off the coast of Florida

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30 *Id.*

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

32 *Id.*

33 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, 73,055 (Dec. 4, 2013), *available at* https://www.federalregister.gov/articles/2013/12/04/2013-27846/takes

34 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. 52,157, 52,159–60 (Sept. 2, 2014).

and Georgia.[35] This area will likely be significantly expanded to include right whale calving, nursing and rearing areas that lie within approximately forty miles of the coastline stretching from Cape Fear, North Carolina to forty-three miles north of Cape Canaveral, Florida.[36] Indeed, these areas comprise "the only known calving ground for North Atlantic right whales, and that the most biologically valuable portion of the species' population is utilizing this habitat."[37] NMFS further identified over one hundred biologically important areas that serve as breeding and feeding grounds and migratory corridors for this species.[38] These biologically important areas span from central Florida to Georges Bank, totaling 269,448 square kilometers - again right within the target zone for seismic surveys.[39]

VI. Proposed Survey Implementation Techniques Would Fail To Mitigate Threats to Marine Mammal Populations

1. Observer Programs

The mitigation measures proposed by the survey applicants are grossly inadequate. In particular, the applicants place most reliance upon daytime observer programs. However, this mitigation scheme ignores the best available science on the significant limits of visual monitoring. Visual detection rates for marine mammals generally approach only 5 percent. This well-known inadequacy of observer-based mitigation measures is further compounded by the undeniable fact that such measures cannot be employed at night or under low visibility conditions.

Despite the obvious and significant limitation of the proposed observer programs to daylight hours with good visual conditions, the applicants do not propose any effective mitigation measures to counter this problem – such as, *e.g.*, simply not operating the acoustic survey equipment at night. For example, TDI-Brooks proposes a particularly ridiculous "solution":

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35 NMFS, Designated Critical Habitat; Northern Right Whale, 59 Fed. Reg. 28,793, 28,795 (June 3, 1994).
36 NMFS, Endangered and Threatened Species; Critical Habitat for Endangered North Atlantic Right Whale, 80 Fed. Reg. 9,313, 9,319, 9, 342 (proposed Feb. 20, 2015). *See also* Comment from Margaret Cooney, IFAW, to Mary Colligan, Assistant Regional Administrator of NMFS Protected Resources Division, Apr. 21, 2015.
37 *Id*.
38 NMFS, Press Release, Mar. 6, 2015, *New Tool Aids U.S. Conservation and Management of Whales, Dolphins, and Porpoises*, http://www.nefsc.noaa.gov/press_release/pr2015/scispot/ss1503.
39 NOAA, Cetacean & Sound Mapping Working Group, *Biologically Important Areas*, http://cetsound.noaa.gov/biologically-important-area-map (last visited Aug. 28, 2015).

> During nighttime and other times when visibility is obscured, the MBES system will continue to operate, in order to continue to deter animals from entering the exclusion zone. The operational noise of the instrument acts in and of itself a deterrent to animals. Continuous operation of the instrument is a mitigation measure and should include ship turns or other times when data may not be collected. Should the instrument be shut down for any length of time, observers should monitor the exclusion zone for thirty minutes prior to a soft-start of the instrument. Soft-start or start-up of the multibeam by first utilizing lower sound pressure levels will alert any unseen and nearby animals of the acoustic source before full power is utilized. This acoustic disturbance will aid in moving animals away from the sound source.

Thus, this applicant apparently intends to use the very acoustic source that is the subject of mitigation as the instrument of mitigation. There is no scientific basis for this fanciful proposal.

The other survey applicants rely nearly exclusively upon passive acoustic monitoring. Although passive monitoring has been recognized as an effective mitigation measure when properly implemented, it has its limitations and, as such, should not be relied upon exclusively. As recognized by TGS-NOPEC in its application:

> Although these systems typically increase the number of marine mammal detections recorded by observers, they require that marine mammals be actively calling or echolocating within the detection range of the system in order to be detected. Detection ranges can vary substantial as a result of masking from vessel noise, flow noise, seismic source noise and reverberation, and high sea states.

Other than passive acoustic monitoring, the only other proposed nighttime mitigation measure is the use of night vision devices. Nevertheless, as candidly admitted by TGS-NOPEC in its application, these devices are ineffective at detecting marine mammals at a distance.

2. Time and Area Restrictions

There is a general consensus among the scientific community that "[p]rotecting marine mammal habitat is…the most effective mitigation measure currently available" to reduce the harmful impacts of mid-frequency sonar on marine mammals.[40] Despite this recognition, only two of the survey applicants even propose restrictions in the vicinity of, *e.g.,* right whale migration corridors and nursing areas. For example, with respect to right whales, TDI-Brooks proposes only very minimal mitigation measures based on an anticipated small number of such whales in the survey area:

> Very few right whales are anticipated within the survey area. However, the North Atlantic right whale is considered critically endangered, and special care will be taken to avoid harassment of this species. Ship speed will not exceed 10 knots when right whales are observed within the area. Additionally, mother-calf pairs will be avoided.

This proposal is fundamentally flawed for a number of reasons, including, most importantly, its failure to acknowledge that a small number of right whales in the area coupled with the precarious status of this population counsels that there be even greater protections against take – for the loss of even a single whale will have dire consequences for long term viability of the entire population.

Even where time and area closures are proposed, the applicants provide very few details as to their intended implementation. One key source of information that should be included in setting the parameters of any proposed restrictions is the Cetacean Density and Distribution Mapping Working Group's identification of density and distribution maps for marine mammal populations. This information will be critical in the identification of marine mammal "hot spots" that should be either entirely avoided by the proposed surveys or used in the formulation of strict time and area restrictions.

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[40] *See* Correspondence from Jane Lubchenco, Under Secretary of Commerce for Oceans and Atmosphere to Nancy Sutley, Chair, Council on Environmental Quality dated Jan. 19, 2010, *available at* http://www.nrdc.org/media/docs/100119.pdf; see also 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); ECS Working Group: Dolman, S., Aguilar 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. Working group convened by European Cetacean Society, (2009); OSPAR Commission, Assessment of the environmental impact of underwater noise. OSPAR Biodiversity Series, (2009); Parsons, E.C.M., Dolman, S.J., Wright, A.J., Rose, N.A., and Burns, W.C.G. Navy sonar and cetaceans: just how much does the gun need to smoke before we act? Marine Pollution Bulletin 56: 1248-1257 (2008).

3. Other Mitigation Measures

The few and inadequate mitigation measures suggested by the applicants should be supplemented by additional, global measures with a view toward the overall impact of the proposed surveys on marine mammals. Such additional measures, identified by other commenters with regard to similar proposed surveys in the Gulf of Mexico[41], should include (at a minimum) the following:

- **Activity Caps:** "[M]eaningful caps 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.' … These effects cannot be eliminated through the use of area closures alone, especially given the long distances at which they may occur …."

- **Elimination of Unnecessary Survey Effort:** "NMFS should require BOEMRE to eliminate unnecessary duplication of survey effort throughout the Gulf, by rejecting permit applications or requiring modification of permit applications that duplicate, in whole or in part, other surveys occurring in the same locations for the same or similar purposes."[42]

- **Mitigate the Effects of Overlapping Surveys: "**NMFS should require separation of seismic vessels to reduce the potential impacts of overlapping sound fields. As NMFS has noted, 'the zone of seismic exclusion or influence could be quite large [if seismic operations overlap in time], depending on the number, and the relative proximity of the surveys.'"[43]

VII. Permit Approval of Proposed Surveys Would Not Be Based Upon Best Available Science

Under 50 C.F.R. § 216.102(a), NMFS is required to use the "best scientific evidence available" in making its finding of "negligible impact." When it comes to assessing the impacts of seismic surveys, NMFS clearly recognizes that that its current guidance materials are grossly insufficient.

Indeed, on July 31, 2015, NMFS announced the "availability of a revised version of draft guidance for assessing the effects of anthropogenic sound on marine

[41] *See* July 14 2011 comments submitted by the Natural Resources Defense Counsel regarding the MMPA Incidental Take Application for Oil and Gas Geological and Geophysical Activities in the Gulf of Mexico, at 14 (citations omitted).
[42] *Id.* at 15 (citations omitted).
[43] *Id.* at 16 (citations omitted).

mammal species under NOAA's jurisdiction."[44] NMFS further noted that this Draft Guidance "provides updated received levels, or thresholds, above which individual marine mammals are predicted to experience changes in their hearing sensitivity (either temporary or permanent) for all underwater anthropogenic sound sources."[45]

While NMFS' efforts to enhance guidance materials and give direction to industry is certainly welcomed and appreciated, renowned scientists note that these efforts are not enough. As required, NMFS solicited public comment on the Draft Guidance based on updated scientific information and comments received during the first public comment period."[46] In a comprehensive comment letter on this issue, four ocean scientists representing multiple coastal states noted the following shortcomings in the Draft Guidance (direct quotes):

- **Impact of multiple incidental take permits -** NOAA's proposed guidance fails to effectively account for exposure to sounds originating from multiple sources in close proximity. Instead, the scope of the guidance extends only to evaluating the impact of discrete activities. For determining the number of incidental takes under the Marine Mammal Protection Act and Endangered Species Act, we believe an evaluation of the impact that aggregate noise from multiple sources may have on Permanent Threshold Shift (PTS) onset is essential. Such cumulative impact analysis is already required as part of Environmental Impact Statements carried out under the National Environmental Policy Act. In evaluating the impacts in this case, NOAA should recognize that not only are cumulative effects potentially significant biologically, but agencies using this guidance may be legally required to consider them under NEPA.

- **Additional sources of noise -** Marine noise pollution can stem from many sources. The Draft Guidance seeks to identify the acoustic threshold levels at which marine mammals are likely to experience acute injury from anthropogenic sound. Based on the physical characteristics of the noise, the Draft Guidance divides sound into two categories: impulsive and non-impulsive. Examples of impulsive sound given in the Draft Guidance are underwater high explosives, seismic air guns, and impact pile driving, with sonar and vibratory pile drivers provided as examples of non-impulsive sounds. In our view, the Draft Guidance's focus on these five sources of acute, incidental exposure to underwater sound serves as a limiting factor to the robustness of this Highly Influential Scientific Assessment. In our view, the Draft Guidance should consider other sources of sound that have the impact

[44] 80 FR 45642, Draft Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing-Acoustic Threshold Levels for Onset of Permanent and Temporary Threshold Shifts.
[45] *Id.*
[46] *Id.*

to damage or affect marine mammal hearing by attaching an appendix of potential sound sources to the Draft Guidance . . . However, we believe that the Draft Guidance could greatly benefit from an explicit recognition of other sources of sound that may lead to acute exposure for marine mammals.

- **Overlapping TTS recovery periods -** While cumulative impacts can be difficult to account for, the current Draft Guidance allows for TTS recovery times that may overlap. During a TTS recovery period, a protected mammal may encounter another sound impulse causing an additional TTS that would be exacerbated by the recovery from the previous exposure. As noted in the Navy report,19 behavioral shifts have been observed to last multiple days during TTS. A long-lasting recovery period, in combination with periodic TTS-inducing sound impulses, has the potential to hold an individual in recovery for extended periods of time, causing a significant impact to its livelihood. Transient and local acoustic noise can impact the livelihood of cetacean populations by increasing stress levels leading to abandonment of important habitats, reduction of foraging efficiency, and loss of reproduction opportunities. The emphasis on short-term responses may not be good proxies of long-term population-level impacts as responses are highly variable between species, age, class, behavioral states, etc.[47]

VIII. Conclusion

For the foregoing reasons, SSL respectfully requests that NMFS deny the applications for incidental harassment related to the geophysical survey activity in the Atlantic ocean.

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[47] *See* August 26, 2015 letter to from Alicia Amerson, Annie Brett, Isaac Irby, Neal McMillin in response to NOAA Draft Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammals (citations omitted). *Available at* https://www.federalregister.gov/articles/2015/07/31/2015-18790/draft-guidance-for-assessing-the-effects-of-anthropogenic-sound-on-marine-mammal-hearing-acoustic.

Sierra Club – Croatan Group

Jolie Harrison, Chief, Permits and Conservation Division,
Office of Protected Resources
National Marine Fisheries Service
1315 East-West Highway,
Silver Spring, MD 20910
ITP.Laws@noaa.gov.

August 14, 2015

Dear Ms. Harrison:

The Croatan Group of the Sierra Club comprising over 500 members from Carteret, Craven, Jones, Onslow, and Pamlico counties strongly opposes the application to allow Spectrum Geo Inc., GX Technology, TGS, CGG Services, and any other company to conduct seismic surveys in the waters offshore of North Carolina.

We feel very strongly that not enough information is currently known about the area that is being considered for seismic surveys. Indeed it is our understanding that scientists have only adequately studied about 10% of the area. This area needs adequate scientific study prior to any seismic surveys or seismic blasting occurs.

Seismic guns can create sound blasts in the area of 250 decibels (dB) which is well above the 180 dB that is known to cause damage to fish ears and will begin to cause local reductions in catch rates. These seismic blasts travel for hundreds of miles. It is equally important to note that marine mammals rely on hearing and producing sounds for navigation, for communication, to locate food, for mate selection, and to avoid predators. There seems to be no question that these seismic blasts will have a negative impact on the ability of sea mammals to function normally. What is equally disturbing is the likelihood that many marine mammals and sea life will avoid the area entirely. The impact on the loss of feeding, breeding and socialization habitat for sea life in this area is unknown but with it should be considered especially in light of decreasing populations regionally and worldwide.

If the National Marine Fisheries Services (NMFS) decides to go ahead with allowing seismic testing by these companies we would recommend the following:

1. Postponement of the permit process for at least one year to allow public hearings and interested parties, particularly the local scientific community that is most familiar with the area that is slated to be tested, to develop an adequate monitoring program to study the impacts of the seismic testing proposed.
2. Require an independent scientific research team that is adequately funded to be in place prior, during, and after testing to examine the impact of testing and report back to NMFS.
3. The methods stated by the companies to protect marine life and other wildlife are not adequate. Due to the distances that the sound from seismic blasting travels

underwater and what is not known about the impacts of this sound on Atlantic sea life a detailed and thorough study of its impacts should be conducted.

We would like to refer to this section of the Marine Mammal Protection Act:

> *Sections 101(a)(5)(A) and (D) of the MMPA (16 U.S.C. 1361 et seq.) direct the Secretary of Commerce to allow, upon request by U.S. citizens who engage in a specified activity (other than commercial fishing) within a specified area, the incidental, but not intentional, taking of small numbers of marine mammals, providing that certain findings are made and the necessary prescriptions are established.*
>
> *The incidental taking of small numbers of marine mammals may be allowed only if NMFS (through authority delegated by the Secretary) finds that the total taking by the specified activity during the specified time period will (i) have a negligible impact on the species or stock(s) and (ii) not have an unmitigable adverse impact on the availability of the species or stock(s) for subsistence uses (where relevant). Further, the permissible methods of taking and requirements pertaining to the mitigation, monitoring and reporting of such taking must be set forth, either in specific regulations or in an authorization.*

We feel strongly that the proposed activity will have a significant impact and that marine life and more importantly adequate measures are not in place to mitigate this impact particularly to mammals. To properly gauge this impact we call on the NMFS to allow enough time for the public and scientific community to study the area and to come up with a plan to monitor and protect the sea life.

Sincerely,

Michael E. Murdoch, Chair
Croatan Group of the Sierra Club
415 Wildwood Road
Newport, NC 28570
memurdoch@gmail.com

North Carolina Coastal Federation
Working Together for a Healthy Coast

August 28, 2015

Jolie Harrison
Chief, Permits and Conservation Division
Office of Protected Resources
National Marine Fisheries Service
1315 East-West Highway
Silver Spring, MD 20910

RE: Notice of Receipt of Applications for Incidental Harassment Authorization ("IHA") for Geophysical Surveys in the Atlantic Ocean, 80 Fed. Reg. 45,195 (July 29, 2015)

Dear Ms. Harrison,

On behalf of the North Carolina Coastal Federation, I am submitting these comments in response to the National Marine Fisheries Service (NMFS) and National Oceanic and Atmospheric Administration's (NOAA) request for public comments and information in regards to the receipt of applications for incidental harassment authorization for geophysical surveys in the Atlantic Ocean.

Based upon the best available science, the federation urges your agencies to consider the following literature and information while assessing the proposed seismic survey applications.

Cumulative Impacts

None of the Incidental Harassment Authorizations (IHAs) being reviewed analyze the potential for these surveys to be occurring simultaneously with other seismic surveys. The combined effect of several surveys occurring during the same time period, in the same general areas in the Atlantic, is an unknown variable that has not been adequately assessed.

Typically, the potential impacts of anthropogenic noise sources (including seismic surveys) are assessed as a result of individual activities (e.g., a single survey).[1] Not only are the environmental assessments focusing on a single survey, they are focusing only on the loudest source (i.e., seismic airguns). This consideration largely overlooks the potential cumulative noise disturbance when considering additional vessel traffic related to seismic surveys, in addition to normal shipping traffic in the Atlantic. The additional ambient noise of sub-bottom profilers and undersea communication systems must also be considered. In short, all aforementioned noise sources must be analyzed in combination with the proposed seismic surveys to adequately estimate the potential impact on marine life, specifically marine mammals.[2]

[1] HESS (High Energy Seismic Survey) Team. 1999. High energy seismic survey review process and interim operational guidelines for marine surveys offshore southern California. Camarillo, CA: California State Lands Commission and U.S. Minerals Management Service.
[2] Southall BL, Rowles T, Gulland F, *et al*. 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. Cambridge, UK: International Whaling Commission.

Northeast Regional Office
128 Grenville Street
Manteo, NC 27954
252.473.1607

NC Coastal Federation Headquarters and Central Regional Office
3609 Highway 24 (Ocean) • Newport, NC 28570 • 252.393.8185 • www.nccoast.org

Southeast Regional Office
530 Causeway Drive Suite F1
Wrightsville Beach, NC 28480
910.509.2838

Currently, the NMFS is solely considering the four proposed seismic surveys. This ignores the additional four applications that the Bureau of Ocean Energy Management (BOEM) is currently considering. Considering these four surveys currently under review at NMFS, three of the four IHA permit applications propose seismic surveys in overlying areas and times. To be able to consider the true cumulative impacts, the best available science provides considerably effective tools that are able to analyze these impacts.[3]

Threshold Level

Under the Marine Mammal Protection Act (MMPA) 1994 Amendments, harassment is statutorily defined as, any act of pursuit, torment, or annoyance which:

> ***Level A Harassment*** *- has the potential to injure a marine mammal or marine mammal stock in the wild; or,*
>
> ***Level B Harassment*** *- 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 but which does not have the potential to injure a marine mammal or marine mammal stock in the wild.*

The description of Level A harassment clearly demonstrates that Level A takes severely handicap or subsequently kill a marine mammal. Level B takes are much more difficult to observe and quantify, as these generally occur outside of the monitoring zones in the vicinity of these activities.

As such, it is clear that the best available science shows that behavioral disruptions are occurring at much lower noise exposure levels than what NMFS has currently adopted as regulatory thresholds for Level B harassment.[4]

Using the 160 dB level as a threshold for behavioral disturbance is an inaccurate assessment, based upon the best available science, as referenced below:

1. Bowhead whales (Balaena mysticetus) increase call rates at initial detection of airguns at 94 dB, then decrease after 127 dB, and stop calling above 160 dB.[5]
2. Harbor porpoise feeding notifications decreased 15% with exposure to seismic airguns at 130-165 dB. [6]

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[3] Christiansen, F., Bertulli, C. G., Rasmussen, M. H., & Lusseau, D. (2015). Estimating Cumulative Exposure of Wildlife to Non-Lethal Disturbance Using Spatially Explicit Capture–Recapture Models. *Journal of Wildlife Managment*, 1–14. http://doi.org/10.1002/jwmg.836

[4] 160dB$_{RMS}$ re: 1µPa for behavioral disruption for impulsive noise (e.g., impact pile driving), 120dB$_{RMS}$ re: 1µPa for behavioral disruption for non-pulse noise (e.g., vibratory pile driving, drilling) (MMPA 2007).

[5] Blackwell SB, Nations CS, McDonald TL, Thode AM, Mathias D, Kim KH, et al. (2015) “Effects of Airgun Sounds on Bowhead Whale Calling Rates: Evidence for Two Behavioral Thresholds.” PLoS ONE 10(6): e0125720.

[6] Pirotta E, Brookes KL, Graham IM, Thompson PM. 2014 “Variation in harbour porpoise activity in response to seismic survey noise.” Biol. Lett. 10: 20131090. http://dx.doi.org/10.1098/rsbl.2013.1090

3. Blue whales ceased their calls on 143 dB exposure to airguns.[7]

The federation urges your agency to use the best available science to analyze these IHA applications. Based upon the aforementioned literature, it is clear that the 160 dB threshold for Level B takes is inaccurate and outdated.

MMPA and Level A takes of the North Atlantic Right Whale

Under the MMPA, the NMFS is allowed to issue an IHA only if the proposed activity take level meets the following criteria:

The take must:

1. *be of small numbers;*
2. *have no more than a "negligible impact"[8] on those marine mammal species or stocks, and;*
3. *not have an "unmitigable adverse impact"[9] on the availability of the species or stock for "subsistence" uses.*

According to BOEM's Final Programmatic Environmental Impact Statement (2014) assessing the proposed seismic surveys, the North Atlantic Right Whale (NARW) population in the Atlantic will experience the following take levels over an 8 year period (originally 2012-2020):

> *"… Level A incidental takes of 0-2 NARW individuals/year using NMFS's 180-dB criterion and less than one individual using the Southall et al. (2007) criterion. Level B incidental takes of the NARW are estimated by the models to range from 0 to 224 individuals/year."*

The MMPA defines the "Potential Biological Removal (PBR)" level as: "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 population." For the NARW, the PBR is .9.[10] Further according to the 2013 stock assessment: "any mortality or serious injury to this species can be considered significant."

Therefore, based upon the current stock assessment it is clear that approving an IHA for the current seismic survey applicants could have long-term, detrimental impacts on the existing endangered NARW population, in addition to other marine mammal species.

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[7] Mark A. McDonald, John A. Hildebrand, and Spahr C. Webb "Blue and fin whales observed on a seafloor array in the Northeast Pacific." J. Acoustical Society of America, 98:1 1995

[8] "…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." (NOAA)

[9] "…An impact resulting from the specified activity that is likely to reduce the availability of the species to a level insufficient for a harvest to meet subsistence needs by: (1) causing marine mammals to abandon or avoid hunting areas, (2) directly displacing subsistence users; or, (3) placing physical barriers between the marine mammals and the subsistence users; AND (4) cannot be sufficiently mitigated by other measures to increase the availability of marine mammals to allow subsistence needs to be met." (NOAA)

[10] NMFS, Marine Mammal Stock Assessment Reports, http://www.nmfs.noaa.gov/pr/sars/2013/ao2013_rightwhale-west-atl.pdf.

Given assessment of the best available science, the federation urges you to consider the aforementioned information and literature while making your determinations on the current seismic survey applications.

Sincerely,

Ladd Bayliss
Coastal Advocate

DEPARTMENT OF MARINE & ENVIRONMENTAL SCIENCES

SAVANNAH STATE UNIVERSITY 1890

Box 20467
Savannah, GA 31404
P: (912) 358 - 4101
F: (912) 358 - 4604

27 August 2015

Jolie Harrison
Chief, Permits and Conservation Division
Office of Protected Resources
National Marine Fisheries Service
1315 East-West Highway
Silver Spring, MD 20910

Dear Ms. Harrison:

Please find enclosed comments regarding the four applications for Incidental Harassment Authorizations in relation to geophysical surveys in the Atlantic Ocean (80 FR 45195; 29 July 2015). Our comments can be grouped into general comments for all four applications and then specific comments regarding the individual applications.

General comments:

As stated in the federal register notice, the total taking of marine mammals must have a negligible impact on species or stocks of marine mammals. However, when taken together, the four applications clearly request authorization to take more than the Potential Biological Removal Level (PBR) of several species and stocks, which indicates these takes are not sustainable. Please reference Table 1 for estimated TOTAL takes and PBR for some selected species. While one authorization may be acceptable (even though some takes are still exceedingly high by NMFS own standards, i.e., PBR), the sum of all four could result in severe population consequences for multiple species of marine mammals. <u>We recommend NMFS carefully evaluate the cumulative impact of all four authorizations on marine mammals and require much more stringent monitoring and mitigation to attempt to reduce the estimated takes</u>.

Of special concern, the IHA applications combined estimate a total of 16-106 North Atlantic right whales (*Eubalaena glacialis*), with two of the IHAs estimating a total of 16 Level A takes (and the other two not specifying what level takes – see below). With an estimated population of less than 500 individuals and a current PBR level of 0.9 (Waring et al. 2014), these estimated takes are clearly not sustainable. Some of the IHA applications stated they would not conduct surveys during certain times and seasons, but even these IHAs were not specific enough. For example, Ion GeoVentures noted that they were conducting their surveys at a time that would reduce marine mammal take. However, their application does not go into specific detail about when the boats will be at certain areas of their transect lines. Thus, <u>we recommend that the National Marine Fisheries Service implement time/area restrictions based on those species that are at highest risk of impact</u>.

All of the IHA applications stated that as part of their mitigation plans, they would have Protected Species Observers (PSOs) monitoring for marine mammals during daylight hours. However, only having 1-3 PSOs per vessel for 12-hour shifts every day of surveying will not be effective monitoring. Barlow and Gisiner (2006) estimated that beaked whales only have a probability of 0.23-0.45 of being detected during research surveys, a probability that decreases to .02 during a seismic survey due to lower power binoculars, inability to detect at night, and higher sea state. This reduction in detectability does not account for the likelihood that observers on seismic surveys will likely have less training than those on research surveys, thus lowering the probability two-fold (Barlow et al. 2006). One IHA application stated that the PSOs would work 3-hour shifts, another stated 4-hour shifts, but the other two did not specify. Thus, we recommend that the National Marine Fisheries Service require the seismic survey companies have at least four independent observers on board with shifts short enough to diminish eye fatigue.

Related to the recommendation above, observers will never be 100% effective, nor will they be able to observe at night. Therefore, we recommend that NMFS require Passive Acoustic Monitoring 24 hours a day while seismic surveys are being conducted. While two of the IHAs already mention this mitigation technique, it should be required for all companies surveying since it is the best way to truly detect marine mammals.

Specific Comments:

TDI-Brooks International

Compared to the other IHA applications, the application from TDI-Brooks was much shorter in length. It lacked specific details, with most of the application being summaries of the given species. One of the greatest concerns for this application is the failure to mention the specific dates that the surveys will occur. Without specific dates, it is difficult to verify the take estimates. We recommend that NMFS delay the IHA for TDI-Brooks International until a more thorough assessment can be done of the potential takes and mitigation measures. Specifically, the application should specify how they estimated takes, delineate between Level A and Level B takes, implement Passive Acoustic Monitoring for nighttime activities, and implement time/area closures to minimize potential takes of North Atlantic right whales. Finally, the application from TDI-Brooks International has an incomplete list of potential species affected. Possibly most concerning is that they report “beaked whales” as a whole, and their estimated take of 4 seems low, given that beaked whales are highly susceptible to disruption from sound. We recommend TDI-Brooks incorporate a more thorough analysis of potential takes, especially with respect to beaked whales.

Spectrum Geo Inc.

Of the four IHA applications submitted, Spectrum Geo Inc. provided the most thorough take analysis by delineating Level A and Level B harassment as well as utilizing acoustic integration models and modeling sound source movement, animal movement, and mitigation efforts. This application gave very detailed descriptions of the status and distribution of each of the marine mammals within the proposed survey area. Specific species’ behavioral parameters such as surface time, dive time, speed, and group size were also provided as evidence for the research that was conducted for the animal movement modeling. However, the Level A take estimates that they propose for some species exceeds the Potential Biological Removal Level. The North Atlantic right whale, for example, is predicted to have 14 Level A takes for this seismic survey. We recommend that Spectrum Geo Inc. provide take estimates for both the regional and detailed surveys separately. The closely spaced detailed survey may be the reason for such high take estimates. If this is the case, we recommend that NMFS only allow the regional survey to be conducted. Spectrum Geo Inc. is commended for the plan to use passive acoustic monitoring and observe closed areas at certain parts of the year. However, the application implies that only one PSO will be on board which makes the visual surveys useless. Multiple trained observers with limited shifts will need to be used to increase the probability of detected marine mammals in the ensonified area. We recommend that the total number of Protected Species Observers on each vessel at all times be stated in the application, and if necessary be increased to at least 4.

ION GeoVentures

We commend Ion GeoVentures on its plans for passive acoustic monitoring and the 4-hour observation limits for the PSOs. However, they only plan on having 3 PSOs, which is not enough for the size vessel or the amount of area they will be covering. In addition, they estimate that they will have 2 level A takes of North Atlantic right whales. This number already exceeds the PBR for the species. They also cite many sources saying that the effects of the seismic waves should be minimal but then go on to admit that most of these experiments are done with 1-5 pulses. Since they will be surveying constantly, the seismic may have a cumulative effect on the mammals in the surrounding areas. Thus, we recommend Ion GeoVentures increase the number of PSOs, utilize Passive Acoustic Monitoring, and avoid any (not just critical) habitat of North Atlantic right whales seasonally.

TGS-NOPEC

We commend TGS-NOPEC on the inclusion of the specific dates of operation as well as the recognition of the dates of time-area closures for marine mammals, especially the considerations and precautions regarding the endangered North Atlantic right whales. The TGS-NOPEC IHA application states that Level A harassment of marine mammals is highly unlikely due to extensive mitigation and monitoring measures; however, we recommend that this company revise its application to include the estimated number of Level A takes. In addition, TGS-NOPEC used three different models to estimate takes of marine mammals due to variable data availability. For comparison, we recommend that the number of estimated takes (to include Levels A and B) should be evaluated using the same exposure estimation model(s) for each of the 39 marine mammal species found in the study area.

For some species, TGS-NOPEC anticipates exposing individuals multiple times. However, cumulative impacts on individuals are not addressed. Given that multiple TTS can lead to PTS, which considered a Level A take, we recommend that TGS-NOPEC revise its sampling to reduce the numbers of takes (Level A and Level B) of marine mammals.

Sincerely,

Tara M. Cox, Rachael Randall, Jordan Rutland, Emma Schultz, Rebecca Thublin
Savannah State University
Masters of Marine Science program
Contact: coxt@savannahstate.edu

Literature Cited

Barlow, J. and R. Gisiner. 2006. Mitigating, monitoring and assessing the effects of anthropogenic sound on beaked whales. J. Cetacean Res. Manage. 7(3): 239-249.

Barlow, J., M. Fergus, W.F. Perrin, L. Balance, T. Gerrodette, G. Joyce, C.D. MacLeod, K. Mullin, D.L. Palka, and G. Waring. 2006. Abundance and densities of beaked and bottlenose whales (family Ziphiidae). J. Cetacean Res. Manage. 7(3): 263-270.

Waring, G.T., E. Josephson, K. Maze-Foley, and P.E. Rosel, eds. 2014. U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments – 2014.

Table 1. Summary of estimated takes relative to Potential Biological Removal (PBR) level (Waring et al. 2014) for selected species. *TDI-Brooks and TGS-NOPEC did not differentiate between beaked whale species, instead reporting estimated takes for a generic category of "beaked whales".

Species	TDI-Brooks	ION GeoVentures[1]	TGS-NOPEC	Spectrum Geo[2]	TOTAL[3]	PBR
N. Atlantic right whale	1	2-14	12	14-79	16-106	0.9
Fin whale	1	3-12	214	11-103	14-330	2.5
Cuvier's Beaked Whale	4*	25-32	13,423*	583-4,201	611-17,660	50
Gervais beaked whale	4*	2-14	13,423*	82-600	84-14,041	46
Sowerby's Beaked Whale	4*	2-6	13,423*	2-25	4-13,460	46
Risso's dolphin	54	49-376	3,563	2,376-19,798	2,425-23,791	126
Atl. Spotted dolphin	175	96-799	45,594	7,657-80,590	7,753-127,158	316
Pantropic Spotted Dolphin	40	14-95	1,413	798-8,695	812-10,243	17
Bottlenose dolphin (offshore)	161	305-2513	45,041	9,017-91,737	9,322-139,452	561

[1] ION GeoVentures broke their takes into summer/fall and 160dB and 180dB. Thus, the smaller number is the 160dB (Level B takes) summed across seasons and the larger number is the 180dB (Level A takes) summed across seasons.
[2] Spectrum Geo Inc. reported estimated Level A and Level B takes; thus, the range here represents estimated Level A takes (lower number) and Level B takes (higher number).
[3] Totals were calculated under the assumption TDI-Brooks and TGS-NOPEC were reporting Level B takes, not Level A. The lower number is Level A takes and the higher number is Level B.

University of North Carolina
UNCW WILMINGTON

28 August 2015

Jolie Harrison
Chief, Permits and Conservation Division
Office of Protected Resources
National Marine Fisheries Service

Dear Dr. Harrison,

We are writing in response to NOAA's Federal Register notice (7/29/2015) of "Receipt of Applications for Incidental Harassment Authorization (IHA)" announced as "Taking and Importing Marine Mammals; Taking Marine Mammals Incidental to Geophysical Surveys in the Atlantic Ocean."

NMFS has specifically requested information on the "best available scientific information and appropriate use of such information in assessing potential effects of the specified activities on marine mammals and their habitat." Our lab has carried out aerial survey efforts focused on assessing the occurrence of protected species in multiple locations along the US Atlantic coast since 1998. These survey efforts have included Navy EIS surveys, NOAA right whale aerial surveys, and our current collaborative bio-monitoring program aimed at assessing marine mammal abundance and distribution at sites that may be impacted by activities of the US Navy. All surveys have been carried out under authorization from NOAA (current Scientific Permit No. 16473) and sightings data are publically available on OBIS SEAMAP (http://seamap.env.duke.edu/). We incorporate the results of these survey efforts into our comments below.

(1) North Atlantic Right Whales – distribution outside of federally identified protected areas

The current and proposed critical habitat designation for the North Atlantic right whale does not include all documented right whale occurrences. For example, the site of one of only two observed right whale birth events (at 30.047°N, 80.677°W) is far offshore of any designated protected area for this species (see Figure 1 below; Foley *et al.* 2011). We have documented multiple right whale sightings offshore of critical habitat and seasonal management areas in the waters off Florida (data available in OBIS SEAMAP).

These data demonstrate that mitigation efforts for seismic activities that rely upon time-area closures, which are based upon federally identified critical habitat designations, will not be adequate to protect this critically endangered species.

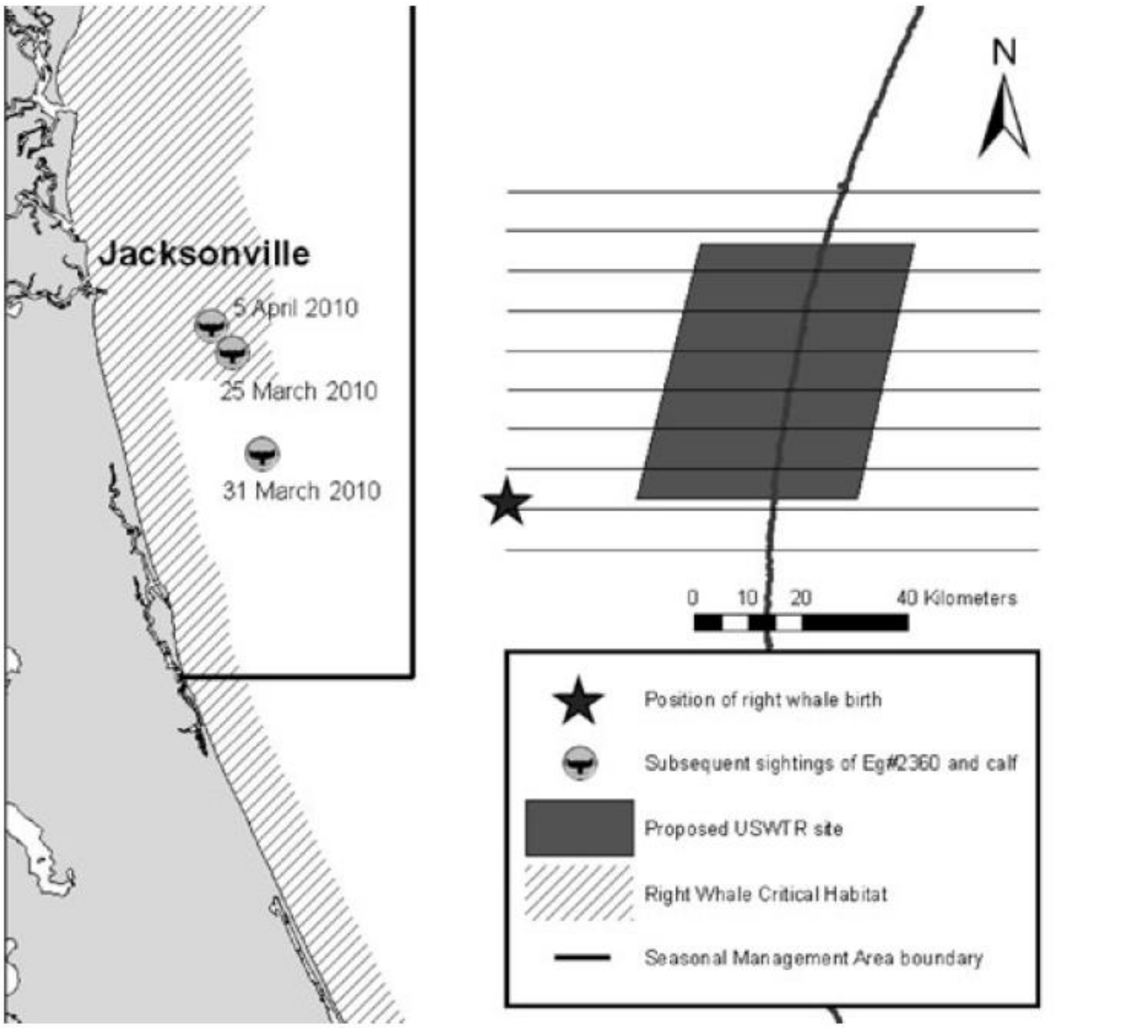

Figure 1. Location of observed right whale birth on 20 March 2010 off of Jacksonville, Florida including proposed Jacksonville Undersea Warfare Training Range (USWTR) site, aerial survey tracklines, Right Whale Critical Habitat, and Seasonal Management Area boundaries. Subsequent sightings of Eg#2360 and calf are also plotted.

Figure 1: Foley, H.J., Holt, R.C., Hardee, R.E., Nilsson, P.B., Jackson, K.A., Read, A.J., Pabst, D.A. and W.A. McLellan. 2011. Observations of a western North Atlantic right whale (*Eubalaena glacialis*) birth offshore of the protected Southeast U.S. critical habitat. *Marine Mammal Science*. 27(3): E234–E240.

(2) Cumulative impacts of simultaneous large-scale seismic surveys

NMFS defines “negligible impact” in 50 CFR 216.103 as “. . . an impact resulting from the specified activity that cannot be reasonably expected to, and is not reasonably likely to, adversely affect the species or stock through effects on annual rates of recruitment or survival.” We are concerned that both individually, and *cumulatively*, these applications transcend this federal definition.

Three of the four IHA requests are for commercial seismic exploration utilizing high energy air-guns. Two of these – Spectrum and TGS-NOPEC – have fully overlapping dates (beginning February 2016 for one year period) and geographic ranges. The third – ION – will be active from July through December 2016, in the sage geographic region. Together, these surveys will cover 67,591 linear km (Spectrum), 55,133 linear km (TGS-NOPEC), and 13, 062 linear km of tracklines.

While multiple large scale seismic surveys cannot physically occur simultaneously in a single location, the potential for an individual cetacean in any given geographic region to experience *serial exposures* by these operations is of concern. In addition, an individual of a migrating species may experience *serial exposures* across its migratory path. Such species include the bottlenose dolphin, for which cumulative takes are exceedingly high (Level A: 9322 individuals, Level B:139,291 individuals), and the critically endangered North Atlantic right whale, with a current population estimate of approximately 500 individuals (Level A:16 individuals, Level B: 105 individuals). These estimated take levels include consideration of the time-area closures specifically designed to protect the right whales. As a point of comparison, the Potential Biological Removal (PBR) for these species as determined by NOAA is 561 individual bottlenose dolphins, and 0.9 individual North Atlantic right whales. *The cumulative impacts of these surveys, both across time and space, should be considered when evaluating these IHA requests.*

(3) Cape Hatteras, North Carolina – a geographic region of special concern

The waters directly off Cape Hatteras, North Carolina support one of the most diverse assemblages, and highest densities, of cetacean species along the entire Atlantic coast (data available on OBIS SEAMAP; Roberts *et al.* 2015). Multiple aerial and vessel based survey efforts in this region have documented a minimum of 18 cetacean species, including the endangered North Atlantic right, humpback, fin, sei and sperm whales, multiple species of delphinids, and at least three species of beaked whales, at this site. This unique geographic area is included in all IHA requests, and is identified by Spectrum as the site of closest approach of air gun arrays to shore, and is similarly mapped by TGS-NOPEC.

Of special concern here, above and beyond the large number of species and individuals potentially exposed, is the potential impact on deep divers – including sperm and beaked whales. In the waters off Cape Hatteras, sperm whale mothers and very young calves have been sighted during aerial our surveys, and Cape Hatteras experiences neonate sperm whale strandings, a rare event anywhere along the Atlantic coast (North Carolina stranding data). Thus, this region is likley of of special concern for the reproductive success of this endangered species.

Beaked whales are also commonly found year-round at this site. As part of continued protected species monitoring of sites utilized by the US Navy along the mid- and southeast Atlantic coast, we have conducted monthly aerial surveys off Cape Hatteras. Survey tracklines cover from shallow continental shelf waters, across the continental shelf break, to deep pelagic waters. Between May 2011 and December 2014, we recorded 63 on-effort beaked whale sightings, representing 173 individuals. Beaked whales were observed in every month of the year off Cape Hatteras, with the highest number of sightings (n=42) from May through August. The most commonly encountered species, which was observed in every month of the year, was *Ziphius cavirostris* (n=36 sightings, 106 individuals). *Mesoplodon* spp. (n= 27 sightings, 67 individuals) were encountered in all months except September and October. With recent advances in species ID characteristics by our Lab, five mesoplodont sightings could be identified to species with *M. europaeus* (n= 5 sightings, 14individuals) being identified from May through July. All beaked whales were encountered only on the continental shelf break suggesting a very restricted distribution.

As deep divers, beaked whales are extremely difficult to detect using visual methods (Barlow and Gisiner 2006), and can even be difficult to detect utilizing passive acoustic monitoring (PAM) techniques. For example, although TGS-NOPEC describe in detail their plan for passive acoustic monitoring during surveys, for which they are to be commended, they state that the locations of individuals deeper than 904m depth, may not be accurately assessed using PAM. Beaked whales can routinely dive to over 1000m (e.g. Tyack *et al.* 2006; Schorr *et al.* 2014), and are often acoustically silent at depths less than 400m (Tyack *et al.* 2006). Thus, neither visual nor acoustic monitoring techniques are particularly useful for these species, which are found year round at this site (data available on OBIS SEAMAP). The cumulative impacts of seismic surveys are of special concern as deep-diving beaked whales have been shown to be vulnerable to high-amplitude, impulsive anthropogenic sounds. It is important to identify more efficient detection methods for these deep diving species.

In closing, as marine mammal stranding responders with over 30 years of experience in this region, we are concerned that if seismic surveys are conducted off our shores, there will be a public expectation that stranding events will be investigated to determine if seismic activity contributed to the event. This public concern, as well as the potentiality of this outcome, has to the best of our knowledge, not been addressed at any stage in the permitting process thus far.

We hope this information will be of value as NOAA considers the individual and cumulative impacts of seismic surveys on marine mammals in the mid- and southeast Atlantic.

Sincerely,

William A. McLellan
Research Associate
Biology and Marine Biology

D. Ann Pabst
Professor
Biology and Marine Biology

Jolie Harrison
Chief, Permits and Conservation Division
Office of Protected Resources
National Marine Fisheries Service.
1315 East-West Highway
Silver Spring, MD 20910

RE: Notice of Receipt of Applications for Incidental Harassment Authorization ("IHA") for Geophysical Surveys in the Atlantic Ocean, 80 Fed. Reg. 45,195 (July 29, 2015).

Dear Jolie:

We welcome the opportunity to comment on the Notice of Receipt of Applications for Incidental Harassment Authorizations ("IHA") for geophysical surveys in the Atlantic Ocean. Specifically, our comments focus on the following areas: use of the best available scientific information and most appropriate use of such information for assessing potential effects of the specified activities on marine mammals and their habitat; application approaches for estimating acoustic exposure and takes of marine mammals; and appropriate mitigation measures and monitoring requirements for these activities.

In particular, we express specific concerns over the following six issues.

1. **The use 160dB$_{RMS}$ re: 1μPa as a threshold for behavioral disturbance for cetaceans, particularly mysticetes including right whales, is scientifically indefensible**.

The existing paradigm by which NOAA evaluates the potential environmental impacts, effects and influences of anthropogenic acoustic activities, including seismic airgun array surveys, is fundamentally and scientifically flawed. Importantly, we believe that NOAA's existing paradigm is no longer based on the best available science. The paradigm relies on outmoded concepts that have been superseded by more advanced concepts based on recent scientific findings. In particular: (1) as noted below, the current paradigm does not consider aggregate effects from multiple anthropogenic sound sources (*e.g.* commercial shipping, multiple seismic operations, local vessel traffic); (2) it uses questionable density and distribution estimates (also see below); and (3) it does not account for the individual and aggregate uncertainties in model parameters. As such, the impacts as presently assessed do not adequately represent the biological risk, or the uncertainty in the assessment of that risk.

An example of the outdated impact assessment methodology is the use of the sound level of the seismic impulse itself as the cause for concern. It is now well known that, as a result of reflection and reverberation, energy from the impulse spreads into the time gaps between impulses and raises the background noise level by 30-45 dB throughout those gaps within at least 1 km of the survey and by 20-25 dB within 25-50 km from the survey. Furthermore, a rise in background noise level can extend out to >100 km from the seismic source, dramatically altering the low-frequency acoustic environment for the duration of the survey. Thus, restricting an assessment of a seismic survey to only the specific impulse (< 1 sec), within a restricted dB isopleth (160 dB) is simply wrong and scientifically unsound. These facts are not based on results from a model; they are based on empirical evidence during real-world seismic airgun array surveys from multiple locations in different ocean regimes[1]. It is particularly vexing that this knowledge is widespread within the scientific community, but is not reflected in *any* of these applications. We urge you to take into full account the entirety of the impact of such an extremely loud, repeated impulsive source.

Furthermore, it is scientifically indefensible that any current assessment of the environmental effects of a seismic survey considers only the individual activity (*e.g.* a single survey), rather than the aggregate of all activities that contribute to the acoustic environment. This single-activity approach applies simplistic methods based entirely on expected maximum sound exposure levels at points in time and uses decades-old guidelines.[2] It does not adequately integrate the full extent of the impacts over time, over space or across frequency domains. It is now well established that the sound level to which an animal is exposed, based either on empirical metrics or modeled estimates, is not the sole predictor of impact response, and that impact response is highly dependent on context[3]. Under the MMPA, the Fisheries Service established two regulatory thresholds defining "Takes": Level A—the threshold of permanent physical damage which includes permanent auditory threshold shift ("PTS"), tissue damage, and death; and Level B—any behavioral disruption from startle response and evasive actions to "temporary" auditory threshold shift ("TTS").[4] Under this regime, "Level A takes" and thus the "Level A"

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[1] Guerra, M., Thode, A. M., Blackwell, S. B., & Macrander, A. M. (2011). Quantifying seismic survey reverberation off the Alaskan North Slope. *Journal of the Acoustical Society of America*, *130*, 3046–3058.
[2] HESS (High Energy Seismic Survey) Team. 1999. High energy seismic survey review process and interim operational guidelines for marine surveys offshore southern California. Camarillo, CA: California State Lands Commission and US Minerals Management Service.
[3] Ellison WT, Southall BL, Clark CW, and Frankel A. 2012. A new context-based paradigm to assess behavioral responses of marine mammals to sound. Con. Bio. 26:21-28.
[4] "…any act that disturbs or is likely to disturb a marine mammal or marine mammal stock in the wild by causing disruption of natural behavioral patterns, including, but not limited to, migration, surfacing, nursing, breeding, feeding, or sheltering, to a

regulatory threshold is fairly unambiguous: A noise exposure does or is likely to maim or kill a marine mammal.

Level B takes, on the other hand, often occur well outside of our ability to directly observe the disruption, and typically outside the 1,000 m observation zones around such disruptive activities. The best available science clearly shows that behavioral disruptions occur at vastly lower noise exposure levels than the current regulatory thresholds for Level B disturbances,[5] and at much larger distances than on-board Marine Mammal Observers or passive acoustic monitoring can document. Taken as a whole, therefore, the proposed concurrent seismic airgun surveys over the Atlantic Outer-Continental Shelf operations will disrupt populations of marine mammals in a manner that is considerably more significant than reflected in any of the *individual* IHA applications.[6]

We are particularly concerned about potentially sensitive species, such as right whales. There have been no studies on the reactions of right whales to seismic airgun surveys, although we do know that this species responds strongly to acoustic stimuli at received levels far below the $160dB_{RMS}$ re: 1µPa threshold used to estimate response[7,8]. The closest analog we have for the response of right whales to seismic signals is from the related bowhead whale (*Balaena mysticetus*). This species shows responses to distant seismic signals at levels ~45 dB lower than the levels that evoked strong responses in right whales.[9]

Recent research reveals behavioral disruption(s) occurring at levels that are, in some cases, many orders of magnitude lower than the 160 dB threshold for impulsive noise. Indeed, the evidence that this threshold is outdated is compelling,

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point where such behavioral patterns are abandoned or significantly altered." Marine Mammal Protection Act, 2007 (MMPA 2007)

[5] $160dB_{RMS}$ re: 1µPa for behavioral disruption for impulsive noise (e.g., impact pile driving), $120dB_{RMS}$ re: 1µPa for behavioral disruption for non-pulse noise (e.g., vibratory pile driving, drilling) (MMPA 2007).

[6] None of the IHA's under review includes the likelihood that surveys will be occurring simultaneously with other surveys. This perspective is solely under the purview of the Fisheries Service, which the agency must incorporate into the permit approval process. For inadequacy of the propagation models, including more accurate models for concurrent surveys, and continuous "reverberant" noise in the far field, see Comment of Michael Stocker, OCS, to Gary D. Goeke, BOEM (April 30, 2014) (attached as Exhibit ##).

[7] Nowacek, DP et al. (2004) "North Atlantic right whales ignore ships but respond to alerting stimuli" Proc. R. Soc. Lond. B 271:227-231.

[8] Clark, C.W., and Clark, J.M. 1980. Sound playback experiments with southern right whales (Eubalaena australis). Science 207:663-665.

[9] Blackwell SB, Nations CS, McDonald TL, Thode AM, Mathias D, Kim KH, et al. (2015) "Effects of Airgun Sounds on Bowhead Whale Calling Rates: Evidence for Two Behavioral Thresholds." PLoS ONE 10(6): e0125720.

particularly based on the number of species for which responses have been documented:

- Bowhead whales increase call rates at initial detection of airguns at **94 dB re: 1μPa**, then decrease after 127 dB, and stop calling above 160 dB.[8]
- Harbor porpoise feeding buzzes[10] decreased 15% with exposure to seismic airguns at 130–165 dB.[11]
- Blue whale call rates increase with exposure to seismic "sparkers"[12] at 140 dB.[13]
- Fin whale call rates decrease and migratory disruption occurs when exposed to seismic airgun surveys at 175 to 285 km distance at noise levels below shipping noise.[14]
- Seismic survey activity disrupts the breeding display, or singing, of humpback whales.[15]
- Blue whales ceased calling upon exposure to airgun signals of 143 dB [16]

The results of the recent bowhead whale study have several profound implications regarding potential impacts on right whales from even a single seismic airgun array survey. The bowhead study was based on a very large, four-year data set that provided nearly 1 million bowhead calls of which 50,000 were used in the statistical model. Prior to this publication the study of bowhead whale responses to seismic surveys had been restricted to periods of a few weeks in areas that were restricted to within a few tens of miles from the source, yielding very limited sample sizes, with the resultant behavioral responses presenting often conflicting and incoherent

[10] Odontocete biosonar is characterized by siting clicks. Once the prey is sited the predator hones in on the prey in what sounds like a "buzz"—indicating a capture, and thus sustenance.
[11] Pirotta E, Brookes KL, Graham IM, Thompson PM. 2014 "Variation in harbour porpoise activity in response to seismic survey noise." Biol. Lett. 10: 20131090. http://dx.doi.org/10.1098/rsbl.2013.1090
[12] A "Sparker" is an electro-dynamic seismic impulse source that generates a loud electrical spark across a gap producing a plasma or vapor bubble that collapses and generates a low frequency impulse.
[13] Di Iorio D & Clark CW, *Exposure to seismic survey alters blue whale acoustic communication*, Biol. Lett. 6, 51–54 (2010).
[14] Manuel Castellote, Christopher W. Clark, Marc O. Lammers 2012 "Acoustic and behavioral changes by fin whales (*Balaenoptera physalus*) in response to shipping and airgun noise." Biological Conservation 147 (2012) 115–122
[15] Cerchio S, Strindberg S, Collins T, Bennett C, Rosenbaum H, (2014) "Seismic Surveys Negatively Affect Humpback Whale Singing Activity off Northern Angola." PLoS ONE 9(3): e86464.
[16] Mark A. McDonald, John A. Hildebrand, and Spahr C. Webb "Blue and fin whales observed on a seafloor array in the Northeast Pacific." J. Acoustical Society of America, 98:1 1995

results.[17] In contrast, the results from the large-scale Blackwell *et al*. (2015) study make sense of and bring the pieces of the puzzle into focus: The lessons learned from bowheads are directly transferrable to right whales. A responsible and adequate assessment of impact on an endangered marine mammal must incorporate monitoring, mitigation and ongoing research at appropriate biological and ecological scales. The present IHA proposals fail to address these fundamentally essential requirements.

2. Inconsistencies in the use of cetacean density models

Each of the four IHA applications derives estimates of the density of marine mammals from different sources that employ divergent methods. These include the CetMap model outputs[18], NODES model outputs[19], NMFS stock assessments, and preparation of their own density estimates from results reported on OBIS-SEAMAP and by the AMAPPS program. Only one application, from TGS-NOPEC, uses the most recently available spatial models of cetacean density – from the CetMap project[20] – and only for *some* of the species that would be affected. In our opinion, the CetMap spatial density models represent the best available scientific information and should be used in all applications. We note, however, that even the most recent CetMap models do not include AMAPPS survey results from 2010 to 2014 and so these models should be updated to include these data.

3. Choice of propagation models

The models used in the IHAs do not consider the existence of hard bottom habitat when calculating the propagation of the acoustic signals through the environment. Substantial portions of the continental shelf off the US Atlantic coast are characterized by hard-bottom habitat (e.g., reefs, hardgrounds)[20], indeed there is an estimated 14-30% hard-bottom habitat between Cape Hatteras and Cape Canaveral. The presence of these hard bottom habitats will substantially change the amount of

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[17] Richardson WJ, Malme CI (1993) Man-made noise and behavioral responses. In: Burns JJ, Montague JJ, Cowles CJ, editors. The bowhead whale. Special Publication No. 2, Society for 808 Marine Mammalogy. Lawrence, Kansas: Allen Press. pp. 631–700.

[18] Roberts J.J., B.D. Best, L.Mannocci, P.N. Halpin, D.L. Palka, L.P. Garrison, K.D. Mullin, T.V.N. Cole, W.M. McLellan, G.G. Lockhart. 2015. Habitat-based cetacean density models for the Northwest Atlantic and Northern Gulf of Mexico. Manuscript in preparation.

[19] Department of the Navy. 2007c. Navy OPAREA density estimates (NODE) for the southeast OPAREAS:VACAPES, CHPT, JAX/CHASN, and southeastern Florida & AUTEC-ANDROS. U.S. Dept. of the Navy,Naval Facilities Engineering Command, Atlantic: Norfolk, VA. Contract N62470-02-D-9997, Task Order 0060. Prepared by GeoMarine Inc., Hampton VA.

[20] Parker Jr., R. O., D. R. Colby, and T. D. Willis. 1983. Estimated amount of reef habitat on a portion of the U.S. South Atlantic and Gulf of Mexico continental shelf. Bull. Mar. Sci. 33: 935–940.

reverberation and attenuation of the seismic signals[21], making the propagation estimates in the IHAs potentially problematic, specifically hard-bottom habitat can and usually does result in less transmission loss, i.e., sound levels remain higher farther from the source.

4. **Meaningful analysis of cumulative impacts**

The assessment of the impact of seismic surveys is insufficient as it is limited to individual environmental assessments that focus only on the *loudest sound source type* (e.g. seismic airgun array) and only for a *single survey*. This ignores all the other sources and the large-scale changes to the acoustic environment as a result of the aggregate of all sources (e.g. sub-bottom profilers, support vessels, undersea communication systems, shipping vessels). The aggregate sound field, not just the specific airgun survey must be analyzed to estimate the overall influences of changes in the acoustic environment at appropriate ecological scales, the potential impacts on marine life, and the potential effects on populations.[22] Given our rapidly improving understanding of the spatial, temporal, and spectral scales of the acoustic footprints generated by these seismic activities, this single-source regulatory approach is no longer appropriate[23].

The National Marine Fisheries Service must consider the cumulative effects of these four proposed seismic surveys, as well as the four other applications that BOEM is currently considering. Considering only the four proposed seismic surveys currently under review, three of the four IHA permit applications propose conducting concurrent airgun surveys in the same times and areas. In an era where we now have the tools with which to quantify the dynamics of the resultant noise field from the aggregate of sound sources [24,25,26], and analyze cumulative[27] as well as

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[21] Urick, R. J. (1983). Principles of Underwater Sound (3rd ed.). New York: McGraw-Hill Co.
[22] Southall BL, Rowles T, Gulland F, *et al*. 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. Cambridge, UK: International Whaling Commission.
[23] Nowacek, D. P., Clark, C. W., Mann, D. A., Miller, P. J. O., Rosenbaum, H. C., Golden, J. S., et al. (2015). Marine seismic surveys and ocean noise: time for coordinated and prudent planning, *Frontiers in Ecology and the Environment*. doi: 10.1890/130286
[24] Streever W, Ellison WT, Frankel AS, Racca R, Clark CW, Fleishman E, Guerrra M, and Sformo T. 2012. Early progress and challenges in assessing aggregate sound exposure and associated effects on marine mammals. Soc. Petrol. Engr. Perth, AU, 11-13 Sep 2012, pp. 1-7.
[25] Dugan P, Zollweg J, Hawthorn D, Ponirakis D, Shiu Y, Klink H, Roch M, Clark C. Raven X: New Matlab based high performance computing toolbox for bioacoustics. The 7th International DCLDE [Detection, Classification, Localization, and Density Estimation] Workshop. 2015. San Diego, CA.

population level impacts[28], the treatment of the topic in the original BOEM G&G PEIS as well as for the IHAs currently under consideration is unacceptable.

5. **Level A takes on right whales**

As you know, the recovery of North Atlantic right whales has been hampered by two primary anthropogenic sources of mortality (ship strikes and entanglement in fishing gear). However, the population also experiences a significantly reduced reproductive rate; the fecundity of this population is only about 1/3 of that of southern right whales[29]. Most of the right whale population migrates along the east coast of the U.S. and Canada, so it is exposed to a variety of acoustic stressors, including shipping, sonar, military exercises and seismic exploration. It has been demonstrated that right whales exhibit increased and chronic stress levels when exposed to shipping noise[30]. Chronic stress has been associated with poor health, reduced fecundity, and suppressed immune systems, so industrial noise in the Atlantic may be contributing to reduced reproductive rates in this species[31]. The

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[26] Ponirakis DW, Dugan PJ, Zollweg JA, Porter MB, and Clark CW A Matlab based HPC toolset for noise analysis of large acoustic datasets**.** The 7th International DCLDE [Detection, Classification, Localization, and Density Estimation] Workshop. 2015. San Diego, CA.
[27] Schick, R. S., Kraus, S. D., Rolland, R. M., Knowlton, A. R., Hamilton, P. K., Pettis, H. M., et al. (2013). Using Hierarchical Bayes to Understand Movement, Health, and Survival in the Endangered North Atlantic Right Whale. *PLoS One*, *8*(6), e64166. http://doi.org/10.1371/journal.pone.0064166.
Christiansen, F., Bertulli, C. G., Rasmussen, M. H., & Lusseau, D. (2015). Estimating Cumulative Exposure of Wildlife to Non-Lethal Disturbance Using Spatially Explicit Capture–Recapture Models. *Journal of Wildlife Management*, 1–14. http://doi.org/10.1002/jwmg.836
[28] King, S. L., Schick, R. S., Donovan, C., Booth, C. G., Burgman, M., Thomas, L., & Harwood, J. (2015). An interim framework for assessing the population consequences of disturbance. *Methods in Ecology and Evolution*, n/a–n/a. http://doi.org/10.1111/2041-210X.12411
New, L. F., Harwood, J., Thomas, L., Donovan, C., Clark, J. S., Hastie, G., et al. (2013). Modeling the biological significance of behavioural change in coastal bottlenose dolphins in response to disturbance. *Functional Ecology*, *27*(2), 314–322. http://doi.org/10.1111/1365-2435.12052
[29] Kraus, S. D., Rolland, RM, Eds. (2007). The Urban Whale: North Atlantic Right Whales at the Crossroads. Harvard University Press.
[30] Rolland, R. M., Parks, S. E., Hunt, K. E., Castellote, M., Corkeron, P. J., Nowacek, D. P., et al. (2012). Evidence that ship noise increases stress in right whales. *Proceedings of the Royal Society B-Biological Sciences*, *279*(1737), 2363–2368. http://doi.org/10.1098/rspb.2011.2429
[31] Rolland, R. M., & Hamilton, P. K. (2007). Faecal sampling using detection dogs to study reproduction and health in North Atlantic right whales (*Eubalaena glacialis*).

cumulative impacts of these multiple acoustic stressors must be taken into consideration when considering these IHA requests.

The NMFS is statutorily responsible for the recovery of the North Atlantic right whale. It cannot fulfill this responsibility unless it fully examines the potential effects of new industrial activities that will affect right whale habitat. This requires: (1) a quantitative cumulative analysis of all the proposed seismic activities in the Atlantic; (2) an assessment of the degree of masking and disturbance that will take place in right whale habitat during these activities, including in-water verification and monitoring; (3) an acoustic monitoring program while seismic surveys are underway, with the option of shutting down seismic activity if the received level of seismic signals in right whale habitat exceed a level commensurate with those levels known to elicit strong reactions[7]; and (4) a behavioral and health assessment program to evaluate the potential for elevations of chronic disturbance over baseline levels.

6. **Effects of multi-beam echosounder and sub-bottom profiler**

One of the IHA applications, submitted by 'TDI-Brooks and ONE East Coast Multibeam Bathymetry Program' proposes to use multi-beam sonar system, the Kongsberg EW122, and a sub-bottom profiler, specifically Massa TR-1075 sub-bottom profiler. We commend these companies for requesting an IHA and, in so doing acknowledging the potential impact of these systems, but it is disturbing that this application does not cite the report that has documented the association of these types of systems with impacts on marine mammals, specifically the Madagascar stranding of melon-headed whales (*Peponocephala electra*)[22]. The authors of this report openly acknowledge that there is no firm cause-effect connection between the whale stranding and the use of the multi-beam system, but temporally it was the closest associated event. Furthermore, the authors of the Madagascar report make several recommendations about how the potential impacts of these systems should be included in environmental assessments. So, the omission of this report is glaring in this application, particularly as it appears the companies plan to use the very same vessel that was involved in the Madagascar incident.

We would be happy to discuss these issues with you and/or your staff.

Sincerely,

Doug Nowacek, Ph.D.
Repass-Rodgers Chair of Marine Conservation Technology
Nicholas School of the Environment & Pratt School of Engineering
Duke University

Christopher Clark, Ph.D.
Senior Scientist
Bioacoustics Research Program
Cornell University

Scott Kraus, Ph.D.
Vice President of Research
John H. Prescott Marine Laboratory
New England Aquarium

Andrew J. Read, Ph.D.
Stephen Toth Professor of Marine Biology
Division of Marine Science and Conservation
Nicholas School of the Environment
Duke University

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

August 28, 2015

VIA EMAIL (ITP.Laws@NOAA.gov)

Jolie Harrison
Chief, Permits and Conservation Division Office of Protected Resources
National Marine Fisheries Service
1315 East-West Highway
Silver Spring, MD 20910

Re: Comments on an Incidental Harassment Authorization Application for the Incidental Taking of Marine Mammals During A Geophysical Survey in the Atlantic Ocean

Dear Ms. Harrison:

CGG has prepared comments in response to the National Marine Fisheries Service's ("NMFS") notice and request for comments on four pending Incidental Harassment Authorization ("IHA") applications for the proposed seismic surveys in the Mid- and South Atlantic Outer Continental Shelf ("OCS"). CGG concurs with the joint industry comment letter provided by the International Association of Geophysical Contractors ("IAGC"), the American Petroleum Institute ("API"), and the National Ocean Industries Association ("NOIA"). We appreciate NMFS's consideration of the comments set forth below.

CGG disagrees with any applicant's request for Level A harassments in their IHA application. We agree with the joint industry comments regarding unrealistic exposure estimates because that applicant (1) failed to consider mitigation measures and (2) misrepresented the ensonification field of their seismic acoustic source. In over four decades of offshore Geological and Geophysical ("G&G") activity, there has been no empirical evidence that concludes the acoustic source used during seismic surveys has had injurious or mortal consequences on marine mammals. Furthermore, IHAs issued for previous G&G surveys have shown that realized Level B takes are far less than the number of estimated takes authorized, supporting the conclusion that G&G activities have negligible effects on individual marine mammals and stocks. This is attributed to the implementation of mitigation measures, based on best available science, which are designed to minimize deleterious effects on marine mammals and their environment.

CGG supports the issuance of IHAs for Level B harassment that are consistent with the best available data and information. We respectfully encourage NMFS to ensure that only reasonable and effective mitigation measures consistent with both the law and justified science are included as conditions of the IHAs and the related federal authorizations. We appreciate your consideration of our comments.

Sincerely,

Matt Bognar, SVP
CGG Multi-Client North America

August 28, 2015

VIA EMAIL (ITP.Laws@NOAA.gov)

Jolie Harrison
Chief, Permits and Conservation Division Office of Protected Resources
National Marine Fisheries Service
1315 East-West Highway
Silver Spring, MD 20910

Re: Comments on Incidental Harassment Authorization Applications for the Incidental Taking of Marine Mammals During Geophysical Surveys in the Atlantic Ocean

Dear Ms. Harrison:

This letter provides the comments of the International Association of Geophysical Contractors ("IAGC"), the American Petroleum Institute ("API"), and the National Ocean Industries Association ("NOIA") (collectively, the "Associations") in response to the National Marine Fisheries Service's ("NMFS") request for comments on four pending Incidental Harassment Authorization ("IHA") applications for geophysical surveys in the outer continental shelf ("OCS") of the Atlantic Ocean. We appreciate this opportunity to preliminarily comment on the pending applications, and we strongly support geophysical surveying in the Mid- and South Atlantic OCS, which furthers our common interest in the safe and responsible development of domestic oil and gas reserves.

I. THE ASSOCIATIONS

IAGC is the international trade association representing geophysical services companies that support and provide critical data to the oil and natural gas industry. IAGC members (including companies engaged in geophysical data acquisition, processing and interpretation, geophysical information ownership and licensing, and associated services and product providers) play an integral role in the successful exploration and development of offshore hydrocarbon resources through the acquisition and processing of geophysical data. IAGC members have expressed interest in conducting geophysical activities on the Atlantic OCS, and all three of the seismic survey IHA applicants are IAGC members.

API is a national trade association representing over 625 member companies involved in all aspects of the oil and natural gas industry. API's members include producers, refiners, suppliers, pipeline operators, and marine transporters, as well as service and supply companies that support all segments of the industry. API and its members are dedicated to meeting environmental requirements, while economically developing and supplying energy resources for consumers.

NOIA is the only national trade association representing all segments of the offshore industry with an interest in the exploration and production of both traditional and renewable energy resources on the U.S. OCS. The NOIA membership comprises more than 325 companies engaged in a variety of business activities, including seismic surveying, production, drilling, engineering, marine and air transport, offshore construction, equipment manufacture and supply, telecommunications, finance and insurance, and renewable energy.

II. COMMENTS

A. Approval of IHA applications for Atlantic surveys is consistent with the MMPA and furthers Congressional directives to develop oil and gas reserves in the OCS.

The Marine Mammal Protection Act ("MMPA"), 16 U.S.C. §§ 1361-1407, provides mechanisms for the authorization of the incidental taking of small numbers of marine mammals. 16 U.S.C. § 1371(a)(5)(A)(i); 50 C.F.R. § 216.107. To issue an incidental take authorization, NMFS must find that the proposed activity (i) is limited to a "specified geographical region," (ii) would result in the incidental take of "small numbers" of marine mammals, and (iii) have no more than a "negligible impact" on a marine mammal species or stock. 16 U.S.C. § 1371(a)(5)(A). NMFS has a long and successful history of issuing such authorizations for seismic surveys in the Beaufort and Chukchi Seas, and in Cook Inlet, Alaska.

NMFS's authorization of marine mammal take incidental to exploratory activities in the Atlantic OCS is consistent with the Outer Continental Shelf Lands Act ("OCSLA"), which mandates the "expeditious and orderly development" of the OCS "subject to environmental safeguards," such as those provided under the MMPA. 43 U.S.C. § 1332(3). The U.S. Bureau of Ocean Energy Management ("BOEM") currently estimates that the Mid- and South Atlantic OCS holds at least 4.72 billion barrels of oil and 37.51 trillion cubic feet of natural gas.[1] Although these estimates are impressive, it is widely believed that modern seismic imaging—the only feasible technology that accurately creates a subsurface image before a well is drilled—will aid in better locating and dissecting prospective areas for exploration and provide more realistic estimates of the potential resource. The pending geophysical survey proposals will facilitate the safe and orderly development of oil and gas reserves in the Mid- and South Atlantic OCS.

[1] *See* http://www.boem.gov/Assessment-of-Oil-and-Gas-Resources-2014-Update/.

Seismic modeling not only helps to delineate reserves, it also significantly reduces environmental risk by increasing the likelihood that exploratory wells will successfully tap hydrocarbons and decreasing the number of wells that need to be drilled in a given area. This reduces the overall environmental impact of oil and gas development by limiting the footprint of exploration. Because survey activities are temporary and transitory, they are the least intrusive and most cost-effective means to understanding where recoverable oil and gas resources likely exist in the Mid- and South Atlantic OCS.

In addition, more than four decades of worldwide seismic surveying and scientific research indicate that the risk of physical injury to marine life from seismic survey activities is extremely low. Currently, there is no scientific evidence demonstrating biologically significant negative impacts to marine life from seismic surveying. As stated by BOEM in its August 22, 2014, *Science Note*:

> 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.

http://www.boem.gov/BOEM-Science-Note-August-2014/.

Finally, it bears mention that IAGC, API, and the oil and gas industry fund independent research to further our understanding of the potential effects of seismic surveys on marine animals including mammals. This helps to reduce uncertainties about the possible effects of seismic surveys. Some of this research, in addition to other frequently cited references regarding the effects of sound on marine life, is reviewed in the annotated bibliography included as Attachment A to the April 29, 2015 comment letter of IAGC, API, and NOIA (which is included in the Appendix attached hereto).

B. The best available science demonstrates that seismic surveys do not cause Level A harassment and, therefore, authorization of Level A harassment is not required.

Under the MMPA, Level A harassment is defined as "any act of pursuit, torment, or annoyance which . . . has the potential to <u>injure</u> a marine mammal or marine mammal stock in the wild." 16 U.S.C. § 1362(18)(A)(i) (emphasis added); *see also* 50 C.F.R. § 216.3. In addition, NMFS is required to base marine mammal incidental take authorizations on the "best scientific evidence available." 50 C.F.R. § 216.102(a). We are aware of no scientific evidence demonstrating that seismic activities have resulted in the <u>injury</u> of marine mammals. To the contrary, the history of incidental take authorizations for offshore seismic activities shows that seismic operations have negligible impacts to individual marine mammals and to marine mammal stocks, and that levels of actual incidental take (Level B) are far smaller than even the most balanced pre-operation estimates of incidental take.[2]

[2] *See, e.g.*, BOEM, *Final EIS for Gulf of Mexico OCS Oil and Gas Eastern Planning Area Lease Sales 225 and 226*, at 2-22 (2013), http://www.boem.gov/BOEM-2013-200-v1/ ("Within the CPA, which is directly adjacent to the EPA, there is a long-standing and well developed OCS Program (more than 50 years); there are no data to suggest that activities from the preexisting OCS Program are significantly impacting marine mammal populations."); BOEM, *Final EIS for Gulf of Mexico OCS Oil and Gas Western Planning Area (WPA) Lease Sales 229, 233, 238, 246, and 248 and Central Planning Area (CPA) Lease Sales 227, 231, 235, 241, and 247*, at 4-203 (v.1) (2012), http://www.boem.gov/Environmental-Stewardship/Environmental-Assessment/NEPA/BOEM-2012-019_v1.aspx (WPA); *id*. at 4-710 (v.2), http://www.boem.gov/Environmental-Stewardship/Environmental-Assessment/NEPA/BOEM-2012-019_v2.aspx (CPA) ("Although there will always be some level of incomplete information on the effects from routine activities under a WPA proposed action on marine mammals, there is credible scientific information, applied using acceptable scientific methodologies, to support the conclusion that any realized impacts would be sublethal in nature and not in themselves rise to the level of reasonably foreseeable significant adverse (population-level) effects."); BOEM, *Final Supplemental EIS for Gulf of Mexico OCS Oil and Gas WPA Lease Sales 233 and CPA Lease Sale 231*, at 4-30, 4-130 (2013), http://www.boem.gov/uploadedFiles/BOEM/BOEM_Newsroom/Library/Publications/2013/BOEM%202013-0118.pdf (reiterating conclusions noted above); MMS, *Final Programmatic EA, G&G Exploration on Gulf of Mexico OCS*, at III-9, II-14 (2004), http://www.nmfs.noaa.gov/pr/pdfs/permits/mms_pea2004.pdf ("There have been no documented instances of deaths, physical injuries, or auditory (physiological) effects on marine mammals from seismic surveys."); *id*. at III-23 ("At this point, there is no evidence that adverse behavioral impacts at the local population level are occurring in the GOM."); LGL Ltd., *Environmental Assessment of a Low-Energy Marine Geophysical Survey by the US Geological Survey in the Northwestern Gulf of Mexico*, at 30 (Apr.-May 2013), http://www.nmfs.noaa.gov/pr/pdfs/permits/usgs_gom_ea.pdf ("[T]here has been no specific documentation of TTS let alone permanent hearing damage, i.e., PTS, in free-ranging marine mammals exposed to sequences of airgun pulses during realistic field conditions."); 75 Fed. Reg. 49,759, 49,795 (Aug. 13, 2010) (issuance of IHA for Chukchi Sea seismic activities ("[T]o date, there is no evidence that serious injury, death, or stranding by marine mammals can occur from exposure to airgun pulses, even in the case of large airgun arrays.")); MMS, *Draft Programmatic EIS for OCS Oil & Gas Leasing Program, 2007-2012*, at V-64 (Apr. 2007) (citing 2005 NRC Report), http://www.boem.gov/Oil-and-Gas-Energy-Program/Leasing/Five-Year-Program/5and6-ConsultationPreparers-pdf.aspx (MMS agreed with the National Academy of Sciences' National Research Council that "there are no documented or known population-level effects due to sound," and "there have been no known instances of injury, mortality, or population level effects on marine mammals from seismic exposure ").

Given this well-established scientific record, the Associations firmly take the position that the authorization of Level A harassment incidental to seismic surveys is not consistent with the best available science and, therefore, is not warranted or appropriate. In this context, the Associations note that one of the four Atlantic IHA applications requests authorization for Level A harassment. For the reasons stated above and below, the Associations disagree with the projections of Level A harassment set forth in that application.

As a general matter, the Level A take estimates described in the application improperly equate projected received sound levels to take. Potential exposure to certain sound levels does not necessitate that injury may occur. For example, the application estimates 9,017 Level A takes of bottlenose dolphins based only on potential exposures. However, even if 9,017 exposures to 180 dB SPL rms occurs, the best available science demonstrates that temporary threshold shift ("TTS") will <u>not</u> occur to bottlenose dolphins at this level of exposure. *See infra* § II.C.1. Moreover, it is well-accepted that the assumption that exposure to 180 dB SPL rms causes injury to marine mammals is incorrect and contrary to the best available science.[3] NMFS is <u>not</u> bound by this outdated acoustic criteria and, instead, must determine the potential type and levels of take that are "reasonably likely" or "reasonably expected" to occur based on the <u>best scientific evidence available</u>. 50 C.F.R. §§ 216.102(a), 216.103.[4]

More specifically, the subject IHA application appears to contain a number of incorrect assumptions that contribute to incorrect estimates of Level A harassment. Some of these assumptions are as follows:

- The application does not take into account the fact that many, if not all, animals will react to sound and leave an area before they enter areas with sounds levels exceeding the threshold that NMFS assumes will result in Level A harassment. The models used in the application do not appear to incorporate animal behaviors, such as avoidance to "ramping up" sound sources, which would substantially reduce the

[3] *See* Southall, B.L., Bowles, A.E., Ellison, W.T., Finneran, J.J., Gentry, R.L., Greene, Jr., C.R., Kastak, D., Ketten, D.R., Miller, J.H., Nachtigall, P.E., Richardson, W.J., Thomas, J.A., and Tyack P.L. 2007. Marine mammal noise exposure criteria: Initial scientific recommendations. *Aquatic Mammals,* 33:411-521; Finneran, J.J., and Jenkins, A.K. 2012. Criteria and thresholds for U.S. Navy acoustic and explosive effects analysis. San Diego, California: SPAWAR Systems Center Pacific.

[4] In fact, NMFS has used other criteria as the basis for recent MMPA incidental take authorizations. *See* 80 Fed. Reg. 46,112, 46,148-49 (Aug. 3, 2015); 80 Fed. Reg. 13,264, 13,280-81 (Mar. 13, 2015).

estimated number of exposures (which, in any event, do not equate to take, as described above).[5]

- The application assumes that Level A take will occur beyond 500 meters from the sound source, but does not propose to power down or shut down operations for detections beyond 500 meters. It is well-established that marine mammal observations can be made well past 500 meters and seismic operators have a longstanding history of successfully employing power down and shut down procedures for marine mammal observations beyond 500 meters and, thereby, avoiding exposure at levels that NMFS incorrectly assumes will result in Level A harassment.

- The application appears to make overly conservative assumptions in its source characterization, which result in abnormally large acoustic propagation ranges. In some cases, these assumed acoustic propagation ranges are more than double the size of the ranges calculated in the other two seismic survey applications, which increases the assumed affected area by a factor of four.[6]

Finally, except for very limited exceptions,[7] incidental take authorizations have been issued for seismic survey operations for only Level B harassment, not Level A harassment. The extensive record from these authorizations, including substantial monitoring documentation, demonstrates that commonly employed avoidance and mitigation measures (that are less stringent than those proposed in the pending applications) are effective in avoiding Level A harassment and minimizing the amount of Level B harassment. Again, we are aware of no information demonstrating that seismic survey operations have resulted in documented Level A harassment. Based on the extensive scientific record, multiple agency findings, and well-documented monitoring records, the Associations firmly take the position that (1) with the use of

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[5] *See, e.g., Issuance of IHA to Apache Alaska Corp. for Seismic Survey in Cook Inlet*, 79 Fed. Reg. 13,626, 13,636-37 (Mar. 11, 2014); *Issuance of IHA to TGS-Nopec for Seismic Survey in Chukchi Sea*, 78 Fed. Reg. 51,147, 51,160 (Aug. 20, 2013).

[6] We note that the applicant may correct these, and other, assumptions by submitting a revised IHA application for NMFS's consideration. Such a revised application would appropriately request authorization for only Level B harassment and propose mitigation measures that effectively avoid Level A harassment.

[7] *See, e.g.*, 80 Fed. Reg. 40,016 (July 13, 2015) (SAExploration IHA for Beaufort Sea survey); 77 Fed. Reg. 65,060 (Oct. 24, 2012) (ION Geophysical IHA for Beaufort Sea and Chukchi Sea survey). In both of these instances, the applicant requested authorization for only Level B harassment, but NMFS nonetheless authorized Level A harassment in the IHA.

proper mitigation measures, seismic survey operations can and do avoid Level A harassment; and (2) the authorization of Level A take incidental to seismic survey operations is therefore not warranted or appropriate.

C. Mitigation programs are effective in limiting and preventing the incidental take of marine mammals.

The best available scientific data and information demonstrate that mitigation programs can effectively minimize and avoid the incidental take of marine mammals as a result of offshore geophysical survey operations. Insofar as we are aware, no seismic activities that have received MMPA incidental take authorizations have caused impacts beyond a temporary change in behavior and there are no known injuries, mortalities, or other adverse consequences to any marine mammal species or stocks.

The majority of IHA applications currently under consideration by NMFS incorporate some of the mitigation measures recommended in the preferred alternative of BOEM's Atlantic Geological and Geophysical Activities Programmatic Environmental Impact Statement ("PEIS").[8] The Associations commented in detail on these proposed measures. *See* Appendix. For the reasons stated in our previous comment letters, some of the measures proposed by BOEM are not consistent with the best available science and/or are unnecessarily overbroad. Notably, however, BOEM has stated that it will not apply those measures uniformly, but rather will apply certain mitigation measures to fit specific circumstances. We encourage NMFS to also apply only those mitigation measures that are appropriate for specific circumstances and that result in the least practicable adverse impact. Although the IHA applicants are free to voluntarily propose some of the mitigation measures recommended by BOEM, we restate below the reasons why some of those measures are either overly broad or not based on the best available science. We also adopt by reference our previous comments with respect to mitigation measures (*see* Appendix).

1. Exclusion zones

All of the IHA applicants commit to using exclusion zones to prevent marine mammal exposure to sound pressure levels of 180 dB re 1 µPa rms or more for cetaceans and 190 dB re 1 µPa rms for pinnipeds. Although the PEIS recommends a minimum exclusion zone of 500 m, exclusion zones should be based on the best available science and modeling, and if that modeling demonstrates that exclusion zones of less than 500 meters are warranted, then there is no basis for arbitrarily requiring a minimum exclusion zone of 500 m. This flexibility is consistent with both NMFS's and BOEM's commitments to adaptive management.

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[8] *See* Record of Decision, BOEM PEIS, available at http://www.boem.gov/Record-of-Decision-Atlantic-G-G/. The full PEIS, including appendices, is available at http://www.boem.gov/BOEM-2014-001-v1/.

The applicants also commit to shutting down seismic arrays where marine mammals are detected in the exclusion zone. The PEIS contains one exception to its proposed mandatory shut down policy—for dolphins that voluntarily enter the exclusion zone. Although this measure is adopted by multiple IHA applicants, we would like to emphasize, for reasons stated in our previous comments, that any shutdown for dolphins that enter the exclusion zone is unwarranted. A recently published study that investigated whether bottlenose dolphin exposure to seismic air pulse at cumulative sound exposure levels of 185-196 dB re 1 μPa^2-s results in a noise-induced TTS found that, even at that level of exposure, there was no evidence of TTS.[9] Additionally, observation reports continue to indicate that there is no significant difference between the frequency of dolphin sightings and acoustic detections during seismic operations, whether the source is active or silent.[10] In sum, mandatory dolphin shutdown mitigation measures, even when the animal does not "voluntarily" enter the exclusion zone, would broadly and substantially impact seismic operations without any corresponding environmental benefit and without any scientific support.

2. Buffer zones between concurrent surveys

Generally, the IHA applicants propose 40 km buffer zones between seismic operations (as recommended in the PEIS), and one applicant proposes a 60 km buffer zone between concurrent surveys. Consistent with our comments on the PEIS, we reiterate here that the best available scientific information does not support buffer zones of 40 km. This measure was not included in NMFS's Biological Opinion (associated with the PEIS), and BOEM has offered no evidence to support its underlying assumption that marine mammals would utilize the "corridor" that the separation requirement is designed to create. Indeed, in its Record of Decision, BOEM acknowledges "uncertainty about [the] effectiveness of this measure." Record of Decision at 6.

The IHA applicants are, of course, free to propose mitigation buffer zones that are appropriate for their specific surveys, and to the extent they propose the 40 km buffer zone recommended in the PEIS, they are agreeing to mitigation measures that go above and beyond what is necessary based upon the best available scientific information. The Associations also wish to clarify that they do not support the proposal for 60 km buffer zones, which clearly are not required based on the extensive scientific record. As stated in previous comments, the

[9] Finneran J.J., Schlundt C.E., Branstetter, B.K., Trickey, J.S., Bowman, V., and Jenkins, K. Effects of multiple impulses from a seismic air gun on bottlenose dolphin hearing and behavior. 137 J. Acoust. Soc. Am. 1634-46 (April 2015).

[10] *See* Barkaszi, M.J., M. Butler, R. Compton, A. Unietis, and B. Bennet. 2012. Seismic survey mitigation measures and marine mammal observer reports. U.S. Dept. of the Interior, Bureau of Ocean Energy Management, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study BOEM 2012-015. *See also* Attachment D to April 29, 2015 letter of IAGC, API, and NOIA (included in Appendix).

Associations recommend either no buffer zone or, alternatively, a 17.5 km buffer zone consistent with standard industry practice.

3. Mandatory "all clear" periods

All of the IHA applicants propose mandatory "all clear" periods, but two of the applicants propose a 30-minute window as opposed to the 60-minute "all clear" period proposed by BOEM in the PEIS. As a practical matter, expanding the standard 30-minute "all clear" period to 60 minutes would substantially increase the duration and cost of seismic surveys, which, in turn, increases safety and environmental risks. Increased survey time will also increase the amount of time that protected species are exposed to the potential effects associated with the presence of vessels.

Moreover, a mandatory 60-minute "all clear" period would be both novel and not supported by the best available science. To our knowledge, a 60-minute "all clear" period has never been required as a condition of any offshore seismic authorization in the United States. In fact, the routine and proven practice is to require a 30-minute or less "all clear" period for marine mammals.[11] There is no available information suggesting that the standard practice has not been effective and, to the contrary, all available information demonstrates that the standard practice has been very successful in protecting marine mammals. *See* footnotes 2 and 11. Mitigation measures required in an IHA must be supported by the best available science and limited to those that effect the "least practicable adverse" impact. A 60-minute "all clear" period is not supported

[11] Since the ROD was issued, additional MMPA incidental take authorizations that include 15- and 30-minute "all clear" periods have been proposed by NMFS. *See Issuance of IHA to Apache Alaska Corp. for Seismic Survey in Cook Inlet*, 79 Fed. Reg. 13,626, 13,636-37 (Mar. 11, 2014) (requiring 30-minute observation period before startup and after sightings of killer and ESA-listed beluga whales and large odontocetes, but only 15-minute period after sightings of pinnipeds and small odontocetes); *Issuance of IHA to Apache Alaska Corp. for Seismic Survey in Cook Inlet*, 78 Fed. Reg. 12,720, 12,732-33 (Feb. 25, 2013) (providing same requirements, and specifying that the shorter 15-minute clearance period applies to harbor porpoises); *Issuance of IHA to TGS-Nopec for Seismic Survey in Chukchi Sea*, 78 Fed. Reg. 51,147, 51,154, 51,160 (Aug. 20, 2013) (same); *Issuance of IHA to Shell and WesternGeco for Seismic Surveys in the Beaufort and Chukchi Seas*, 73 Fed. Reg. 66,106, 66,135-36 (Nov. 6, 2008) (requiring 30-minute observation period before ramp-up and 15- or 30-minute delay of ramp-up for sightings of small odontocetes and pinnipeds, or baleen whales and large odontocetes, including ESA-listed species, respectively); *Issuance of ITR for Oil and Gas Activity in Chukchi Sea*, 78 Fed. Reg. 35,364, 35,424, 35,425 (June 12, 2013) (requiring monitoring period of 30 minutes for walruses and ESA-listed polar bears before startup and after sighting); *Issuance of ITR for Oil and Gas Activity in Beaufort Sea,* 76 Fed. Reg. 47,010, 47,052 (Aug. 3, 2011) (same).

by the best available science and is not necessary to achieve the least practicable adverse impact.[12]

4. Vessel Strike Avoidance

In general, the pending IHA applications propose vessel strike avoidance measures that are more than adequate to effectively avoid vessel strikes. For example, the following measures are adopted in the majority of the pending IHA applications:

- Reducing speed to 10 knots or less when transiting across designated areas closed to active seismic operations for North Atlantic Right Whales ("NARW");
- Maintaining a 500 meter distance from any NARW and a 100 meter distance from any species listed under the Endangered Species Act ("ESA"); and
- Utilizing avoidance measures (e.g., vessel direction or speed alteration) if an ESA-listed species is seen within 100 m of the vessel.

The necessity of these proposed measures should be evaluated in the proper context. Seismic vessels are different than typical vessels due to the substantial amount of specialized equipment that they tow. Operationally, a seismic vessel must maintain forward motion to sustain the equipment spread. The consequence of immediately shifting the engine into neutral due to a marine mammal sighting could be significant equipment damage (potentially in the tens of millions of dollars), weeks of vessel downtime, and additional related safety risks to crew members. As a practical matter, a seismic vessel moving at 3 to 5 knots is very unlikely to strike an ESA-listed marine mammal. For instance, in the event of a sighting of an ESA-listed whale within 100 m of the vessel, the vessel could reasonably be expected to slow (to no less than 3 knots) and turn gently away from the animal, which would effectively avoid a collision and lessen the risk of damage to seismic equipment.[13]

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[12] Although a 60-minute "all clear" period is referenced in BOEM's Record of Decision, BOEM also indicated that "mitigation measures themselves will be reviewed as part of BOEM's commitment to adaptive management" in "subsequent environmental reviews of site-specific action." Record of Decision at 8. Moreover, BOEM's Record of Decision does not dictate the content of MMPA authorizations issued by NMFS, which must be based on the most rational conclusions that NMFS can draw from the best available science.

[13] *See, e.g., Issuance of IHA to SAExploration, Inc. for Seismic Survey in Cook Inlet*, 80 Fed. Reg. 29,162, 29,176 (May 20, 2015) ("NMFS neither anticipates nor authorizes takes of marine mammals from ship strikes."); PEIS at xiv ("It is unlikely that survey vessels would strike marine mammals because they would travel slowly during surveys (typically between 4.5-6 knots [kn]).").

We do not object to the IHA applicants proposing the above-listed vessel avoidance measures so long as they are practical and feasible for the operators. Indeed, some of the IHA applications reasonably provide that these measures will be implemented "when safety allows" or "to the extent practicable." This acknowledges the inherent limitations of fully operating seismic vessels and important safety concerns balanced against the very low strike risk posed by seismic vessels.

5. Protected species observers ("PSOs")

All four IHA applications commit to employing trained PSOs to maintain watch for marine mammals, including those protected under the ESA. The use of PSOs is a long-established, effective means of limiting the potential incidental take of cetaceans and pinnipeds.

More broadly, however, we recommend that NMFS not uniformly require implementation of the recommendations described in NOAA Technical Memorandum NMFS-OPR-49, *National Standards for a Protected Species Observer and Data Management Program: A Model Using Geological and Geophysical Surveys* (Nov. 2013) ("Observer Standards"). Although we appreciate the agencies' attempt to clarify and standardize observer guidelines and requirements, we believe the Observer Standards are flawed in a number of respects and have not yet been subject to public review and input. *See* May 7, 2014 comment letter of IAGC, API, and NOIA, Attachment A (included in Appendix). Among other things, the standards should encourage adaptive technology, remote monitoring, reduction of health, safety, and environmental risks, and use of an updated reporting form that provides substantive data from observations to inform the need (if any) for additional or revised mitigation measures. Although one of the IHA applicants has voluntarily proposed to adopt the Observer Standards, NMFS should not impose those standards on other current or future applicants.

6. Passive acoustic monitoring ("PAM")

Three of the four pending IHA applications commit to the use of PAM during all survey activities, whether or not visibility is compromised. The Associations recognize the utility of PAM during periods of low visibility. PAM is one of several monitoring techniques that complements (rather than replaces) traditional visual monitoring. Overall performance and capabilities of PAM are highly dependent on factors such as technical specification of equipment, operational setting, availability of experienced and trained personnel, and the species of marine mammals present in a given area. Use of PAM is therefore not always logistically possible. Moreover, mandatory use of PAM will increase survey cost and require the placement of more personnel on vessels (i.e., four dedicated PAM observers onboard). Accordingly, the Associations urge NMFS to either make the use of PAM optional, or require PAM only for operations at night and in periods of low visibility.

7. Special area avoidance and time-area closures

The four pending IHA applications present varied approaches to special area avoidance and time-area closures, all of which are reasonable means of minimizing and avoiding incidental take. NMFS should evaluate time-area closures on a case-by-case basis and should not require unsupported, blanket restrictions that may or may not apply to a given applicant's proposed program. Each application should be evaluated for the specific program proposed and the mitigation (time-area closures) should be narrowly tailored to only the activities proposed in a given IHA application.

D. Seismic surveys in the Atlantic OCS will not cause cumulatively significant impacts.

There has been no demonstration of population-level effects to marine life from seismic or other geophysical survey activity, individually or cumulatively. BOEM expressly recognizes this fact in its August 22, 2014 *Science Note*, in which it states that "[w]ithin the [Gulf of Mexico Central Planning Area] . . . there is a long-standing and well-developed OCS Program (more than 50 years); there are no data to suggest that activities from the preexisting OCS Program are significantly impacting marine mammal populations."[14] BOEM similarly concluded in its March 9, 2015, *Science Note* that 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." http://www.boem.gov/BOEM-Science-Note-March-2015/. Moreover, BOEM has spent more than $50 million on protected species and noise-related research without finding evidence of adverse effects. The geophysical and oil and gas industries, the National Science Foundation, the U.S. Navy, and others have spent a comparable amount on researching impacts of seismic surveys on marine life and have found no evidence of cumulatively significant effects. In short, the best available data and information strongly support a conclusion that there will be no cumulatively significant impact from the surveys that have been proposed for the Mid- and South Atlantic OCS. *See* PEIS § 4.3.2.

[14] http://www.boem.gov/BOEM-Science-Note-August-2014/. Moreover, it is well documented that some marine mammal populations, such as the western Arctic bowhead whale population, have continued to grow in areas where seismic survey occurs. *See* Allen, B. M., and R. P. Angliss, 2013 Stock Assessment Reports, NOAA-TM-AFSC-277, available at: http://www.nmfs.noaa.gov/pr/sars/2013/ak2013_bowhead.pdf (from 1978 to 2001, Arctic bowhead whale abundance "doubled from approximately 5,000 to approximately 10,000 whales" is growing at a rate of over 3% per year).

III. CONCLUSION

The Associations appreciate NMFS's review of the IHA applications and consideration of these comments. Building on decades of industry experience, the four pending IHA applications set forth aggressive mitigation programs designed to effectively avoid and limit incidental take. Many of the proposed mitigation measures are more stringent than measures that have commonly been employed and, indeed, some of the proposed mitigation measures are unnecessary, based on the best available scientific information. With the use of proper mitigation measures, seismic survey operations can and do avoid Level A harassment and, therefore, the authorization of Level A harassment is not warranted or appropriate. The Associations support the issuance of IHAs for Level B harassment that prescribe mitigation measures that are effective and consistent with the best available data and information.

Sincerely,

Nikki Martin
International Association of Geophysical Contractors
President

Andy Radford
American Petroleum Institute
Sr. Policy Advisor – Offshore

Jeff Vorberger
National Ocean Industries Association
Vice President Policy and Government Affairs

APPENDIX

April 29, 2015

VIA Federal eRulemaking Portal

Mr. Gary D. Goeke
Chief, Environmental Assessment Section
Office of Environment (GM 623E)
Bureau of Ocean Energy Management
Gulf of Mexico OCS Region
1201 Elmwood Park Boulevard
New Orleans, LA 70123–2394

Re: Comments on Applications for G&G Permits in the Mid- and South Atlantic OCS

Dear Mr. Goeke:

This letter provides the comments of the International Association of Geophysical Contractors ("IAGC"), the American Petroleum Institute ("API"), and the National Ocean Industries Association ("NOIA") (collectively, the "Associations") in response to the Bureau of Ocean Energy Management's ("BOEM") request for comments on the pending Geological and Geophysical ("G&G") permit applications for the Mid- and South Atlantic Outer Continental Shelf ("OCS"). We appreciate BOEM's consideration of the comments set forth below.

I. THE ASSOCIATIONS

IAGC is the international trade association representing the industry that provides geophysical services (geophysical data acquisition, processing and interpretation, geophysical information ownership and licensing, and associated services and product providers) to the oil and natural gas industry. IAGC member companies play an integral role in the successful exploration and development of offshore hydrocarbon resources through the acquisition and processing of geophysical data. IAGC members have expressed interest in conducting geophysical activities on the Atlantic OCS, and some IAGC members have already filed applications for authorizations relating to such activities.

API is a national trade association representing over 625 member companies involved in all aspects of the oil and natural gas industry. API's members include producers, refiners, suppliers, pipeline operators, and marine transporters, as well as service and supply companies that support all segments of the industry. API and its members are dedicated to meeting environmental requirements, while economically developing and supplying energy resources for consumers.

NOIA is the only national trade association representing all segments of the offshore industry with an interest in the exploration and production of both traditional and renewable energy resources on the U.S. OCS. The NOIA membership comprises more than 325 companies engaged in a variety of business activities, including production, drilling, engineering, marine and air transport, offshore construction, equipment manufacture and supply, telecommunications, finance and insurance, and renewable energy.

II. COMMENTS

A. Contextual Background

BOEM's plan to authorize exploratory activities on the Atlantic OCS is consistent with the Outer Continental Shelf Lands Act, which mandates the "expeditious and orderly development" of the OCS "subject to environmental safeguards." 43 U.S.C. § 1332(3). BOEM currently estimates that the Mid- and South Atlantic OCS holds at least 4.72 billion barrels of oil and 37.51 trillion cubic feet of natural gas.[1] Although these estimates are impressive, it is widely believed that modern seismic imaging using the latest technology will enable BOEM to more accurately evaluate the Atlantic OCS resource base. The industry's advancements in geophysical technology—including specifically and primarily seismic reflection technology, but also complimentary gravity, magnetics, and electromagnetic technology—will provide more realistic estimates of the potential resource. By utilizing these tools and by applying increasingly accurate and effective interpretation practices, industry operators can better locate and dissect prospective areas for exploration. In short, seismic and other geophysical surveys are the only feasible technologies available to accurately image the subsurface before a single well is drilled. Allowing the pending geophysical survey proposals to proceed, subject to appropriate "environmental safeguards," facilitates—indeed, makes possible—the orderly development of the Mid- and South Atlantic OCS.

For the energy industry, modern geophysical imaging reduces risk by increasing the likelihood that exploratory wells will successfully tap hydrocarbons and decreasing the number of wells that need to be drilled in a given area, which reduces the overall footprint for exploration. Because survey activities are temporary and transitory, they are the least

[1] *See* http://www.boem.gov/Assessment-of-Oil-and-Gas-Resources-2014-Update/.

intrusive and most cost-effective means to understanding where recoverable oil and gas resources likely exist in the Mid- and South Atlantic OCS.[2]

In addition, more than four decades of worldwide seismic surveying and scientific research indicate that the risk of direct physical injury to marine life as a result of seismic survey activities is extremely low, and currently there is no scientific evidence demonstrating biologically significant negative impacts to marine life. As BOEM stated in its August 22, 2014 *Science Note*:

> 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.

Moreover, IAGC, together with the oil and gas industry, funds independent research to further our understanding of the effects of seismic surveys on marine life. This is helping to reduce uncertainties about the possible effects of seismic surveys. Some of this research, in addition to other frequently cited references regarding the effects of sound on marine life, is reviewed in the annotated bibliography included as Attachment A to this letter.[3]

B. Seismic Survey Activities in the Mid- and South Atlantic OCS Will Have, at Most, a Negligible Impact on Marine Mammals

During the administrative process related to BOEM's issuance of its Final Programmatic Environmental Impact Statement for Proposed G&G Activities on the Mid- and South Atlantic OCS ("PEIS"),[4] the Associations provided comments that, among other things, explained why BOEM's assessment of marine mammal impacts was flawed and why

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[2] Although different surveys for different purposes may cover the same general area, these surveys are spread out in space and in time. If two or more surveys occur in the same place over a period of time, they are generating different information, designed to appeal to specific, unique customer needs not met by other surveys.

[3] Additional technical information regarding different types of seismic surveys is provided in Attachment B.

[4] BOEM, *Final Programmatic Environmental Impact Statement for Proposed G&G Activities on the Mid- and South Atlantic OCS* (Mar. 2014).

some of the mitigation measures proposed by BOEM were unnecessary and impractical. The Associations incorporate those comments by reference, and we have included a copy of IAGC's comment letter to the final PEIS as Attachment C. We also provide the following information, which is intended to supplement the information and positions presented in the PEIS comments.[5]

1. BOEM's site-specific environmental assessments should provide an accurate evaluation of expected marine mammal impacts

As explained in our PEIS comments, BOEM's evaluation of potential marine mammal impacts at the programmatic level is flawed because it is premised upon an unrealistic scenario in which exploration activities are projected to result in thousands of incidental takes of marine mammals, which BOEM has definitively stated will not actually occur. Indeed, in its response to comments in the Record of Decision associated with the PEIS ("ROD"), BOEM states very clearly that "the numbers estimated for incidental take are higher than BOEM expects would actually occur." ROD at 12; *see also id*. ("the take estimates are based on acoustic and impact models that are by design conservative, which results in an over-estimate of take"). The supposed effects of this "worst case" hypothetical scenario are then addressed in the PEIS with mitigation measures, many of which are similarly unrealistic because they mitigate inaccurately presumed effects.

Setting aside our continuing disagreement with BOEM's approach to the evaluation of marine mammal impacts in the PEIS, we respectfully request that BOEM perform a proper NEPA analysis in its site-specific environmental assessments and evaluate the <u>actual</u> environmental impacts that are <u>expected</u> to occur. For the reasons stated in our comments on the PEIS, such an approach would be consistent with both the law and the best available science. *See* IAGC PEIS Comment Letter § II.A (Attachment C).

2. A 40-km buffer between surveys is unnecessary and impractical

The PEIS recommends an expanded 40-km buffer zone between concurrent seismic surveys "to provide a corridor between vessels conducting simultaneous surveys where airgun noise is below Level B thresholds and approaching ambient levels." PEIS at 2-37. In the PEIS, BOEM acknowledges that there is "uncertainty about [the] effectiveness" of a 40-km buffer requirement and, in its ROD, BOEM states that it will "assess the value of this measure in site-specific environmental analyses . . . and decide whether to include it as a

[5] Consistent with BOEM's commitment "to adaptive management and the modification of mitigations if warranted by the facts at the site-specific level" (ROD at 11), we encourage BOEM to reconsider the data and information presented in the Associations' comments on the final PEIS as well as the information presented in this comment letter.

condition of a permit or other authorization." ROD at 10. We reiterate that a 40-km buffer is unnecessary and impractical for the reasons stated in the Associations' comments on the PEIS. *See* IAGC PEIS Comment Letter § II.B.2. We also provide the following additional points, and request that BOEM consider this information, in addition to our PEIS comments, as it conducts its site-specific analyses.

Although seismic operations can be detected at great distances under certain oceanographic conditions and locations, so can sound waves generated by earthquakes and baleen whale calls.[6] The deep sound channel in the Atlantic OCS, often cited for the notion that sound from seismic operations can be detected outside of a survey's established exclusion zone, does not extend onto the continental shelf off the mid-Atlantic region. Furthermore, this notion is only applicable if protected species and marine animals are present in the deep sound channel to receive the higher levels of sound. Few species dive that deep in the areas of the Atlantic Ocean under consideration. In particular, baleen whale species of greatest concern are not known to be present in waters at those depths.

The seismic sound source is engineered to direct its energy downward, rather than laterally, which the National Marine Fisheries Service ("NMFS") has admitted is itself a mitigation measure.[7] For any energy that is transmitted laterally, the signal strength decreases rapidly, well below the thresholds NMFS has established for Level B harassment and at such low frequency that it does not cause injury to marine mammals.[8] Consistent with this information, what evidence there is of potential behavioral disturbance from seismic operations suggests minor and transitory effects, such as temporarily leaving the survey area, and these effects have not been linked to negative or biologically significant impacts on marine mammal populations.

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[6] Nieukirk, S.L., Mellinger D.K., Moore S.E., Klinck K., Dziak R.P., and Goslin J. 2012. Sounds from airguns and fin whales recorded in the mid-Atlantic Ocean, 1999-2009. J. Acoust. Soc. Am. 131(2):1102-1112; Munk W., Worcester P., and Wunsch C. 1995. Ocean Acoustic Tomography. Cambridge U Press, Cambridge, UK.

[7] *See New Jersey v. National Science Foundation*, 3:14-cv-0429 (D. N.J.), Federal Defendants' Brief in Opposition to Plaintiffs' Motion for Declaratory and Injunctive Relief at 25 (July 7, 2014).

[8] Richardson W.J., Greene Jr. C.R., Malme C.I., and Thomson D.H. 1995. Marine Mammals and Noise. Academic Press, NY. *See also* Acoustic Ecology Institute, *Seismic Surveys at Sea: The contributions of airguns to ocean noise.* August 2005 (An air source array with a source level of 200 – 230 dB "drops quickly to under 180 dB (usually within 50- 500 m depending on source level and local conditions), and continues to drop more gradually over the next few kilometers, until leveling off at somewhere near 100 dB.").

Neither BOEM nor NMFS has yet to provide any scientifically supported rationale for the proposed 40-km buffer. Instead, the PEIS concluded the measure "would only potentially slightly reduce acoustic impacts on marine mammals, sea turtles, and other marine biota," but even then, the effectiveness of the measure is uncertain. ROD at 6. Accordingly, we respectfully request that BOEM decline to adopt the 40-km buffer zone in site-specific environmental assessments and, instead, recommend either no buffer zone or, alternatively, a 17.5-km buffer zone, consistent with standard practice and the best available science. *See* IAGC PEIS Comment Letter § II.B.2.

3. New research demonstrates that seismic impulses have insignificant effects on dolphins

The PEIS recommends a mitigation measure calling for the shutdown of operations if a dolphin enters the acoustic exclusion zone, unless the dolphin is determined by the observer to be voluntarily approaching the vessel. PEIS at 2-11. In our comments on the PEIS, we provided substantial information demonstrating that this proposed measure is contrary to the best available science, impractical, and otherwise unsupported. In those comments, we also directed BOEM to current research being conducted with the support of the E&P Sound and Marine Life Joint Industry Program to study the effects of multiple airgun pulses in odontocetes and, specifically, to study whether bottlenose dolphin exposure to airgun impulses results in temporary threshold shift ("TTS").[9] *See* IAGC PEIS Comment Letter § II.B.1. As the public abstract from the study states, "subjects participated in over 180 exposure sessions with no significant TTS observed at any test frequency, for any combinations of range, volume or pressure during behavioral tests."[10] This research will be published very soon in a peer-reviewed scientific journal.[11] We will provide the published paper to BOEM promptly upon its publication, and we request that it be included in the administrative record and considered by BOEM during the permitting process.

[9] James J. Finneran et al., *Final Report* (2013). TTS in odontocetes in response to multiple airgun impulses. (The Associations understand that a copy of this Final Report was provided by the author to NMFS.)

[10] C.E. Schlundt et al., *Auditory Effects of Multiple Impulses from a Seismic Airgun on Bottlenose Dolphins*, presentation at the Effects of Noise on Aquatic Life Third International Conference, Budapest, Hungary (Aug. 11-16, 2013). The results of this study also are useful to support inclusion of frequency weighting in updated acoustic criteria.

[11] Finneran J.J., Schlundt C.E., Branstetter, B.K., Trickey, J.S., Bowman, V., and Jenkins, K. Effects of multiple impulses from a seismic air gun on bottlenose dolphin hearing and behavior. Submitted to J. Acoust. Soc. Am. (in review).

Additionally, PSO observation reports continue to indicate that there is no statistically significant difference between the frequency of dolphin sightings and acoustic detections during seismic operations, whether the source is active or silent. Enclosed with this letter as Attachment D is an updated version of an attachment to IAGC's PEIS comments, which includes additional data confirming this conclusion.

In sum, the proposed dolphin shutdown mitigation measure would broadly and substantially impact seismic operations without any corresponding environmental benefit and without any scientific support. For the reasons presented in this letter and in our comments on the PEIS, the Associations respectfully request that BOEM make an express finding that this recommended measure is unsupported and unnecessary.[12] In conjunction with this finding, we also request that BOEM clarify that shutdown is not required for dolphins within the exclusion zone in <u>all</u> circumstances, regardless of whether dolphins are exhibiting bow-riding behavior or any other behavior.

4. BOEM should modify the proposed 60-minute "all clear" requirement

The PEIS recommends that monitoring of the exclusion zone shall "begin no less than 60 min prior to start-up" and that restarting of equipment after a shutdown "may only occur following confirmation that the exclusion zone is clear of all marine mammals and sea turtles for 60 min." PEIS at C-29. As explained in our comments on the PEIS, this proposed measure is unprecedented and without factual or scientific support. Specifically, IAGC provided numerous examples confirming that the routine, and proven-to-be-effective, practice is to require 15- and 30-minute "all clear" periods—for marine mammals <u>and for ESA-listed species</u>. *See* IAGC PEIS Comment Letter § II.B.3. In its ROD, BOEM provides no substantive response to this indisputable information. Indeed, since the ROD was issued, additional MMPA incidental take authorizations that include 15- and 30-minute "all clear" periods have been proposed by NMFS.[13]

We sincerely hope that BOEM will reconsider this proposed requirement and work with NMFS to ensure that a reasonable 15- / 30-minute "all clear" requirement is included in the federal authorizations related to seismic activities in the Atlantic Ocean, consistent with

[12] Although BOEM notes that this and other measures were addressed in the draft PEIS, it still must consider comments on these measures as part of its site-specific analyses for the proposed surveys, and it may adjust mitigation requirements based upon those analyses.

[13] *See, e.g.*, 80 Fed. Reg. 9510, 9524 (Feb. 23, 2015) (proposed Cook Inlet incidental take authorization calling for a 15-minute "all clear" period for small odontocetes and pinnipeds and a 30-minute "all clear" period for large odontocetes); 80 Fed. Reg. 20,084, 20,097 (Apr. 14, 2015) (same provision for proposed Beaufort Sea incidental take authorization).

the well-supported current practice. Expanding the standard 15- / 30-minute "all clear" period to 60 minutes will substantially increase the duration and cost of seismic surveys, which, in turn, increases potential risks. *See* IAGC PEIS Comment Letter § II.B.3.[14]

5. There will be no cumulatively significant impact from the proposed surveys

As stated in our PEIS comments, there has been no demonstration of population level effects to marine life from seismic or other geophysical survey activity, individually or cumulatively. BOEM expressly recognizes this fact in its August 22, 2014 *Science Note*, in which it states that "[w]ithin the [Gulf of Mexico Central Planning Area] . . . there is a long-standing and well-developed OCS Program (more than 50 years); there are no data to suggest that activities from the preexisting OCS Program are significantly impacting marine mammal populations." BOEM similarly concluded in its March 9, 2015 *Science Note* that 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." Moreover, BOEM has spent more than $50 million on protected species and noise-related research without finding evidence of adverse effects. The geophysical and oil and gas industries, the National Science Foundation, the U.S. Navy, and others have spent a comparable amount on researching impacts of seismic surveys on marine life and have found no evidence of cumulatively significant effects. In short, for the reasons stated in our comments on the PEIS, and as consistent with the well-established record and BOEM's public findings, there will be no cumulatively significant impact from the surveys that have been proposed for the Mid- and South Atlantic OCS.

C. Seismic Survey Activities in the Mid- and South Atlantic OCS Will Have, at Most, a Negligible Impact on Fish Populations and Fish Habitat

As part of the G&G permitting process in the Atlantic OCS, site-specific environmental assessments will include an Essential Fish Habitat ("EFH") assessment to determine whether the specific activity and location would cause a significant adverse effect

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[14] The impact of this and other measures addressed by the Associations is magnified when coupled with the proposed expanded exclusion zones. The Associations reiterate their previous comments that exclusion zones should be based on the best available science, including when the science demonstrates that an exclusion zone of less than 500 m is appropriate. If the minimum 500 m exclusion zone requirement is not applied, IAGC would support the incorporation of power-down procedures to mitigate any potential effects, as described in IAGC's PEIS comments. *See* Attachment C, footnote 21; *see also, e.g.*, 80 Fed. Reg. at 9524 (Cook Inlet proposed incidental take regulations); 80 Fed. Reg. at 20,097 (Beaufort Sea proposed IHA); 80 Fed. Reg. 14,913, 14,928 (Mar. 20, 2015) (Cook Inlet Proposed IHA); 79 Fed. Reg. 36,730, 36,735 (June 30, 2014) (Notice of Issuance of Beaufort Sea IHA).

to fisheries and EFH. Because the sound output from a seismic survey is immediate and local, there is no contaminate residue or destruction of habitat, and therefore no significant adverse effect to EFH. For the reasons set forth below, seismic survey activities will also not result in any significant adverse effects to fish populations or to fisheries.

Marine seismic surveys have been conducted since the 1950s and experience demonstrates that fisheries and seismic activities can and do coexist. There has been no observation of direct physical injury or death to free-ranging fish caused by seismic survey activity, and there is no conclusive evidence showing long-term or permanent displacement of fish. Any impacts to fish from seismic surveys are short term, localized, and not expected to lead to significant impacts on a population scale.[15]

Seismic source vessels move along a survey tract in the water creating a line of seismic impulses. As the seismic source vessel is in motion, each signal is short in duration, local, and transient. Since seismic surveys are a moving sound source, any impacts to fish are inherently local and short term, potentially causing a localized reduction in fish abundance within close proximity to the seismic source.[16] There is no conclusive evidence,

[15] *See* Attachment A; *see also* Science for Environment Policy, Future Brief: Underwater Noise, European Commission, June 2013: http://ec.europa.eu/environment/integration/research/newsalert/pdf/FB7.pdf; "Stocks at a Glance – Status of Stocks" 2011, U.S. Department of Commerce, NOAA: www.nmfs.noaa.gov/stories/2012/05/05_14; Boeger, W.A., Pie, M.R., Ostrensky, A., Cardoso, M.F., 2006. The Effect of Exposure to Seismic Prospecting on Coral Reef Fishes; Brazil. J. Oceanogr. 54, 235-239; 3D marine seismic survey, no measurable effects on species richness or abundance of a coral reef associated fish community. Mar. Pollut. Bull. (2013), http://dx.doi.org/10.1016/j.marpolbul.2013.10.031; Hassel, A., Knutsen, T., Dalen, J., Skaar, K., Lokkeborg, S., Misund, O.A., Osten, O., Fonn, M., Haugland, E.K., 2004. Influence of seismic shooting on the lesser sand eel. ICES J. Mar. Sci. 61, 1165-1173; Pena, H., Handegard, N.O. and Ona, E. 2013. Feeding herring schools do not react to seismic air gun surveys. ICES J. Mar. Sci, http://icesjms.oxfordjournals.org/content/70/6/1174.short?rss=1; Saetre, R. and E. Ona, 1996. Seismic investigations and damages on fish eggs and larvae; an evaluation of possible effects on stock level. Fisken og Havet 1996:1-17, 1-8.

[16] Although some studies have shown that various life stages of fish and invertebrate species can be physically affected by exposure to sound, in all of these cases, the subjects were very close to the seismic source or subjected to exposures that are virtually impossible to occur under natural conditions. For example, frequently cited experimental studies such as Skalski et al. (1992), Lokkeborg et al. (2010), Engas (1996), and Wardle (2001) employed artificially concentrated sound within hundreds of meters of the fish under observation and the fishing vessels. As Lokkeborg et al. (2012) noted in a recent review of the literature, "Seismic air gun emissions distributed over a large area may thus produce lower sound

(continued . . .)

however, showing long-term or permanent displacement of fish. Similar seismic surveys conducted for research in the Atlantic OCS in the past did not result in any detectable effects on commercial or recreational fish catch, based on a review of NMFS's data from months surveys were conducted, which noted that "there was absolutely no evidence of harm to marine species" (including fish).[17] Additionally, in the Gulf of Mexico, where G&G activities have routinely occurred for over 40 years, seafood harvested from the OCS is worth approximately $980 million annually and the fishing industry directly supports in excess of 120,000 jobs, suggesting that G&G activities can occur without negatively impacting commercial fisheries.

Finally, seismic and other geophysical surveys also do not result in closing areas to commercial or recreational fishing. During surveys, the survey crews work diligently to maintain a vessel exclusion zone around the survey vessel and its towed streamer arrays to avoid any interruption of fishing operations, including the setting of fishing gear. As with all combined uses of offshore waters, there must be a certain level of coordination by all parties. At sea, coordination is regulated by the U.S. Coast Guard under the International Regulations for Preventing Collisions at Sea, requiring a Local Notice to Mariners specifying survey dates and locations. BOEM has concluded that "there is only a limited potential for space-use conflicts between G&G activities and commercial fishing operations within the area of interest" and any impacts "would be intermittent, temporary, and short term." PEIS at 4-160, 4-161.

III. CONCLUSION

As explained above, the performance of seismic and other geophysical surveys is critical to the federally mandated "expeditious and orderly development" of the Mid- and South Atlantic OCS. A wealth of data and information demonstrates that these surveys will have no more than a temporary, localized, and negligible impact on marine life. The Associations respectfully encourage BOEM to proceed with approving the pending permit applications and to work with NMFS to ensure that only reasonable, well-supported, and effective mitigation measures are included as conditions of the permits and the related federal authorizations.

(. . . continued)
exposure levels and thus have less impact on commercial fisheries." As another example, Aguilar de Soto (2013) exposed scallop larvae to noise at loud volume for up to 90 hours at a distance of 9 centimeters, which is virtually impossible to occur outside of experimental settings.

[17] *New Jersey v. National Science Foundation*, No. 3:14-cv-0429 (D. N.J.), Federal Defendants' Brief in Opposition to Plaintiffs' Motion for Declaratory and Injunctive Relief at 25-26, citing Exhibit D, Higgins Decl. ¶ 21, Exhibit D, Mountain Decl. ¶ 8 (July 7, 2014).

We appreciate your consideration of our comments. Should you have any questions, please do not hesitate to contact Nikki Martin at (713) 957-8080.

Sincerely,

Nikki C. Martin

Nikki Martin
International Association of Geophysical Contractors
Vice President, Government and Legal Affairs

Andy Radford

Andy Radford
American Petroleum Institute
Sr. Policy Advisor – Offshore

Jeff Vorberger
National Ocean Industries Association
Vice President Policy and Government Affairs

ATTACHMENT A

ANTHROPOGENIC SOUND AND IMPACTS TO MARINE LIFE:
An Annotated Bibliography of Selected & Frequently Cited References

IAGC, together with the oil and gas industry, funds independent research to further our understanding of the effects of seismic surveys on marine life. This is helping to remove uncertainties about the possible effects of seismic surveys. Some of this research, in addition to other frequently cited references regarding the effects of sound on marine life, is reviewed in the attached annotated bibliography.

More than four decades of worldwide seismic surveying and scientific research indicate that the risk of direct physical injury to marine life is extremely low, and currently there is no scientific evidence demonstrating biologically significant negative impacts to marine life. As BOEM stated in its August 22, 2014 *Science Note*, "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."

There has been no observation of direct physical injury or death to free-ranging fish caused by seismic survey activity, and there is no conclusive evidence showing long-term or permanent displacement of fish. Any impacts to fish from seismic surveys are short-term, localized and are not expected to lead to significant impacts on a population scale or to commercial and recreational fishing activities.

The seismic sound source is engineered to direct its energy downward, rather than laterally. For any energy that is transmitted laterally, the signal strength decreases rapidly and would not cause injury to marine mammals. Research indicates that in-water sounds received at 110-90 dB SPL are comparable to a whisper or soft speech, even if it travels hundreds or thousands of kilometers in water. In some areas, such as the busy ports of the Atlantic coast, ambient sound in the frequencies produced by seismic sources may be as high as 110-120 dB due to ship noise, thereby masking any additional contribution from distant seismic surveys. What evidence there is of potential behavioral disturbance from seismic operations suggests minor and transitory effects, such as temporarily leaving the survey area, and these effects have not been linked to negative biologically significant impacts on populations.

More information on our commitment to science can be found at www.soundandmarinelife.org.

ANTHROPOGENIC SOUND AND IMPACTS TO MARINE LIFE:
An Annotated Bibliography of Selected & Frequently Cited References

Aguilar de Soto N, Delorme N, Atkins J, Howard S, Williams J, Johnson M. 2013. Anthropogenic noise causes body malformations and delays development in marine larvae. Scientific Reports 3, 2831. DOI 10: 1038/srep02831. www.nature.com/scientificreports.

Purports to demonstrate that airgun sound affects development of scallop larvae at levels of 160 dB SPL or lower. But the work has many flaws; an unrealistically long sound, played at much shorter than normal intervals for as much as 90 hours continuous. The sound source used in the experiment was not able to accurately replicate the actual seismic sound and was placed only 9 cm from the test subjects, producing large particle displacement effects of 4-6mm/s velocity, comparable to an SPL of 195 dB SPL. The latter value translates to a distance of a few hundred meters from an actual source, not the hundreds of square kilometers postulated by the authors. The best laboratory culture methods typically yield some variation in survival and development, but this study reported perfect scores for all controls at all stages. The work needs to be replicated by an independent and expert experimentalist.

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 Houégnignan L. 2011. Low-frequency sounds induce acoustic trauma in cephalopods. Front Ecol Environ 2011; doi: 10.1890/100124. www.frontiersinecology.org. The Ecological Society of America.

Another study where it is difficult to know what to make of the data because of the way the sound was presented and measured. The reported received level is 157 dB re 1 µPa, so one can presume that the measurement is of pressure, but whether this is averaged, spectrum level, total energy under the envelope is unclear. Levels up to 175 dB re 1 µPa are also reported but it is not clear if that is a single frequency peak or whether the received levels fluctuated around 157 dB to as high as 175 dB. Thus the actual exposure history as SEL for the two hours of exposure is unknown. The sound source is in air and its properties are not provided. Given the impedence mismatch of water the source would have had to be extremely loud to get as much as 157-175 dB SPL into the water. Squid do not have swim bladders or air spaces associated with the ears, so the appropriate value to report is actually particle velocity. This is especially true since the containers were so much smaller than the wavelengths of sound in water at those frequencies (4-30 meters). The sound field inside the containers is bound to be complex and should have been measured. What is most probable is that the squid experienced considerable vibratory motion for two hours, leading to the damage observed; damage that could have never occurred in an open water environment where pressure and particle velocity would never be experienced at those levels for that duration.

Bartol, S.M. and Bartol, I.K. 2011. Hearing Capabilities of Loggerhead Sea Turtles (Caretta caretta) throughout Ontogeny: An Integrative Approach involving Behavioral and Electrophysiological Techniques. Final Report, JIP Grant No.22 07-14. Available online at http://www.soundandmarinelife.org/research-categories/physical-and-physiological-effects-and-hearing/hearing-capabilities-of-loggerhead-sea-turtles-throughout-ontogeny.aspx

Bolle LJ, de Jong CAF, Bierman SM, van Beek PJG, van Keeken OA, Wessels PW, van Damme CJG, Winter HV, de Haan D, Dekeling RPA. 2012. Common Sole Larvae Survive High Levels of Pile-Driving Sound in Controlled Exposure Experiments. PLoS One 7(3): e33052. Doi 10:1371/journal.pone.0033052.

This is a well-designed and properly measured sound exposure experiment, although claims that recordings played from a speaker are able to replicate the impulse time amplitude signature should always be treated with skepticism. Exposures up to 206 dB SEL_{cum} did not produce mortality, with single strike SELs of 186 dB and zero to peak pressures of 32 kPa, erroneously reported as 210 dB re $1\mu Pa^2$ in the abstract.

Booman, C., Dalen, J., Leivestad, H, Levsen, A., van der Meeren, T. and Toklum, K. 1996. Effects from airgun shooting on eggs, larvae, and fry. Experiments at the Institute of Marine Research and Zoological Laboratorium, University of Bergen. (In Norwegian. English summary and figure legends). Fisken og havet No. 3. 83 pp. as reviewed in:

Dalen, J, Dragsund E, Næss A, and Sand O. 2007. Effects of seismic surveys on fish, fish catches and sea mammals. Report for the Cooperation group – Fishery Industry and Petroleum Industry, Report No. 2007-0512. Available at https://www.norskoljeoggass.no/PageFiles/6574/Effects%20of%20seismic%20surveys%20on%20fish,%20fish%20catches%20and%20sea%20mammals.pdf?epslanguage=no

Observed effects on eggs and larvae only extended 1 to 5 meters from a full seismic array, suggesting that powerful particle motion effects were responsible for damaging the microscopic eggs and larvae. The net effect would be a pencil line damage zone in the wake of the array that would conceivably account for some tiny fraction of 1% of pelagic eggs and larvae distributed in the larger region of interest. Considering that more than 99% of eggs and larvae typically never make it to adulthood, this is an inconsequential effect compared to predation, disease and many other natural density-dependent or density independent causes of mortality.

Castellote, M., Clark, C.W., and Lammers, M.O. 2012. Acoustic and behavioural changes by fin whales (*Balaenoptera physalus*) in response to shipping and airgun noise. Biological Conservation 147: 115–122.

The authors make a slim statistical case that calls were altered by the presence of shipping noise and in one case a seismic survey. Measured and modeled acoustic data in the Straits of Gibraltar, a very unusual acoustic environment, were extrapolated as a more general case to predict effects of seismic on fin and other related whales generally. This speculation should be supported with data. Inferences of whale displacement by sound were from reductions in numbers of vocalizations, not actual observed movement or changes in distribution.

Engås A, Løkkeborg S, Soldal AV, and Ona E. 1996a. Comparative fishing trials for cod and haddock using commercial trawl and longline at two different stock levels. J Northw Atl Fish Sci 19: 83-90. http://journal.nafo.int.

Commercial bottom trawl and longline vessels fished 7 days before, 5 days during, and 5 days after a seismic survey was conducted in the area. Acoustic surveys of fish populations were also conducted, along with a sampling bottom trawl of different dimensions and mesh size than the commercial trawl. Only before and after data were analysed in this paper; “during” data were omitted but are reported in Engås et al (1996b). Because multiple fishing methods were employed on two species of fish, the matrix of data are somewhat complicated: generally, catches declined, smaller fish were caught after the seismic survey, and the ratio of haddock to cod increased after survey. It is difficult to know what to make of the results given the number of uncontrolled and possibly contributing variables that could have confounded the results, including the unusual prolonged proximity of survey vessels to fishing, and the amount of continuous fishing in one place that may have contributed to reduced catches and smaller size fish being caught over time.

Engås A, Løkkeborg S, Ona E, and Soldal AV. 1996b. Effects of seismic shooting on local abundance and catch rates of cod (Gadus morhua) and haddock (Melanogrammus aeglifinus). Can J Fish Aquat Sci 53:2238-2249.

Same study as above but includes data during the survey and more spatial information showing the effects described above tended to be greatest near the seismic survey and less out to the borders of the study area. An independent re-analysis of the data (JRHGeo, unpublished) suggest a different interpretation of declining catches during the before-exposure period suggestive of depletion of stocks within the unusually heavy, concentrated fishing effort within the test area, followed by clearly decreased catches within 1 km of the survey but smooth decline through pre- and during exposure periods, suggesting little to no effect beyond 1 km. In the 5 days following seismic survey there is a rebound of catch at both the < 1 km and 1-3 km ranges, which suggests that there may have indeed been an effect from the seismic sound on catches, but catches recovered immediately afterward, confounded by the ongoing 10-15 days of continuous intensive fishing in the area. The re-analysis suggests that the data may have been confounded by variables other than sound, and that the original clearcut conclusions in Engas et al 1996a,b are perhaps not quite as pronounced as initially stated.

Finneran J.J., Schlundt C.E., Branstetter, B.K., Trickey, J.S., Bowman, V., and Jenkins, K. (2013). Temporary threshold shift (TTS) in odontocetes in response to multiple air gun impulses. Final Report for JIP Project 2.1.1., 51 pp. Available online at http://www.soundandmarinelifejip.org/index.php?doc=docmeta&id=3695

Finneran J.J., Schlundt C.E., Branstetter, B.K., Trickey, J.S., Bowman, V., and Jenkins, K. (in review). Effects of multiple impulses from a seismic air gun on bottlenose dolphin hearing and behavior. Submitted to J. Acoust. Soc. Am.

Gross JA, Irvine KM, Wilmoth S, Wagner TL, Shields PA and Fox JR . 2013. The Effects of Pulse Pressure from Seismic Water Gun Technology on Northern Pike. *Trans Am Fish Soc* 142: 1335-1346. ISSN: 0002-8487 print / 1548-8659 online DOI: 10.1080/00028487.2013.802252.

The study assessed the probability of mortality of pike (freshwater) when exposed to two pulses at 3, 6 and 9 meters distance from either a 343 cu in water gun or a 120 cu in water gun, both pressurized at 2000 psi. Measures of peak and peak to peak pressure were made as well as $SEL_{cum.}$ SEL_{cum} was used as the metric for effects in most of the results and discussion since it seemed to correlate best with levels of injury and mortality. Mortality within 72-168 hours was correlated with SELs in excess of 195 dB. Gas bladder rupture was observed at 199 dB SEL; 100% of fish at 3-6 meters and 87% of fish at 9 meters. Given the history of water guns producing greater injury and mortality than airguns, these results with two pulses from good sized single guns, indicate that fish would need to be within a few meters of a single airgun or full array to achieve comparable effects.

Harrington JJ, McAllister J, and Semmens JM. 2010. Assessing the short term impact of seismic surveys on adult commercial scallops (Pecten fumatus) in Bass Strait: Final Report. Tasmanian Aquaculture and Fisheries Institute, U. of Tasmania

Scallops were sampled from control and exposure sites before and after an extensive 2-D seismic survey. No statistical differences were found between control and exposed populations, neither in survival nor body condition. Exposure levels were not recorded. The paper also reviews several prior studies of seismic effects on scallops in Ireland and other sites, all also with no effect. One cited paper reported that one of three scallops experienced a split in its shell at distance of 2 meters from an airgun.

Higgins SM. 2014. Declaration; State of New Jersey, Dept of Environmental Protection vs National Science Foundation, et al. United States Federal District Court, District of New Jersey. Case 3:14-cv-04249-PGS-LHG, Document 6-7, filed 07/07/14, pageID 1520-1527

Contains a comparison of annual commercial and recreational fishery catches for years and months in which seismic surveys were conducted off the New Jersey coast, relative to the same months in other years, between 1990-2004. No discernable differences were found between periods with seismic survey and without. (Fishery statistical data from NMFS 2014, http://www.st.nmfs.noaa.gov/).

Lavender, A.L., Bartol, S.M., and Bartol, I.K. (2014). Ontogenetic investigation of underwater hearing capabilities in loggerhead sea turtles (*Caretta caretta)* using a dual testing approach. J. Exp. Biol., 2014, 217(14):2580-2589.

Løkkeborg S, Ona E, Vold A, and Salthaug A. 2012. Effects of sounds from seismic air guns on fish behaviour and catch rates. In A.N. Popper and A. Hawkins (eds.), *The Effects of Noise on Aquatic Life*, Advances in Experimental Medicine and Biology 730, DOI 10.1007/978-1-4419-7311-5_95, pp. 415-419. Springer, NY NY.

This paper provides a good review of prior behavioral studies. They also report recent data from what is arguably the most realistic and thorough study to date; monitoring of two fisheries (gillnet and longline) for four species of fish; a halibut, two gadids (pollack and haddock) and a seabass (Sebastes marinus), along with acoustic (HF sonar) surveys of the fish populations. Gillnet catches of halibut and seabass increased during and after survey, possibly due to increased swimming activity, while longline catches of halibut and pollack decreased. Acoustic surveys revealed decreases in pollack abundance, but not other species, consistent with prior study by Engås et al (1996a,b).

McCauley RD, Kent CS, Archer M. 2008. Impacts of seismic survey pass-bys on fish and zooplankton, Scott Reef Lagoon, Western Australia: Full report of Curtin University findings. Center for Marine Science and Technology, Curtin University, Perth WA. 92 pp. CMST Report 2008-32.

An extensive research effort involving a real seismic survey over a thoroughly monitored reef lagoon. Caged snapper and damselfish were exposed to seismic passes as close as 45-74 meters with 1% loss of hearing hair cells, later fully recovered. Behavioral reaction was observed at 155-165 dB SPL sound exposure levels but avoidance only occurred out to 200 meters on either side of survey. There was no effect on normal fish sound choruses.

McCauley RD, Fewtrell J and Popper AN. 2003. High intensity anthropogenic sound damages fish ears. J Acoust Soc Am 113(1):638-642 DOI: 10.1121/1.1527962

The authors were able to produce considerable unrecovered damage to the sensory structures of a typical fish ear (Pink snapper) after seven close passes (5-15 meters) by a towed 20 cubic inch seismic air source in the span of four hours. Although no cumulative Sound Exposure Level (SEL) or peak pressure or particle velocity measures were reported, the graphical display of the passes indicates multiple exposures over short periods of time at levels in excess of 180 dB SPL $rms_{0.95}$. The fish were caged and the authors noted that their movements indicated that the fish would have moved away from the sound source if possible, thus preventing the artificially high levels of exposure experienced.

Miller I. and Cripps E. 2013. Three dimensional marine seismic survey has no measurable effect on species richness or abundance of a coral reef associated fish community. Mar Pol Bull. Elsevier Press. http://dx.doi.org/10.1016/j.marpolbul.2013.10.031

No change in abundance or species composition was found in a natural reef community of resident reef fishes (emphasis on damselfishes) and mobile demersal fishes (emphasis on snappers of the Family Lutjanidae). Multiple passes by a full working seismic array were separated by about 6 hours between pass. Minimum stand-off distances from the reef were 400 meters on the outside and 800 meters inside the reef lagoon. Estimated exposures were generally around 187 dB SEL with some exposures as high as 200 dB SEL. Instantaneous peak or average SPL or particle velocity/acceleration were not measured.

Moein, S. E., Musick, J. A., Keinath, J. A., Barnard, D. E., Lenhardt, M. L. & George, R. 1995. Evaluation of seismic sources for repelling sea turtles from hopper dredges. In *Sea Turtle Research Program: Summary Report*. (Ed. Hales, L. Z.) pp 90-93. Technical

Report CERC-95.

National Research Council (NRC). 2005. Marine Mammal Populations and Ocean Noise: Determining When Noise Causes Biologically Significant Effects. National Academy Press, Washington DC. www.nap.edu.

This NRC report lays out a framework for estimating long term, cumulative population consequences from behavioral disturbance by sound, and by extension, any source of behavioral perturbation, individually or cumulatively. While developed for marine mammals, the principles of the Population Consequences of Acoustic Disturbance (PCAD) model are appropriate to any biological population.

Parry GD and Gason A. 2006. The effect of seismic surveys on catch rates of rock lobsters in western Victoria, Australia. Fisheries Research 79 (2006): 272-284.

A statistical comparison of changes in commercial catch rates (Catch Per Unit Effort, CPUE) coincident with seismic survey effort. No correlation was found in a two way analysis of variance, although the authors do note that most survey effort was in deep water away from the shallow water fishery, and that one survey in shallow water was in an area of low lobster abundance.

Peña H, Handegard NO, and Ona E. 2013. Feeding herring schools do not react to seismic air gun surveys. ICES J Marine Science, doi:10.1093/icesjms/fst079. 7 pp. http://icesjms.oxfordjournals.org/

A full 3-D seismic survey array was used to assess responses of herring monitored by an omnidirectional fisheries sonar. The source vessel approached the fish school from a distance of 26 km to a close approach at 2 km without any effect on the swimming and schooling behavior of the fish.

Popper AN, Smith ME, Cott PA, Hanna BW, MacGillivray AO, Austin ME and Mann DA. 2005. Effects of exposure to seismic airgun use on hearing of three fish species. J Acoust Soc Am 117:3958-3971.

Whitefish and juvenile pike did not show any TTS after exposure to five seismic playbacks of about 209 dB SPL_{peak} or 180 dB SEL, and particle displacements of 139 db SVL re 1nm/s (it is not possible to determine which physical property was responsible for any TTS observed in any of the tests). Adult pike under similar exposure conditions showed a TTS of about 20 dB at 400 Hz, which was recovered within 18 hours. Chub, also under similar exposure levels, showed slightly higher levels of TTS, about 25 dB at 200 Hz and 35 dB at 400 Hz, similar for 5 playbacks or 20 playbacks, and fully recovered within 18 hours. Chub are members of a hearing specialist family of freshwater fishes with no marine species.

Santulli A, Modica A, Messina C, Ceffa L, Curatolo A, Rivas G, Fabi G, D'Amelio V. 1999. Biochemical Responses of European Sea Bass (Dicentrarchus labrax L.) to the Stress Induced by Off Shore Experimental Seismic Prospecting. *Marine Pollution Bulletin*, Volume 38, Issue 12, December 1999, Pages 1105-1114.

This study involved exposure of caged fish to very close and very prolonged seismic air source in order to obtain physiological responses typical of stress. The fish returned to baseline levels within 72 hours, with no injury and no apparent lasting effect, despite the unusually high and prolonged sound exposures.

Song, J., D.A. Mann, P.A. Cott, B.W. Hanna, and A.N. Popper. 2008. The inner ears of Northern Canadian freshwater fishes following exposure to seismic air gun sounds**. J. Acoust. Soc. Am.** 124(2):1360-1366.

No damage was found to any of the ears of the test fish from Popper et al (2005), despite findings of Temporary Threshold Shift in two cases where peak pressure exceeded 205-209 dB re 1µPa SPL (peak) or 176-180 dB re 1 μPa^2-s single impulse (shot) SEL.

United States Navy. 2013. Atlantic Fleet Training and Testing Final Environmental Impact Statement / Overseas Environmental Impact Statement. Available online at http://aftteis.com/DocumentsandReferences/AFTTDocuments/FinalEISOEIS.aspx

Wardle CS, Carter TJ, Urquhart GG, Johnstone ADF, Ziolkowski AM, Hampson G, Mackie D (2001) Effects of seismic air guns on marine fish. Cont Shelf Res 21:1005–1027.

A study of free swimming cod, pollack and hake on a reef, using a fixed seismic source. C-start but no movement away from the source was observed at exposure levels up to 195 dB SPL at a distance of 109 meters. The authors speculate on possible reasons for the lack of response, including site fidelity to the unique reef environment at which the study was performed.

ATTACHMENT B

ATTACHMENT B

Currently, three types of surveys are proposed in the Atlantic OCS: 2D seismic surveys, a 3D seismic survey, and an airborne gravity and magnetic survey. These surveys are described in more detail below.

A. Seismic Surveys – Towed Streamers

For the energy industry, modern seismic imaging reduces risk by increasing the likelihood that exploratory wells will successfully tap hydrocarbons and decreasing the number of wells that need to be drilled in a given area, reducing associated safety and environmental risks and the overall footprint for exploration. The use of modern seismic technology is similar to ultrasound technology—a non-invasive mapping technique built upon the simple properties of sound waves. Because survey activities are temporary and transitory, it is the least intrusive and most cost-effective means to understanding where recoverable oil and gas resources likely exist in the Mid- and South Atlantic OCS.

To carry out these surveys, marine vessels use acoustic arrays, most commonly as a set of compressed air chambers, to create seismic pulses. A predominantly low-frequency sound pulse is generated by releasing compressed air into the water as the vessel is moving. The pulses are bounced off the layers of rock beneath the ocean floor. The returning sound waves are detected and recorded by hydrophones that are spaced along a series of cables that are towed behind the survey ship. Seismologists then analyze the information with computers to visualize the features that make up the underground structure of the ocean floor. Geophysical contractors often have proprietary methods of data acquisition that may vary depending on their seismic target and data-processing capabilities, making each contractor's dataset unique. Once the data is processed, geophysicists interpret it and integrate other geoscientific information to make assessments of where oil and gas reservoirs may be accumulated. Based largely on this information, exploration companies will decide where, or if, to conduct further exploration for oil and gas.

2D Seismic Surveys

Two-dimensional surveys are so-called because they only provide a 2D cross-sectional image of the Earth's structure. These surveys are typically used for geologic research, initial exploration of a new region, and to determine data quality in an area before investing in a 3D survey. 2D towed-streamer surveys are acquired with a single vessel usually towing a single air source array and a single streamer cable. The streamer is a polyurethane-jacketed cable containing several hundred to several thousand sensors, most commonly hydrophones. The air source array directs energy downward towards the ocean floor. An integrated navigational system is used to keep track of where the air sources are activated, the positions of the streamer cable, and the depth of the streamer cable. The end of the cable is tracked with global positioning system (GPS) satellites, and tail buoys are attached at the end. Radar reflectors are routinely placed on tail buoys for detection by other vessels, and automatic identification system (AIS) devices are also routinely integrated into the tail buoys.

Ships conducting 2D surveys are typically 30-90 m (100-300 ft) long and tow a single-source array 200-300 m (656-984 ft) behind them approximately 5-10 m (16-33 ft) below the sea surface. The source array often consists of three subarrays, with six to twelve air source elements each, and measures approximately 12.5-18 m (41-60 ft) long and 16-36 m (52-118 ft) wide. Following behind the source array by 100-200 m (328-656 ft) is a single streamer approximately 5 to 12 or more km (3.1-7.5 mi) long. The ship tows this apparatus at a speed of approximately 3 to 5 knots. Approximately every 10-15 seconds (i.e., a distance of 23-35 m [75-115 ft] for a vessel traveling at 4.5 kn [8.3 km/hr]), the air source array is activated. The actual time between activations varies depending on ship speed and the desired spacing.

Typical spacing between ship-track lines for 2D surveys, which is also the spacing between adjacent streamer line positions, is greater than a kilometer. Lines can transect each other and can be parallel, oblique or perpendicular to each other. 2D towed-streamer surveys are normally regional, covering a large area of ocean so that activity is not always limited to a particular area. 2D surveys can provide high resolution imaging with tight line spacing intervals in shallow areas.

2D surveys can cover a larger area with less data density in less detail, resulting in a lower cost per area covered. While surveying, and after a prescribed ramp-up of the output of the array to full-operation intensity, a vessel will travel along a linear track for a period of time until a full line of data is acquired. Upon reaching the end of the track, the ship takes typically 2 - 6 hours to turn around and start along another track, varying depending on the spacing between track lines, the length of track lines, and the objectives of a specific survey. Some 2D surveys might include only a single long line. Others may have numerous lines, with line spacings of 2 km in some cases, and 10 km in other cases. Data acquisition generally takes place day and night and may continue for days, weeks, or months, depending on the size of the survey area. Data acquisition is not, however, continuous. A typical seismic survey experiences approximately 20 to 30 percent of non-operational downtime due to a variety of factors, including technical requirements or mechanical maintenance, standby for weather or other interferences, and performance of mitigation measures (e.g., ramp-up, pre-survey visual observation periods, and shutdowns).

3D Seismic Surveys

3D towed-streamer seismic surveys enable industry to image the subsurface geology with much greater clarity than 2D data because of the much denser data coverage. The quality is such that 3D data can often indicate hydrocarbon-bearing zones from water-bearing zones. Because 3D seismic data has been continuously and rapidly improving since its introduction in the 1970s, areas covered by 3D data shot only a few years ago may be reshot with current, improved technology, offering greater clarity than previous surveys. In addition, areas already covered using 2D techniques may be resurveyed with 3D. Further, 3D surveys may be repeated over producing fields at successive calendar times (at 6-month to several-year intervals) to better characterize and record changes over producing reservoirs. These 4D, or time-lapse 3D, surveys are used predominantly as a reservoir monitoring tool to detect and evaluate reservoir changes over time. Conventional, single-vessel 3D surveys are referred to as narrow azimuth 3D surveys.

The current state-of-the-art ships conducting 3D surveys are purpose-built vessels with much greater towing capability than the vessels conducting 2D surveys. While these vessels are generally 60 - 120 m long, with the largest vessels over 120 m (ft) in length and greater than 65 m (230 ft) wide at the back deck. These seismic ships typically tow two parallel source arrays 200-300 m (656-984 ft) behind them. The two source arrays are identical to each other and are the same as those used in the 2D surveys described previously. Following 100-200 m (328-656 ft) behind the dual source arrays are the streamers.

Most 3D ships can tow eight or more streamers at a time, with the total length of streamers (number of streamers multiplied by the length of each one) exceeding 80 km (50 mi). The theoretical towing maximum today is 24 streamers, each of which can be up to 12 km (7.5 mi) long, for a total of 288 km (179 mi). Towing 8-14 streamers that are each 3-8 km (1.9-5 mi) long is normal practice. Towing 10 streamers that are separated by 75-150 m (246-492 ft) means that a swath 675-1,350 m (2,215-4,429 ft) wide is covered on the sea surface in one pass of the ship along its track line. Other streamer configurations (number of streamers and their separation distance) can produce narrower or wider swaths.

The survey ship tows the apparatus at a speed of 3 to 5.5 kn during production. Approximately every 11 - 15 s (i.e., a distance of 25 m [82 ft] for a vessel traveling at 4.5 kn [8.3 km/hr]), one of the dual air source arrays is fired. The other array is fired 11 - 15 s later. To achieve the desired spacing, the time between firings depends on the ship speed. While surveying, a ship travels along a track for 12-20 hours (i.e., a distance of 100-167 km [62 - 104 mi] at 4.5 kn [8.3 km/hr]), depending on the size of the survey area. Upon reaching the end of the track, the ship takes 3 to 5 hours to turn around and start along another track. This procedure takes place day and night, and may continue for days, weeks, or months, depending on the size of the survey area. Data acquisition is not, however, continuous. A typical seismic survey experiences approximately 20-to-30 percent of non-operational downtime due to a variety of factors, including technical or mechanical problems, standby for weather or other interferences, and performance of mitigation measures (e.g., ramp-up, pre-survey visual observation periods, and shutdowns).

B. Non-Seismic Gravity and Magnetic Surveys

Both conventional gravity surveys and gravity gradiometry surveys are conducted today, most often by fixed-wing aircraft, or where necessary, by marine vessel deployment. There is no sound source associated with gravity or magnetic surveys. The dimensions of the gravity instruments and stand are approximately 1 m by 1 m by 1.5 m high (3 ft by 3 ft by 5 ft) and the total weight is approximately 150 kg (330 lb). The survey acquisition grid is similar to ship-based seismic surveys, generally with flight-line spacing of 0.5-3 km (0.3-2 mi). Surveys of 500 sq. km (180 sq. mi) can be completed in a few hours, with the aircraft flying at an altitude of 70-300 m (230-1,000 ft). The objectives of the survey will determine the flight-line spacing (distance between flight lines) and the altitude at which the survey will be conducted.

Measurements of the earth's magnetic field are useful in helping to determine geologic structures and stratigraphy in the subsurface in frontier exploration areas, such as the Atlantic OCS, and as a complement to existing seismic data. There are at least five types of magnetometers, three of which are commonly used in airborne magnetic surveying. In addition to the different types of magnetometers, there are also several different configurations that can be used on the aircraft. These configurations include: (1) a single sensor, typically a tail installation; (2) two horizontally separated magnetometers, usually wingtip pod sensors; (3) two vertically separated sensors, usually tail-mounted; and (4) a total magnetic intensity configuration, typically involving three, but potentially four, magnetic sensors. The sensor pods are cylindrical in shape, and typically 1-2 m (3.3-6.6 ft) long and several centimeters (several inches) in diameter.

The objectives of the survey (such as the amount of area to be covered, the desired detail to be obtained, etc.) and the cost determine three of the most important factors to be specified for any given survey: (1) the altitude at which the survey will be conducted; (2) the flight-line separation; and (3) the flight-line orientation, or direction. Recent surveys done in the Gulf of Mexico have been flown at altitudes of 60-300 m (200-1,000 ft), at speeds of 110 knots (250 km/hr), and with line spacings of 0.5-2 km (0.3-1.3 mi). Similar surveys were recently completed offshore Greenland and offshore Honduras.

ATTACHMENT C

May 7, 2014

Via Federal eRulemaking Portal

Mr. Gary D. Goeke
Chief, Environmental Assessment Section
Office of Environment (GM 623E)
Bureau of Ocean Energy Management
Gulf of Mexico OCS Region
1201 Elmwood Park Boulevard
New Orleans, LA 70123–2394

Re: Comments on Final Programmatic Environmental Impact Statement for Proposed G&G Activities on the Mid- and South Atlantic OCS

Dear Mr. Goeke:

This letter provides the comments of the International Association of Geophysical Contractors ("IAGC") in response to the Bureau of Ocean Energy Management's ("BOEM") Notice and Request for Comments on its Final Programmatic Environmental Impact Statement for Proposed G&G Activities on the Mid- and South Atlantic OCS ("PEIS"). *See* 79 Fed. Reg. 13,074 (Mar. 7, 2014). We appreciate BOEM's consideration of the comments set forth below.

IAGC is the international trade association representing the industry that provides geophysical services (geophysical data acquisition, processing and interpretation, geophysical information ownership and licensing, and associated services and product providers) to the oil and natural gas industry. IAGC member companies play an integral role in the successful exploration and development of offshore hydrocarbon resources through the acquisition and processing of geophysical data. IAGC members have expressed interest in conducting geophysical activities on the Atlantic OCS, and some IAGC members have already filed applications for authorizations relating to such activities.[1]

[1] In a joint letter with the American Petroleum Institute ("API") and the National Ocean Industries Association ("NOIA"), IAGC earlier commented on the draft PEIS ("DPEIS"). *See* Letter from Andy Radford, Sarah Tsoflias, and Luke Johnson to Gary D. Goeke (July 2, 2012) ("DPEIS Comment Letter"). API, NOIA, and IAGC have also submitted a comment letter dated

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Seismic surveys are the only feasible technology available to accurately image the subsurface before a single well is drilled. BOEM currently estimates that the Mid- and South Atlantic OCS holds at least 3.3 billion barrels of oil and 31.3 trillion cubic feet of natural gas. Although these estimates are impressive, it is widely believed that modern seismic imaging using the latest technology will enable BOEM to more accurately evaluate the Atlantic OCS resource base. The industry's advancements in geophysical technology – including seismic reflection and refraction, gravity, magnetics, and electromagnetic – will provide more realistic estimates of the potential resource. By utilizing these tools and by applying increasingly accurate and effective interpretation practices, IAGC's members can better locate and dissect prospective areas for exploration.

For the energy industry, modern seismic imaging reduces risk by increasing the likelihood that exploratory wells will successfully tap hydrocarbons and decreasing the number of wells that need to be drilled in a given area, reducing associated safety and environmental risks and the overall footprint for exploration. Because survey activities are temporary and transitory, it is the least intrusive and most cost-effective means to understanding where recoverable oil and gas resources likely exist in the Mid- and South Atlantic OCS.

I. OVERVIEW

IAGC supports BOEM's plan to authorize exploratory activities on the Atlantic OCS consistent with the Outer Continental Shelf Lands Act ("OCSLA"), which calls for the "expeditious and orderly development" of the OCS "subject to environmental safeguards." 43 U.S.C. § 1332(3). However, the PEIS undermines OCSLA's mandate, as well as the requirements of other applicable laws, such as the Marine Mammal Protection Act ("MMPA"), in a number of ways. In general, a fundamental flaw with the PEIS is its establishment of an unrealistic scenario in which exploration activities are projected to result in thousands of incidental takes of marine mammals, which BOEM admits will not actually occur. The supposed effects of this "worst case" hypothetical scenario are then addressed in the PEIS with mitigation measures, many of which are similarly unrealistic because they mitigate inaccurately presumed effects. This approach is contrary to both the best available scientific information and applicable law.

Many of the mitigation measures recommended in the PEIS are infeasible, will impose serious burdens on industry, may discourage exploration of the Atlantic, and will result in no benefits to protected species (because they address unrealistic effects). IAGC can and will support mitigation measures that are well supported by the best available science, consistent with existing practices that are proven to be effective and operationally feasible. However, we cannot

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May 7, 2014 (the "Joint Trades Letter"), in response to the PEIS, which IAGC incorporates by reference.

support mitigation measures with no basis in fact or science, which are intended to address effects that will not occur, and which will result in less exploration of the OCS, contrary to OCSLA.

Accordingly, we strongly urge BOEM to include in its Record of Decision ("ROD") the modifications suggested in the comments set forth below. With respect to the alternatives presented in the PEIS, Alternative A presents the option that is most supported by the best available science and applicable law. However, IAGC would support BOEM's adoption of Alternative B only so long as all of the modifications suggested below are incorporated into the ROD. All of these suggested modifications are within the scope of the analyses contained in the PEIS. *See Great Old Broads for Wilderness v. Kimbell*, 709 F.3d 836, 854-55 (9th Cir. 2013) (modified alternative in ROD upheld because all relevant impacts analyzed in NEPA document); *see also W. Watersheds Project v. BLM*, 721 F.3d 1264, 1277-78 (10th Cir. 2013) (same).

II. DETAILED COMMENTS

A. The PEIS's Marine Mammal Impact Analyses Are Factually and Legally Flawed

The PEIS's analysis of marine mammal impacts is, by BOEM's admission, an unrealistic assessment of the potential impacts of geophysical surveys on marine mammals that is purposefully constructed to overestimate levels of incidental take. The PEIS explains:

> The acoustic and impact modeling conducted to develop these [incidental take] estimates is by its very nature complex and demands numerous specific details be identified and used during calculations[.] However, it must be emphasized that each of these assumptions are purposely developed to be conservative and accumulate throughout the analysis (e.g., representative sound source is modeled at highest sound levels and always at maximum power and operation, sound levels received by an animal are calculated at highest levels, marine mammal density values used likely exceed actual densities, and models do not include the effect of all mitigations in reducing take estimates). Therefore, the results of the modeling predictions will overestimate take.

PEIS at 1-5 (emphases added); *see also* PEIS at 4-62 ("BOEM emphasizes that these estimates should be seen as highly conservative of potential take without the consideration of most mitigation with the exception of the time-area closure described in Alternative A."). The results of this hypothetical "worst case" scenario analysis are strikingly divergent from the record of actual observed marine mammal impacts related to offshore exploration activities. *See* DPEIS Comment Letter §§ I, II & Appx. 1. For example, the PEIS implausibly concludes that thousands of marine mammals will experience Level A incidental take, and that hundreds of thousands of marine mammals will experience Level B incidental take, as a result of seismic activities. PEIS at Tables 4-9, 4-10, 4-11, 4-12. These take estimates would result in tens of thousands of shutdown events per year, in contrast to the average 55 shutdowns that are required per year in the Gulf of Mexico under existing operations, monitoring, and mitigation.[2] *See* DPEIS Comment Letter, Appx. 1.

We are aware of no federal agency assessment of the effects of seismic activities on marine mammals that results in incidental take estimates that are remotely similar to those stated in the PEIS. Moreover, the history of incidental take authorizations for offshore seismic activities demonstrates that levels of actual incidental take are far smaller than even the most balanced pre-operation estimates of incidental take. *See* DEIS at E-69.[3] The PEIS's flawed

[2] Aggregating the estimated takes presented in Table 43 of the PEIS yields a total of 26,000 estimated takes.

[3] *See, e.g.*, BOEM, *Final EIS for Gulf of Mexico OCS Oil and Gas Eastern Planning Area Lease Sales 225 and 226*, at 2-22 (2013), http://www.boem.gov/BOEM-2013-200-v1/ ("Within the CPA, which is directly adjacent to the EPA, there is a long-standing and well-developed OCS Program (more than 50 years); there are no data to suggest that activities from the preexisting OCS Program are significantly impacting marine mammal populations."); *id*. at 2-23 (with respect to sea turtles, "no significant cumulative impacts to sea turtles would be expected as a result of the proposed exploration activities when added to the impacts of past, present, or reasonably foreseeable oil and gas development in the area, as well as other ongoing activities in the area"); BOEM, *Final EIS for Gulf of Mexico OCS Oil and Gas Western Planning Area (WPA) Lease Sales 229, 233, 238, 246, and 248 and Central Planning Area (CPA) Lease Sales 227, 231, 235, 241, and 247*, at 4-203 (v.1) (2012), http://www.boem.gov/Environmental-Stewardship/Environmental-Assessment/NEPA/BOEM-2012-019_v1.aspx (WPA); *id*. at 4-710 (v.2), http://www.boem.gov/Environmental-Stewardship/Environmental-Assessment/NEPA/BOEM-2012-019_v2.aspx (CPA) ("Although there will always be some level of incomplete information on the effects from routine activities under a WPA proposed action on marine mammals, there is credible scientific information, applied using acceptable scientific methodologies, to support the conclusion that any realized impacts would be sublethal in nature and not in themselves rise to the level of reasonably foreseeable significant adverse (population-level) effects."); *id*. at 4-235, 4-741 ("[T]here are no data to suggest that routine activities from the preexisting OCS Program are significantly impacting sea turtle populations."); BOEM, *Final Supplemental EIS for Gulf of Mexico OCS Oil and Gas WPA Lease Sales 233 and CPA Lease Sale 231*, at 4-30, 4-130 (2013), http://www.boem.gov/uploadedFiles/BOEM/BOEM_Newsroom/Library/Publications/2013/BOEM%202013-0118.pdf (reiterating conclusions noted above); MMS, *Final Programmatic EA, G&G Exploration on Gulf of Mexico OCS*, at III-9, II-14 (2004), http://www.nmfs.noaa.gov/pr/pdfs/permits/mms_pea2004.pdf ("There have been no documented instances of deaths, physical injuries, or auditory (physiological) effects on marine mammals from seismic surveys."); *id*. at III-23 ("At this point, there is no evidence that adverse

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approach to assessing the impacts of seismic activities on marine mammals results in a number of significant legal and factual errors, as set forth below.

1. The PEIS unlawfully analyzes a worst case scenario

Prior to 1986, NEPA regulations required a lead agency to prepare a "worst case analysis" of impacts for which there is incomplete or unavailable information. *See* 51 Fed. Reg. 15,618 (Apr. 25, 1986).[4] However, this requirement was expressly rescinded decades ago because it was found to be "an unproductive and ineffective method of achieving [NEPA's] goals; one which can breed endless hypothesis and speculation." *Id.*; *see Robertson v. Methow Valley Citizens Council*, 490 U.S. 332, 354-56 (1989) (U.S. Supreme Court confirming that worst case analysis is no longer applicable). In place of the worst case analysis requirement, the federal Council on Environmental Quality ("CEQ") promulgated "a wiser and more manageable approach to the evaluation of reasonably foreseeable significant adverse impacts in the face of incomplete or unavailable information in an EIS." 51 Fed. Reg. at 15,620. The new (and current) approach, codified in 40 C.F.R. § 1502.22, requires federal lead agencies to disclose such impacts and perform a "carefully conducted" evaluation based upon "credible scientific evidence." *Id.*; 40 C.F.R. § 1502.22(b)(1). In developing this requirement, CEQ explained that "credible" means "capable of being believed" and stated that "[i]nformation which is unworthy of belief should <u>not</u> be included in an EIS." 51 Fed. Reg. at 15,622-23 (responses to comments) (emphasis added).

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behavioral impacts at the local population level are occurring in the GOM."); LGL Ltd., *Environmental Assessment of a Low-Energy Marine Geophysical Survey by the US Geological Survey in the Northwestern Gulf of Mexico*, at 30 (Apr.-May 2013), http://www.nmfs.noaa.gov/pr/pdfs/permits/usgs_gom_ea.pdf ("[T]here has been no specific documentation of TTS let alone permanent hearing damage, i.e., PTS, in free-ranging marine mammals exposed to sequences of airgun pulses during realistic field conditions."); 75 Fed. Reg. 49,759, 49,795 (Aug. 13, 2010) (issuance of IHA for Chukchi Sea seismic activities ("[T]o date, there is no evidence that serious injury, death, or stranding by marine mammals can occur from exposure to airgun pulses, even in the case of large airgun arrays.")); MMS, *Draft Programmatic EIS for OCS Oil & Gas Leasing Program, 2007-2012*, at V-64 (Apr. 2007) (citing 2005 NRC Report), http://www.boem.gov/Oil-and-Gas-Energy-Program/Leasing/Five-Year-Program/5and6-ConsultationPreparers-pdf.aspx (MMS agreed with the National Academy of Sciences' National Research Council that "there are no documented or known population-level effects due to sound," and "there have been no known instances of injury, mortality, or population level effects on marine mammals from seismic exposure ").

[4] In the PEIS, BOEM determines that there is incomplete or unavailable information for a full assessment of the impacts of the proposed activities on marine mammals. *See* PEIS at 4-6, 4-47.

By performing an analysis of marine mammal impacts that is "purposely developed to be conservative," based on the "highest" sound levels and erroneously high marine mammal densities, and intended to "overestimate take," BOEM has performed precisely the same type of "worst case analysis" that was rejected by both CEQ and the U.S. Supreme Court many years ago. By its terms, and as expressly stated in the PEIS, the analysis of marine mammal impacts is purposely designed to be inaccurate and to evaluate the worst possible consequences that could hypothetically result from unmitigated seismic surveying. Indeed, it is hard to imagine an analysis that presents a scenario worse than the hundreds of thousands of incidental takings that are erroneously predicted by the PEIS. The PEIS's analysis of marine mammal effects is plainly not credible, it evaluates effects that, by BOEM's admission, will not occur, and, therefore, it is "unworthy of belief." The PEIS's assessment of marine mammal impacts unlawfully applies a "worst case" analysis and does not comply with NEPA or currently applicable CEQ regulations (40 C.F.R. § 1502.22).

2. The PEIS does not present an accurate scientific analysis

An EIS must rely upon "high quality" information and "accurate scientific analysis." 40 C.F.R. § 1500.1(b); *Conservation Nw. v. Rey*, 674 F. Supp. 2d 1232, 1249 (W.D. Wash. 2009); *Envtl. Def. v. U.S. Army Corps of Eng'rs*, 515 F. Supp. 2d 69, 78 (D.D.C. 2007) ("Accurate scientific analysis [is] essential to implementing NEPA."). It also must have "professional integrity, including scientific integrity" and may not rely on "incorrect assumptions or data" or "highly speculative harms" that "distort[] the decisionmaking process." *See Theodore Roosevelt Conservation P'ship v. Salazar*, 616 F.3d 497, 511 (D.C. Cir. 2010); 40 C.F.R. § 1502.24; 73 Fed. Reg. 61,292, 61,299 (Oct. 15, 2008) (CEQ regulations require "high quality" information and "scientific integrity"); *Native Ecosystems Council v. U.S. Forest Serv.*, 418 F.3d 953, 964 (9th Cir. 2005); *City of Shoreacres v. Waterworth*, 420 F.3d 440, 453 (5th Cir. 2005) (internal citations omitted).[5] To be sure, courts have invalided EISs that did not meet these standards, that were based on "stale scientific evidence . . . and false assumptions," or that failed to disclose the "potential weakness" of relied-upon modeling. *See, e.g., Seattle Audubon Soc'y v. Espy*, 998 F.2d 699, 704 (9th Cir. 1998); *Or. Natural Res. Council Fund v. Goodman*, 505 F.3d 884, 897 (9th Cir. 2007) (citations omitted).

Respectfully, the PEIS fails to satisfy any of these important NEPA principles. An analysis that, by the agency's admission, overestimates take and relies upon incorrect assumptions, is, by definition, "inaccurate." Moreover, the PEIS's analysis of marine mammal impacts is, at best, "highly speculative" because it is based on scenarios and assumptions that will not occur.

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[5] *See also CBD v. BLM*, 937 F. Supp. 2d 1140, 1155 (N.D. Cal. 2013) (principle that reasonably foreseeable environmental effects may not include "highly speculative harms" is equally applicable to direct and indirect effects).

3. The conclusions of the PEIS fail to consider, and are contrary to, the MMPA

The PEIS's assessment of marine mammal impacts is directly contrary to the MMPA. BOEM has defined the proposed action to include only those activities that have first received incidental take authorizations under the MMPA. *See* PEIS at 1-14, 1-25. As a prerequisite to incidental take authorization, the MMPA requires the permitting agency to find that the authorized take will have a "negligible impact" on marine mammals. 16 U.S.C. § 1371(a)(5)(A), (D). Accordingly, by definition, the proposed action analyzed in the PEIS should include only those seismic activities causing incidental take at levels that NMFS has expressly determined result in a "negligible impact" to marine mammal stocks. However, in sharp contrast, the PEIS concludes that the impacts of airguns on marine mammals under the proposed action are "moderate." PEIS at Table 2-4. By concluding that "moderate" impacts will result from seismic operations, BOEM has incorrectly analyzed the proposed action that is defined in the PEIS. Moreover, this discrepancy highlights the significant flaws that result from the PEIS's erroneous analysis of marine mammal impacts.[6] BOEM must analyze the effects of the action it has proposed, which includes offshore seismic operations that will receive incidental take authorizations under the MMPA and, by definition, will have no more than a negligible impact on marine mammal stocks. Based on 40 years of experience and recent scientific research and observational data, BOEM should find in the ROD that the impacts of seismic exploration are indeed <u>negligible</u>.

B. Certain Mitigation Measures Recommended in the PEIS Are Unsupported and Unreasonable

The record demonstrates that the scope of mitigation measures applied to offshore operations in the Gulf of Mexico is already more than adequate to protect marine mammals and sea turtles in a manner consistent with federal laws.[7] Despite this record, the PEIS recommends

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[6] The PEIS's "moderate" impact finding is also factually inconsistent. "Moderate" impacts are defined in the PEIS as "detectable, short-term, extensive, and severe; or … detectable, short-term or long-lasting, localized, and severe; or … detectable, long-lasting, extensive or localized, but less than severe." PEIS at x. Accordingly, a "moderate" seismic impact must be either "long-lasting" or "severe." However, insofar as we are aware, no seismic activities that have received MMPA incidental take authorizations have caused impacts amounting to anything more than temporary changes in behavior, without any known injury, mortality, or other adverse consequence to any marine mammal species or stocks. *See supra* note 3.

[7] *See supra* note 3; *see also* Mary Jo Barkaszi et al., *Seismic Survey Mitigation Measures and Marine Mammal Observer Reports* (2012); A. Jochens et al., *Sperm Whale Seismic Study in the Gulf of Mexico: Synthesis Report*, at 12 (2008) ("There appeared to be no horizontal avoidance to controlled exposure of seismic airgun sounds by sperm whales in the main SWSS study area."); 78 Fed. Reg. 11,821, 11,827, 11,830 (Feb. 20, 2013) ("[I]t is unlikely that the

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certain mitigation measures that have never been required for offshore exploratory operations, and that are more stringent (and less supported) than the measures that have already been successfully implemented. The unprecedented measures recommended in the PEIS are a direct result of BOEM's flawed impact assessments. For example, as described above, the PEIS creates a hypothetical worst case scenario for marine mammal impacts, determines that the projected adverse effects in that scenario will be substantial, and then recommends mitigation measures to address those supposed effects. However, because the adverse effects identified in the PEIS are inaccurate and unrealistic, the mitigation measures intended to address those effects are similarly flawed and without any factual or scientific support.

The mitigation measures that particularly concern IAGC are addressed in detail below. Without question, these measures, if implemented, will have substantial adverse effects on offshore geophysical operations. These measures will result in increased survey duration, which, in turn, can increase the potential exposure of marine mammals to seismic-related effects.[8] We strongly urge BOEM to reconsider these mitigation measures as it prepares the ROD.[9]

1. Dolphin shutdowns

The PEIS recommends a mitigation measure calling for the shutdown of operations if a dolphin enters the acoustic exclusion zone <u>unless</u> the dolphin is determined <u>by the observer</u> to be

(. . . continued)
proposed project [a USGS seismic project] would result in any cases of temporary or permanent hearing impairment, or any significant non-auditory physical or physiological effects"; "The history of coexistence between seismic surveys and baleen whales suggests that brief exposures to sound pulses from any single seismic survey are unlikely to result in prolonged effects."); 79 Fed. Reg. 14,779, 14789 (Mar. 17, 2014) ("There has been no specific documentation of temporary threshold shift let alone permanent hearing damage[] (i.e., permanent threshold shift, in free ranging marine mammals exposed to sequences of airgun pulses during realistic field conditions."); 79 Fed. Reg. 12,160, 12,166 (Mar. 4, 2014) ("To date, there is no evidence that serious injury, death, or stranding by marine mammals can occur from exposure to air gun pulses, even in the case of large air gun arrays.").

[8] The mitigation measures also increase the amount of time the vessel spends surveying because shutdowns and delays necessarily result in overall increased surveying time to preserve data quality and integrity.

[9] The effects analysis contained in NMFS's associated biological opinion suffers from the same flaws as the PEIS's effects analysis. In addition, the terms and conditions stated in the biological opinion (which mitigate the inaccurate effects conclusions) lack a rational basis for the reasons stated in this letter with respect to the PEIS's corresponding mitigation measures. IAGC requests that BOEM work with NMFS to similarly reconsider and modify the biological opinion's terms and conditions.

voluntarily approaching the vessel. PEIS at 2-11.[10] This proposed measure is contrary to the best available science, impractical, arbitrary, and unsupported for at least the following reasons.

First, dolphins are mid- to high-frequency specialists and, therefore, insensitive to the low frequency impulse sounds emitted by seismic operations. The E&P Sound and Marine Life Joint Industry Program has supported research to study the effects of multiple airgun pulses in odontocetes and, specifically, to study whether bottlenose dolphin exposure to airgun impulses results in temporary threshold shift ("TTS").[11] As the public abstract from the study explains, "subjects participated in over 180 exposure sessions with no significant TTS observed at any test frequency, for any combinations of range, volume or pressure during behavioral tests."[12] Even at ranges as close as 3.9 m and with the air gun operating at 150 in^3 and 2000 psi, resulting in cumulative Sound Exposure Levels of 189-195 dB re 1μPa^2s, the impulses did not result in detectable TTS in any dolphin tested. As a result of the relative low-frequency content of airgun impulses compared to the relative high-frequency hearing ability of dolphins, no injuries or significant behavioral responses were observed in this study.[13] Industry observations corroborate this scientific evidence. For example, dolphins are frequently observed by personnel on seismic vessels to approach the vessels during operations to bow-ride and chase towed equipment – a direct indication of insensitivity to seismic sound generation. PSO observation reports indicate that there is no statistically significant difference between the frequency of dolphin sightings and

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[10] "Voluntary approach" is defined as "a clear and purposeful approach toward the vessel by delphinid(s) with a speed and vector that indicates that the delphinid(s) is approaching the vessel and remains near the vessel or towed equipment." PEIS at 2-11.

[11] James J. Finneran et al., *Final Report* (2013). TTS in odontocetes in response to multiple airgun impulses. (IAGC understands that a copy of this Final Report has been furnished by the author to NMFS).

[12] C.E. Schlundt et al., *Auditory Effects of Multiple Impulses from a Seismic Airgun on Bottlenose Dolphins*, presentation at the Effects of Noise on Aquatic Life Third International Conference, Budapest, Hungary (Aug. 11-16, 2013) (emphasis added). The results of this study also are useful to support inclusion of frequency weighting in updated acoustic criteria.

[13] In a 2011 Programmatic EIS, the National Science Foundation recognized that "[t]here has been no specific documentation that TTS occurs for marine mammals exposed to sequences of air-gun pulses during operational seismic surveys." Programmatic EIS/OEIS for NSF-Funded & USGS Marine Seismic Research, at 3-133 (June 2011), http://www.nsf.gov/geo/oce/envcomp/usgs-nsf-marine-seismic-research/nsf-usgs-final-eis-oeis_3june2011.pdf (recognizing 180 dB re 1 uPa (rms) criterion for cetaceans "is actually probably quite precautionary, i.e., lower than necessary to avoid TTS at least for delphinids, belugas and similar species").

acoustic detections during seismic operations when the source is active or silent. *See* Attachment A.[14]

Second, even if there were scientific justification for the proposed dolphin shutdown mitigation measure (which there is not), implementation of the measure is impractical. We are aware of no mitigation measures applicable to offshore exploration activities in which an observer is required to subjectively determine the intent of a marine mammal. Determining marine mammal intent from great distances is very difficult for experienced marine mammal biologists in staged scientific experiments, let alone for observers who will be attempting to determine dolphin intent over vast distances in the ocean environment. Based on observation reports, PSOs will be unable to confidently assess animal behavior or "intentions" because they cannot accurately determine species within the expanded exclusion zone.[15] The result is that observers will likely, out of caution, call for shutdowns in almost all instances where dolphins are observed within the exclusion zone.

Third, in areas of high-density dolphin populations, such as the Atlantic Ocean and the Gulf of Mexico, shutdown requirements for a species that enjoys bow-riding and approaching vessels could effectively bring all seismic activity to a halt. Implementation of this proposed measure will substantially increase the number of shutdowns and delays in ramp-ups, which will result in much longer surveys and significantly increased costs with no environmental benefit. *See* Barkaszi, *supra*, note 7, at 1 (75% of delays in ramp-ups due to presence of protected species in exclusion zone during 30 minutes prior to ramp-up were due to dolphins).

Fourth, the proposed measure is without precedent. Under Joint NTL No. 2012-G02 (and previously NTL No. 2007-G02), BOEM required seismic operators in the Gulf of Mexico to shut down for any whale observed in the exclusion zone. BOEM defined "whales" as all marine mammals except dolphins and manatees. In the June 2013 settlement of litigation challenging BOEM's permitting of seismic activity in the Gulf of Mexico, the U.S. District Court for the Eastern District of Louisiana extended the shutdown requirements to manatees. In short, no

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[14] *See also* A. MacGillivray et al., *Marine Mammal Audibility of Selected Shallow-Water Survey Sources*, J. Acoustical Soc'y of Am. 135(1) (Jan. 2014).

[15] *See* Attachment A. It is well known that different species will exhibit different behaviors. For example, Risso's dolphins generally avoid vessels and rarely bow-ride, rough-toothed dolphins generally avoid vessels but do bow-ride, and common dolphins are avid bow-riders. *See* K. Wynn & M. Schwartz, *Guide to Marine Mammals and Turtles of the U.S. Atlantic and Gulf of Mexico* (2009).

dolphin shutdown provision, as recommended in the PEIS, has ever been required by any federal agency.[16]

Finally, there is no legal basis for the proposed dolphin shutdown measure. Under the MMPA, mitigation measures attached to incidental take authorizations must address the reduction of incidental take. *See* 16 U.S.C. §§ 1371(a)(5)(A), (a)(5)(D); 50 C.F.R. § 216.104(a)(13). However, as set forth above, there is no scientific evidence demonstrating that active acoustic seismic surveys result in any incidental takes of dolphins. Accordingly, there is no statutory basis for recommending the dolphin shutdown mitigation measure.

In sum, the proposed dolphin shutdown mitigation measure would broadly and substantially impact seismic operations without any corresponding environmental benefit and without any scientific support. IAGC respectfully requests that BOEM, in its ROD, expressly find that this recommended measure is unsupported and unnecessary, and exclude the measure from the ROD's recommended mitigation measures. The ROD should also affirmatively clarify that shutdown is not required for dolphins within the exclusion zone in all circumstances, regardless of whether dolphins are exhibiting bow-riding behavior or any other behavior.

2. 40 km buffer zone between concurrent surveys[17]

In Alternative B, BOEM recommends an expanded 40 km buffer zone between concurrent seismic surveys. The rationale for this expanded buffer is "to provide a corridor between vessels conducting simultaneous surveys where airgun noise is below Level B thresholds and approaching ambient levels." PEIS at 2-37. The agency's stated scientific basis for this proposed measure is, at best, ambiguous: "New information suggests that, in some circumstances, airgun noise can be detected at great distances from the sound source, such as across ocean basins (Nieukirk et al., 2012), yet it is unknown if detection of sound at these distances has any effect on marine mammals or other marine species." PEIS at 2-38. No other scientific evidence, no published studies, and no other rationale are provided for this proposed measure, which is given a half-page explanation in Appendix C. In addition, this proposed

[16] For example, in the Gulf of Mexico, the average shutdown lasts for 58 minutes, *see, e.g.*, Barkaszi, *supra*, note 7, which the PEIS would extend by at least 30 minutes by increasing the visual monitoring period following a shutdown from 30 to 60 minutes. Multiplying a rough 1.5-hour average shutdown by 26,000 shutdowns would yield roughly 39,000 hours of shutdowns or approximately 1625 days. Because the typical seismic survey operation costs roughly $1.5 million per day, the total potential costs arising from the PEIS's assumptions equal a staggering $2.5 billion.

[17] This measure, as well as the 60-minute "all clear" period addressed below, were not addressed anywhere in the DPEIS. This is the first opportunity the regulatory community has had to comment on these measures.

measure is not mentioned at all in the biological opinion.

In contrast, the best available scientific information supports a buffer zone, if any, of 17.5 km, which is the standard separation distance maintained by seismic operators. The modeling performed by JASCO (*see* PEIS at Appx. D) demonstrates that the typical exposure radius for the 160 dB threshold is 10 km. The largest observed exposure radius was 15 km, but this occurred in less than 10% of the modeled cases. The lowest observed exposure radius was 5 km. Current technology has enabled many operators to decrease typical exposure radii to 7 to 9 km.

A buffer zone that more than doubles the highest possible exposure radii is clearly <u>not</u> reasonable or scientifically supportable – i.e., it is arbitrary. Moreover, the PEIS's reference to airgun noise detections at "great distances" does not support the proposed buffer zone because those detections occur (if at all) at very low levels that are well below the thresholds NMFS has established for Level B harassment.

The recommendations and analyses in an EIS must be "accurate," not speculative, and grounded in "high quality" scientific information. *See supra* Section II.A.2. The recommended 40 km buffer zone fails all of these standards. There is literally no scientific information that supports this measure, and, as explained above, the best available information contradicts it. To our knowledge, no buffer zones even approaching this magnitude have ever been required as a condition of offshore seismic authorizations.[18] To make matters worse, BOEM admits in the PEIS that implementation of the 40 km buffer would result in no additional benefits to protected species. PEIS at xxiv (40 km buffer "would not be expected to change any impact ratings"). Consequently, BOEM must decline to adopt the 40 km buffer zone mitigation measure in the ROD and, instead, recommend either no buffer zone, as recommended in Alternative A, or, alternatively, a 17.5 km buffer zone, consistent with standard practice.

3. 60-minute "all clear" period

The PEIS recommends that monitoring of the exclusion zone shall "begin no less than 60 min prior to start-up" and that restarting of equipment after a shutdown "may only occur following confirmation that the exclusion zone is clear of all marine mammals and sea turtles for 60 min." PEIS at C-29. However, again, BOEM has provided no factual or scientific support for this measure, nor is any meaningful supporting information provided in the biological opinion. To our knowledge, a 60-minute "all clear" period has never been required as a condition of any offshore seismic authorization in the United States. In fact, the routine and <u>proven-to-be-effective</u> practice is to require a 30-minute "all clear" period – for marine mammals

[18] *See, e.g.*, 78 Fed. Reg. 35,364, 35,423 (June 12, 2014) (vessel spacing of 24 km required to avoid any effects of multiple surveys on migrating or foraging walruses).

generally and for ESA-listed species.[19] There is no available information suggesting that the standard practice has not been effective and, to the contrary, all available information demonstrates that the standard practice has been very successful in protecting marine mammals.

Expanding the standard 30-minute "all clear" period to 60 minutes will substantially increase the duration and cost of seismic surveys, which, in turn, increases safety and environmental risks. Extrapolated over all surveys that will be performed over a five-year period, the increased time and expenses resulting from this mitigation measure alone will be dramatic. Increased survey time will also increase the amount of time that protected species are exposed to the potential effects associated with the presence of vessels. The PEIS contains no analysis of the increased operational or environmental effects associated with the 60-minute "all clear" period, compared to the standard 30-minute period (and sometimes 15-minute period) that has successfully been implemented in all offshore seismic operations to date.[20] Accordingly, in the ROD, BOEM should decline to adopt the 60-minute period as unsupported and unprecedented and, instead, adopt the standard 30-minute period.

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[19] *See Issuance of IHA to Apache Alaska Corp. for Seismic Survey in Cook Inlet*, 79 Fed. Reg. 13,626, 13,636-37 (Mar. 11, 2014) (requiring 30-minute observation period before startup and after sightings of killer and ESA-listed beluga whales and large odontocetes, but only 15-minute period after sightings of pinnipeds and small odontocetes); *Issuance of IHA to Apache Alaska Corp. for Seismic Survey in Cook Inlet*, 78 Fed. Reg. 12,720, 12,732-33 (Feb. 25, 2013) (providing same requirements, and specifying that the shorter 15-minute clearance period applies to harbor porpoises); *Issuance of IHA to TGS-Nopec for Seismic Survey in Chukchi Sea*, 78 Fed. Reg. 51,147, 51,154, 51,160 (Aug. 20, 2013) (same); *Issuance of IHA to Shell and WesternGeco for Seismic Surveys in the Beaufort and Chukchi Seas*, 73 Fed. Reg. 66,106, 66,135-36 (Nov. 6, 2008) (requiring 30-minute observation period before ramp-up and 15- or 30-minute delay of ramp-up for sightings of small odontocetes and pinnipeds, or baleen whales and large odontocetes, including ESA-listed species, respectively); *Issuance of ITR for Oil and Gas Activity in Chukchi Sea*, 78 Fed. Reg. 35,364, 35,424, 35,425 (June 12, 2013) (requiring monitoring period of 30 minutes for walruses and ESA-listed polar bears before startup and after sighting); *Issuance of ITR for Oil and Gas Activity in Beaufort Sea*, 76 Fed. Reg. 47,010, 47,052 (Aug. 3, 2011) (same).

[20] Pre-ramp-up and post-shutdown, the vessel is still moving and likely would move 8-9 km at 3-5 knots in a 60-minute period, bypassing any established exclusion zone several times. *See* 79 Fed. Reg. at 14,797 (NMFS stating that ramp-up is unnecessary "[b]ecause the vessel has transited away from the vicinity of the original sighting during the 8-minute period, implementing ramp-up procedures for the full array after an extended power-down (i.e. transiting for an additional 35 minutes from the location of initial sighting) would not meaningfully increase the effectiveness of observing marine mammals approaching or entering the exclusion zone for the full source level and would not further minimize the potential for take").

4. Exclusion zones greater than 500 meters

The PEIS explains that exclusion zones "shall be calculated independently and shall be based on the configuration of the array and the ambient acoustic environment, but shall not have a radius of less than 500 m…." PEIS at 2-10. BOEM's suggested approach for exclusion zones will require substantial modeling effort and will result in exclusion zones that are many times greater than those that have typically been implemented (with success) in the Gulf of Mexico. *See supra* note 3. The expanded exclusion zones are especially concerning because they will ultimately be dictated by the hearing group with the largest modeled radii once new group-specific acoustic criteria are implemented. High-frequency cetaceans, particularly delphinids, will therefore determine the size of the exclusion zone in most instances. Since BOEM is applying shutdown requirements to delphinids, and, as described above, because the exception to those requirements will rarely be applied in practice, this will result in numerous shutdowns due to the observation of delphinids within the large exclusion zone.

Moreover, these shutdowns will serve no environmental benefit because, as explained above, the best available science and information demonstrates that delphinids are unaffected by the lower frequency sounds produced by seismic operations. Exclusion zones should be based on the best available science and modeling and, if that modeling demonstrates that exclusions zones of less than 500 meters are warranted, then there is no basis for arbitrarily requiring a minimum exclusion zone of 500 m. If the minimum 500 m exclusion zone requirement is not applied, IAGC would support the incorporation of power-down procedures to mitigate any potential effects. Power-down procedures acceptable to IAGC are a <u>modified</u> version of the procedures described at 79 Fed. Reg. 14,780, 14,797 (Mar. 17, 2014) ("Langseth IHA").[21]

5. Turtle shutdowns

The PEIS applies exclusion zone shutdown criteria equally to marine mammals and sea turtles. However, the PEIS does not meaningfully address the fact that sea turtles are much more difficult to observe than marine mammals. Sea turtles can be reasonably observed at distances of 100 m to 300 m from a vessel, but it is very unlikely that sea turtles can be reliably observed at greater distances. *See* Attachment A (most turtle observations within 100 m). In addition, if a sea turtle is observed within the exclusion zone (triggering a shutdown of airguns), assuming the vessel is moving at 3 to 5 knots, the observed turtle will be outside of the exclusion zone within approximately 15 minutes because sea turtles swim very slowly compared to marine mammals.

[21] Specifically, IAGC would support power-down procedures similar to those in the Langseth IHA <u>provided that</u>: (1) power-down would be implemented only if a marine mammal is observed <u>in or entering</u> (<u>not</u> "likely" to enter) the exclusion zone; (2) power-down procedures may involve a reduction in the <u>volume and/or pressure of the array</u>; and (3) if a marine mammal is observed within the 500 m exclusion zone, then the reduced array would be shut down and shutdown procedures would apply.

In such circumstances, a 60-minute "all clear" requirement would plainly be unnecessary (setting aside the fact that it is unnecessary in all circumstances).

Because turtles are difficult to observe at distances greater than 300 m, application of the exclusion zone shutdown to sea turtles is infeasible and will very likely result in unwarranted shutdowns because observers, acting out of precaution, will call for shutdowns when anything resembling a sea turtle is observed. There is also no existing scientific basis for the proposed turtle shutdown requirement, and none is provided in the PEIS. *See supra* note 3. The ROD should therefore recommend a reduced exclusion zone for sea turtles that is feasible and practical. Such a reduction is also consistent with the best available science, which indicates that sea turtles are not as sensitive to sound as marine mammal species. *See* PEIS, Appx. I. IAGC recommends a 300 m exclusion zone for all sea turtle species.

6. Expanded NARW time-area closure and DMAs[22]

As part of Alternative B, BOEM recommends an expansion of the time-area closure applicable to North Atlantic Right Whales ("NARW") to a continuous 37 km-wide zone extending from Delaware Bay to the southern limit of the programmatic area. PEIS at C-32. It appears that BOEM intends this closure to be applied to <u>any</u> sound produced by seismic vessels such that no portion of a vessel's ensonification zone may enter the closed area. The result is that the proposed NARW time-area closure will be much larger than what is described in the PEIS. Because NARWs are primarily threatened by ship strikes and fishing entanglement – not seismic sound – BOEM should clarify in its ROD that the NARW time-area closure applies to the <u>presence of vessels, not a vessel's ensonified zone.</u> BOEM should also clarify in its ROD that vessels may transit through the closure area when seismic equipment is not active.

In addition, the PEIS includes time-area closure measures in areas designated as Dynamic Management Areas ("DMAs") under NMFS's ship-strike reduction regulations. *See* PEIS at C-16. These measures are very problematic, and unwarranted, for at least the following reasons:

- DMAs were created to address ship strike situations, which involve vessels traveling at high rates of speed (12-20 knots). Indeed, NMFS has indicated that vessel speeds of less than 10 knots are sufficiently protective. *See* 78 Fed. Reg. 73,726 (Dec. 9, 2013). BOEM's proposed application of DMAs to seismic operations is therefore contrary to both the original purpose of DMAs (to address ship strikes, not potential acoustic impacts) and NMFS's recent finding. Moreover, the proposed application to seismic vessels is particularly arbitrary because BOEM intends to broadly apply it to the vessel's 160 dB ensonified zone.

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[22] The DMA-related measures were also not included for public review in the DPEIS.

- Nowhere has either BOEM or NMFS evaluated the operational practicability or effectiveness of applying DMAs to seismic operations.

- Unlike NMFS's approach to DMAs, BOEM appears to propose to make seismic industry compliance with DMAs mandatory. There is no basis for such a measure, especially given that NMFS has taken no such step for the vessels that DMAs were intended to address.

- DMAs are unpredictable and the identification of DMAs on short notice will compromise the implementation of seismic survey operations that have been carefully planned over a substantial period of time, with no corresponding benefit.

7. Vessel strike avoidance

The PEIS's recommended vessel strike avoidance measures for ESA-listed whales present serious operational and safety problems, and must be modified. Specifically, the PEIS recommends that if a vessel comes within 100 m of an ESA-listed whale species, it "must reduce speed and shift the engine to neutral, and must not engage the engines until the whale(s) has moved outside of the vessel's path and the minimum separation distance has been established." PEIS at C-9. Respectfully, this measure fails to consider that seismic vessels are significantly different than typical vessels due to the substantial amount of highly specialized equipment that is towed behind a seismic vessel. Operationally, a seismic vessel must maintain forward motion to sustain the equipment spread or the whole system will collapse. The consequence of immediately shifting the engine into neutral could be significant equipment damage in the tens of millions of dollars, and weeks of vessel downtime. As a practical matter, a seismic vessel moving at 3 to 5 knots is very unlikely to strike an ESA-listed marine mammal. In the event of a sighting of an ESA-listed whale within 100 m of the vessel, the vessel could slow (to no less than 3 knots) and turn gently away from the animal, which would both avoid a collision and lessen the risk of damage to seismic equipment. In its ROD, BOEM must decline to adopt the vessel strike avoidance mitigation measure.

8. Passive acoustic monitoring

Under Alternative B, BOEM would require the use of Passive Acoustic Monitoring ("PAM") as part of the Seismic Airgun Survey Protocol. IAGC encourages consideration of PAM during periods of low visibility in its 2011 best practices guidelines. PAM is one of several monitoring techniques that compliments (rather than replaces) traditional visual monitoring. However, commercially available PAM systems can be highly variable, the equipment is unreliable, and PAM's utility as a secondary monitoring source during daylight observations has not been proven. Overall performance and capabilities of PAM are highly dependent on factors such as technical specification of equipment, operational setting, availability of experienced and trained personnel, and the species of marine mammals present in a given area. Mandatory use of PAM will increase survey cost, require the placement of more personnel on vessels (i.e., four dedicated PAM observers onboard), and increase entanglement risk due to more gear being towed in the water.

IAGC therefore urges BOEM to either make the use of PAM optional, as recommended in Alternative A, or require PAM only for operations at night and in periods of low visibility.[23] This is reasonable given BOEM's admission that "it is difficult to quantify any difference in impact level [of Alternative B] relative to Alternative A." PEIS at 2-40; *see also* PEIS at xxiv ("The degree of improvement [due to making PAM mandatory] has not been estimated but would not be expected to change any impact ratings."). IAGC encourages BOEM to use risk-based mitigation and monitoring measures based on the best available information and promote development of technologies that can best accomplish effective detection and monitoring of marine mammals.

9. National standards for protected species observers

The PEIS and biological opinion purport to adopt the recommendations described in NOAA Technical Memorandum NMFS-OPR-49, *National Standards for a Protected Species Observer and Data Management Program: A Model Using Geological and Geophysical Surveys* (Nov. 2013) ("Observer Standards"). However, this document was never released for public review and comment and was not referenced in the PEIS. Although we appreciate the agencies' attempt to clarify and standardize observer guidelines and requirements, the Observer Standards are flawed in a number of respects. It is imperative that the agencies consider public input on the Observer Standards and make the revisions necessary to ensure that the standards are workable, accurate, and appropriate. The standards should encourage adaptive technology, remote monitoring, reduction of health, safety, and environmental risks, and use of an updated reporting form that provides substantive data from observations to inform the need (if any) for additional or revised mitigation measures. The letter by IAGC, API, and NOIA, dated May 2, 2014, addressing the Observer Standards (attached) more specifically addresses our concerns with the Observer Standards and offers constructive solutions. We appreciate BOEM's consideration of our concerns.

C. The Adaptive Management Provisions Must Be Clarified and Improved

Although the PEIS states that BOEM will consider future data regarding the efficacy of mitigation measures and will adjust requirements for individual surveys, the PEIS appears to establish minimum standards that can only become more stringent through adaptive management. *See* PEIS at 2-39 (adaptive management at the site-specific level "would analyze the best available information and apply additional mitigation, depending on the site-specific proposed action" (emphasis added)); *see also* PEIS at 1-27 to 1-28 (examples largely focus on

[23] NMFS's biological opinion (page 308) only requires PAM for ramp-up at night or in periods of low visibility.

"additional" measures). As just one example, BOEM has established 500 m as a minimum exclusion zone and indicates that it will not set exclusion zones less than 500 m even if a smaller zone is supported by data and modeling.

The ROD must clarify that BOEM will implement "adaptive management" in the true sense of the term – i.e., site-specific requirements may be adjusted to be either less restrictive or more restrictive based on the project-specific information, the species present in the project area, the assessment of relevant risks, and the best available information.

III. CONCLUSION

IAGC appreciates this opportunity to comment on the PEIS. Although we support BOEM's plan to authorize exploratory activities on the Atlantic OCS, there are several aspects of the PEIS that are not supported by science or by law, or are otherwise infeasible. Of the alternatives presented in the PEIS, Alternative A presents the option that is most supported by the best available science and applicable law. However, IAGC would support BOEM's adoption of Alternative B only so long as <u>all</u> of the modifications suggested in these comments are incorporated into the ROD. We appreciate your consideration of our comments and sincerely hope that BOEM will prepare a ROD that addresses the concerns set forth above. Should you have any questions, please do not hesitate to contact me.

Sincerely,

Karen St. John

Karen St. John
Group Vice President - Environment

International Association of Geophysical Contractors

cc: Mr. Walter Cruickshank (Walter.Cruickshank@boem.gov)
Ms. Jill Lewandowski (Jill.Lewandowski@boem.gov)

ATTACHMENT D

ATTACHMENT D

PSO Data 2013 - March 2015: Dolphin Sightings ***Provided by CGG based on MMO reports submitted to BOEM during this period representing approximately 33% of total vessel activity days in the GOM since 2013.[1] Data prior to 2013 is not included in this analysis because PAM was not used consistently until this point.***		
Species Identification		
% of Unidentified Dolphin	85%	In many reports, PSOs contribute sea state, distance, or the sun's glare as a key factor for not being able to identify species. The significant number of acoustic detections without confirmed species identification is also a main contributor.
% of Identified Dolphin	15%	
PAM		
% of PAM Detections	78%	PAM detections accounted for a majority of the total dolphin sightings and detection reports. However, only 1% of the acoustic detections successfully identified a specific dolphin species. Visual corroboration was necessary to identity the species about 25% of the time.
Source Activity Comparison		
% of sightings and/or acoustic detections – source active	55%	The frequency of sightings and acoustic detections are almost proportional when the source is active or silent.
% of sightings and/or acoustic detections –source silent	45%	
Animal Behavior		
% of sightings when bow-riding was observed (active or silent)	6%	The data indicates an estimated 2% variance in observed bow-riding when the source was active versus when the source was silent. Fewer PSO observations when the source is silent could account for some variance. The values are close enough to conclude the frequency of animal engagement with the vessel is not specific to source status.
Average Distance of Animal at Initial Sighting	570m	Initial sightings and detections are made most often at a distance between 500m and 800m.

PSO Data 2013 - March 2015: Turtle Sightings ***Provided by CGG based on MMO reports submitted to BOEM during this period representing approximately 33% of total vessel activity days in the GOM since 2013.[2] Data is taken from 2013 to be consistent with Dolphin sighting period.***		
Total Sightings	410	410 sea turtles were observed overall.
Average Distance of Animal at Initial Sighting	53m	Analysis of turtle sightings indicates observations are typically within 100m. It is often difficult to ascertain if an object in the water is a turtle or floating debris at further ranges.

[1] Estimated calculation based on level of activity from January 2013 to March 2015 from IHS SeismicBase Vessel Search Database.

[2] *Id.*

May 7, 2014

Mr. Gary D. Goeke
Chief, Environmental Assessment Section
Office of Environment (GM623E)
Bureau of Ocean Energy Management
Gulf of Mexico OCS Region
1201 Elmwood Park Boulevard
New Orleans, Louisiana 70123-2394

Submitted via email: *ggeis@boem.gov*

Re: Comments on the Final Programmatic EIS for the Mid- and South Atlantic

Dear Mr. Goeke:

This letter provides the comments of the American Petroleum Institute ("API"), the International Association of Geophysical Contractors ("IAGC"), and the National Ocean Industries Association ("NOIA"), in response to the Bureau of Ocean Energy Management's ("BOEM") Notice of Availability and Request for Comments on its Final Programmatic Environmental Impact Statement (EIS) for proposed Geological and Geophysical ("G&G") Activities on the Mid- and South Atlantic Outer Continental Shelf ("OCS"). *See* 79 Fed. Reg. 13,074 (March 7, 2014). We appreciate BOEM's consideration of the comments set forth below.

API is a national trade association representing over 600 member companies involved in all aspects of the oil and natural gas industry. API's members include producers, refiners, suppliers, pipeline operators, and marine transporters, as well as service and supply companies that support all segments of the industry. API and its members are dedicated to meeting environmental requirements, while economically developing and supplying energy resources for consumers. API is a longstanding supporter of allowing new exploration in the Atlantic OCS and the Final Programmatic Environmental Impact Statement ("FPEIS") is the first step toward the much needed collection of new and improved data on potential oil and natural gas resources in the Mid-and South Atlantic OCS Planning Areas.

IAGC is the international trade association representing the industry that provides geophysical services (geophysical data acquisition, processing and interpretation, geophysical information ownership and licensing, and associated services and product providers) to the oil and natural gas industry. IAGC member companies play an integral role in the successful exploration and development of offshore hydrocarbon resources through the acquisition and processing of geophysical data.

NOIA is the only national trade association representing all segments of the offshore industry with an interest in the exploration and production of both traditional and renewable energy resources on the U.S. Outer Continental Shelf ("OCS"). The NOIA membership comprises more than 275 companies engaged in a variety of business activities, including production, drilling, engineering, marine and air transport, offshore construction, equipment manufacture and supply, telecommunications, finance and insurance, and renewable energy.

The Associations support BOEM's plan to authorize exploratory activities on the Atlantic OCS consistent with the Outer Continental Shelf Lands Act ("OCSLA"); however, the FPEIS undermines OCSLA's mandate to expeditiously and orderly develop the natural resources of the OCS, and the requirements of other applicable laws such as the Marine Mammal Protection Act, in a number of ways. We feel that the FPEIS establishes an unsupported, unobserved, and unrealistic scenario where G&G activities are projected unrealistically to result in thousands of incidental takes of marine mammals – incidental takes that, in fact, BOEM admits will not actually occur. From this fundamentally flawed and inaccurate approach, the FPEIS develops and analyzes unrealistic mitigation measures to address the effects of a "worst case" hypothetical scenario. This approach is contrary to both the best available scientific information and applicable law. The Associations respectfully recommend that BOEM's Record of Decision (ROD) reflect a revised agency judgment on these issues.

Because G&G activities have little documented impact on marine mammals, the mitigation measures endorsed by Alternative B employ speculation to impose potentially substantial operational and economic burdens on future G&G activities that undermine Congress's clear policy mandate that the Department of Interior facilitate expeditious development of the OCS.

The results of our detailed review of the FPEIS are presented in Appendix 1 attached to this letter, but we have included an overview of the key points contained in the appendix:

1. The FPEIS and future permitting decisions must consider the statutory and environmental context of G&G activities, including the OCSLA. Geological and geophysical activities are critical to the expedited development of OCS resources and the national economic and energy policy goals mandated by OCSLA. The FPEIS omits and undermines much of the critical substantive context and plain congressional directives for the G&G activities analyzed, and it also fails to adequately consider the critical importance of G&G data to OCS development and to the reduction of risks. The ROD that will be prepared based on the FPEIS must consider all relevant factors in balancing the importance of the activities to be permitted, which are critical to the essential purpose of OCSLA.

2. The FPEIS does not incorporate all of the best available science. BOEM discounts observational data that contradict its modeled quantification of G&G impacts and instead relies on unrealistic assumptions regarding sound exposure that are not supported by the best science currently available.

3. Alternative B encourages BOEM to impose unnecessary, arbitrary, and impracticable mitigation measures lacking scientific justification, including the following:

- The FPEIS's expansion of the exclusion zone – compounded by the extension of the shutdown requirement to delphinids – will significantly increase the number of array shutdowns required during a seismic survey, and thereby substantially impact the economics and operations of conducting a seismic survey in the Atlantic. The establishment of a 500-meter minimum is an arbitrary departure from BOEM's rationale for amending the exclusion zone provision. Because BOEM justifies the new exclusion zone provision on the modeled footprint of the individual array's characteristics and site-specific ambient noise conditions, the exclusion zone should always be based upon the modeled output of the array, even if the modeled output results in an exclusion zone of less than 500 meters.
- The FPEIS extends the visual monitoring period for ramp-up of the airgun array – both prior to beginning the survey and after a shutdown – from 30 minutes to 60 minutes. The extension of the visual monitoring period compounds the other operational difficulties Alternative B imposes on seismic surveys. The FPEIS itself offers no justification for the extension of the visual monitoring period.
- The FPEIS extends shutdown requirement to include delphinids. Both the Associations' 2012 DPEIS comments, and BOEM's approval of past seismic survey applications illustrate that extending the shutdown requirement to delphinids is not scientifically justified because delphinids are mid-frequency hearing specialists, with an effective hearing range largely outside of the low frequency range characteristic of airgun arrays. Implementation of this proposed measure will substantially increase the number of shutdowns with no proven environmental benefit.
- The proposed geographic separation between simultaneous seismic airgun surveys is scientifically unsupported. Because the separation distance rests on NMFS's exposure criteria for Level B takes, it suffers from the same flaws as NMFS's thresholds (most notably that the thresholds do not represent the best available science). In addition, this measure is not included in the NMFS Biological Opinion and BOEM offers no evidence to support its underlying assumption that marine mammals would utilize the "corridor" that the separation requirement is designed to create.

4. The Expanded Time-Area Closure provisions for North Atlantic Right Whales lack sufficient basis in existing data, and are otherwise unsupported and unjustified. Similarly, the addition of an acoustic buffer zone around closure zones and the inclusion of Dynamic Management Areas ("DMAs") in the FPEIS are unsupported by the science. The fact that DMAs and acoustic buffer zone mitigations were not included in the Draft EIS has precluded the opportunity for public evaluation and comment.

5. The FPEIS proposes unprecedented observation and shutdown requirements for High Resolution Geophysical (HRG) activities that mimic closely those required of seismic surveys, despite the fact they are significantly different in many ways.

In addition, we note that the FPEIS incorporates the recently published NMFS-OPR-49, *National Standards for Protected Species Observers and Data Management: A Model Using Geological and Geophysical Surveys* ("Observer Standards"). The Associations recently sent a letter to agency staff regarding changes that we would like to see incorporated into the Observer Standards and we have included that letter as Attachment A in our comments on the FPEIS.

The Associations feel that BOEM has failed to provide a reasoned justification for choosing Alternative B as the preferred alternative. While BOEM justifies Alternative B as providing the "highest practicable" level of mitigation measures, it is not required to make its selection based on this standard at the expense of other valid concerns necessary for achieving balance as required under OCSLA. Moreover, many of the mitigation measures recommended in the FPEIS are infeasible, will impose serious burdens on industry, may discourage exploration of the Atlantic, and will result in no benefits to protected species because they address unreal and unsupported effects. The Associations support mitigation measures that are based on the best available science, consistent with existing practices that are proven to be effective, and are operationally feasible. However, we cannot support mitigation measures with no basis in fact or science, that address effects that have not been observed, and will result in less exploration of the OCS.

The Associations appreciate the opportunity to comment on the FPEIS. Although we support BOEM's plan to authorize exploratory activities on the Atlantic OCS, there are a number of aspects of the PEIS that are not supported by science or by law, or are otherwise infeasible. Of the Alternatives presented in the FPEIS, Alternative A presents the option that is most supported by the best available science and applicable law. However, the Associations would support BOEM's adoption of Alternative B so long as <u>all</u> of the modifications suggested in separate comments to the FPEIS submitted by the IAGC (see Attachment B) are incorporated into the ROD. All of these suggested modifications are within the scope of the analyses contained in the PEIS. *See Great Old Broads for Wilderness v. Kimbell*, 709 F.3d 836, 854-55 (9th Cir. 2013) (modified alternative in ROD upheld because all relevant impacts analyzed in NEPA document); *see also W. Watersheds Project v. BLM*, 721 F.3d 1264, 1277-78 (10th Cir. 2013) (same).

We appreciate your consideration of our comments and sincerely hope that BOEM will prepare a ROD that addresses our concerns. Further, we hope that the ROD will be issued as soon as possible so that much needed seismic surveys in the Atlantic can be initiated. Should you have any questions please contact Andy Radford at (202)682-8584 or radforda@api.org.

Sincerely,

Andy Radford
American Petroleum Institute

Karen St. John

International Association of Geophysical Contractors

Jeffrey Vorberger
National Ocean Industries Association

Appendix 1

Comments of the American Petroleum Institute, International Association of Geophysical Contractors, and National Ocean Industries Association

API, IAGC, and NOIA (collectively, "the Associations") respectfully request that BOEM revise the FPEIS to effectuate the purposes of the Outer Continental Shelf Lands Act (OCSLA) and the agency's obligations under the National Environmental Policy Act (NEPA). For the reasons set forth below, in the accompanying documents, and in prior comments to BOEM, the Associations believe the FPEIS's selection of Alternative B as the preferred alternative violates BOEM's obligations under NEPA and OCSLA. Because G&G activities have little documented impact on marine mammals, the mitigation measures endorsed by Alternative B employ speculation to impose potentially prohibitive operational and economic burdens on future G&G activities that undermine Congress's clear policy mandate that the Department of Interior facilitate expeditious development of the OCS.

Of the Alternatives presented in the FPEIS, Alternative A presents the option that is most supported by the best available science and applicable law. However, the Associations would support BOEM's adoption of Alternative B so long as all of the modifications suggested in separate comments to the FPEIS submitted by the IAGC (see Attachment B) are incorporated into the ROD. All of these suggested modifications are within the scope of the analyses contained in the PEIS. *See Great Old Broads for Wilderness v. Kimbell*, 709 F.3d 836, 854-55 (9th Cir. 2013) (modified alternative in ROD upheld because all relevant impacts analyzed in NEPA document); *see also W. Watersheds Project v. BLM*, 721 F.3d 1264, 1277-78 (10th Cir. 2013) (same).

I. The FPEIS Must Consider the Statutory and Environmental Context of G&G Activities.

NEPA is a purely procedural statute that "does not mandate particular results, but simply prescribes the necessary process." *Robertson v. Methow Valley Citizens Council*, 490 U.S. 332, 350 (1989). "If the adverse environmental effects of the proposed action are adequately identified and evaluated, the agency is not constrained by NEPA from deciding that other values outweigh the environmental costs." *Id*. *See also Utahns for Better Transportation v. U.S. Dep't of Transportation*, 305 F.3d 1152, 1162–63 (10th Cir. 2002) ("[A]gencies are not required to elevate environmental concerns over other valid concerns"). Because NEPA itself provides no substantive guide for consideration of the underlying action—here, the conduct of G&G activities—the "statutory context" of the underlying action must inform the analysis of costs and benefits in an EIS. *See, e.g., League of Wilderness Defenders—Blue Mountains Biodiversity Project v. U.S. Forest Serv.*, 689 F.3d 1060, 1070 (9th Cir. 2012).

Consideration of the statutory context informs an entire EIS. For example, "the goals of an action delimit the universe of the action's reasonable alternatives." *City of Alexandria, Va. v. Slater*, 198 F.3d 862, 867 (D.C. Cir. 1999) (quotation omitted). *See also, e.g., Kootenai Tribe of Idaho v. Veneman*, 313 F.3d 1094, 1121 (9th Cir. 2002) (Forest Service "not required under NEPA to consider alternatives . . . that were inconsistent with its basic policy objectives").

Indeed, an agency may eliminate both alternatives and mitigation measures that do not meet the purposes and needs of a project. *See Biodiversity Conservation Alliance v. BLM*, 608 F.3d 709, 715 (10th Cir. 2010). And the goals must be "heavily influenced by the agency's consideration of the views of Congress, expressed, to the extent the agency can determine them, in the agency's statutory authorization act, as well as in other congressional directives." *Natural Resources Defense Council, Inc. v. Pena*, 972 F. Supp. 9, 18 (D.D.C. 1997) (quotation omitted).

As set forth below, the FPEIS omits and undermines much of the critical substantive context and plain congressional directives for the G&G activities analyzed.

A. G&G Activities Are Critical to the Expedited Development of OCS Resources Mandated by OCSLA.

"Where an action is taken pursuant to a specific statute, the statutory objectives of the project serve as a guide by which to determine the reasonableness of objectives outlined in an EIS." *Westlands Water District v. U.S. Dep't of the Interior*, 376 F.3d 853, 866 (9th Cir. 2004). Here, OCSLA provides the specific statutory authorization of G&G activities. *See* 43 U.S.C. § 1340. While Chapter 1.4.2 of the FPEIS defines the purpose and need of G&G activities with reference to development of "oil and gas reserves," BOEM's generalized discussion of purpose neglects the strong statutory objectives Congress identified in OCSLA. *See* FPEIS at 1-9. That omission is critical.

Congress enacted OCSLA to promote and ensure the "expedited exploration and development of the [OCS] in order to achieve national economic and energy policy goals, assure national security, reduce dependence on foreign sources, and maintain a favorable balance of payments in world trade." 43 U.S.C. § 1802(1); *see also id*. § 1332(3) (the OCS "should be made available for expeditious and orderly development, subject to environmental safeguards, in a manner which is consistent with the maintenance of competition and other national needs"). Indeed, Congress specified that it wished to "make [OCS] resources available to meet the Nation's energy needs as rapidly as possible." *Id*. § 1802(2)(A). OCSLA accordingly "has an objective—the expeditious development of OCS resources . . . ." *California v. Watt*, 668 F.2d 1290, 1316 (D.C. Cir. 1981). Because "[t]he first stated purpose of the Act . . . is to establish procedures to expedite exploration and development of the OCS," OCSLA's remaining purposes primarily concern measures to eliminate or minimize the risks attendant to that exploration and development. Several of the purposes, in fact, candidly recognize that some degree of adverse impact is inevitable." *Id.*[1] *Cf.* Executive Order 13212 (May 18, 2001) (directing that "executive departments and agencies . . . shall take appropriate actions, to the extent consistent with applicable law, to expedite projects that will increase the production, transmission, or conservation of energy").

While the FPEIS concedes that G&G activities generate data that contribute to "informed" and "orderly" development decisions by industry and Government, *see* FPEIS at 1-8–1-9; *see also* FPEIS at 3-3 (noting importance of G&G data), BOEM's choice of Alternative B undercuts the

[1] The FPEIS concludes that the majority of impacts from the proposed G&G activities will be "negligible" or "minor." *See* FPEIS at x–xiv (summarizing anticipated impacts from Alternative A).

critical importance of G&G activities to expeditious OCS development and, thus, to OCSLA's animating purpose. And Alternative B endorses restrictive mitigation measures despite the generally "minor" impacts of G&G activities. As further explained *infra*, the operational and practical limitations imposed by the FPEIS threaten the viability of critical G&G activities and thereby directly undermine Congress's stated purpose to "promote the swift, orderly and efficient exploration" of OCS oil and gas resources.[2]

B. The FPEIS Fails To Adequately Consider the Critical Importance of G&G Activities to Development of OCS Oil and Gas Resources, and To the Reduction of Risks to Environmental Resources from OCS Development.

The FPEIS candidly acknowledges that "[t]he G&G surveys acquired during the period when Atlantic oil and gas leasing took place in the 1970's and 1980's have been eclipsed by newer instrumentation, technology, and data processing that make seismic data of that time period inferior," FPEIS at 1-9, and existing estimates of energy reserves in the Atlantic woefully out-of-date. Rather, "[n]ew surveys conducted with current technology would significantly improve the ability of both industry and Government predict where, and in what quantity, fossil fuel hydrocarbons are more likely to be found," and "allow the Government to place a fair and appropriate value on these resources for the Nation." FPEIS at 2-58.

Moreover, as the FPEIS concedes, "using . . . vintage surveys to optimally site an exploratory well or a well field, or to interpret the nature of formation fluids or gases, is generally not reasonable." FPEIS at 2-57. Having the most accurate and state-of-the-art seismic data for use in drilling and production activities reduces the environmental impact of exploration and production, by significantly reducing the number of unsuccessful wells and, thus, reducing the potential environmental impact of each well so avoided. As technology continues to advance, the seismic industry can continue to reduce drilling risk and increase potential production. Just as physicians today may use MRI technology to image an area that previously had been imaged by X-ray technology, geophysical experts are actively using and enhancing the most modern technology to make improved seismic evaluations.

Indeed, vast improvements in geophysical imaging technologies in recent years now afford the oil and gas industry significant precision in subsurface imaging, which reduces environmental risks during drilling operations. For example, subsurface imaging provides a key input to help predict hazardous over-pressurized zones in a reservoir and thus allows an operator to better design a well to minimize its associated types and levels of risk.

G&G activities thus provide environmental benefits in the conduct of the expeditious OCS oil and gas development activities mandated by OCSLA.[3] The FPEIS, however, fails to consider the environmental benefits of improved G&G activities. Rather, BOEM disregards such benefits

[2] H.R. Rep. No. 95-590, at 8, *reprinted in* 1978 U.S.C.C.A.N. 1450, 1460.

[3] *Cf.* Executive Order 12866, § 1(b)(6) (Sept. 30, 1993) ("Each agency shall assess both the costs and the benefits of the intended regulation and . . . propose or adopt a regulation only upon a reasoned determination that the benefits of the intended regulation justify its costs.").

as "outside of the scope of the NEPA document." FPEIS Vol. III, Table L-6 at L-116 (response to comments of API, IAGC, and NOIA).

Contrary to BOEM's narrow view of G&G activities, "[t]he purpose of NEPA is to require agencies to consider ***environmentally significant aspects*** of a proposed action." *Utahns for Better Transportation v. U.S. Dep't of Transportation*, 305 F.3d 1152, 1162 (10th Cir. 2002) (emphasis added). *Cf. Utahns*, 305 F.3d. at 1174 ("An EIS must analyze not only the direct impacts of a proposed action, but also the indirect impacts of past, present, and reasonably foreseeable future actions . . . ."). By ignoring the environmental benefits of G&G activities to anticipated oil and gas development activities, the FPEIS fails to "adequately set[] forth sufficient information to allow the decisionmaker to consider alternatives and make a reasoned decision after balancing the risks of harm to the environment against the ***benefits*** of the proposed action." *Friends of the Boundary Waters Wilderness v. Dombeck*, 164 F.3d 1115, 1128 (8th Cir. 1999) (emphasis added). *See also Coal. for a Livable Westside v. U.S. Postal Serv.*, No. 99-cv-10873, 2000 WL 1264256, at *3 (S.D.N.Y. Sept. 7, 2000) (explaining that an EIS must "assess[]the environmental benefits and detriments of the proposed action").

II. The FPEIS Does Not Incorporate the Best Available Science.

As explained in the Associations' comments on the DPEIS ("2012 DPEIS Comments"), BOEM's scientific analysis must be based upon the best available science. *See* 2012 DPEIS Comments, Appendix 1 at 1 (identifying requirements of NEPA and Executive Order 13563). *See also* 40 C.F.R. § 1502.24 (requiring agency to "insure the professional integrity, including scientific integrity, of the discussions and analyses in the environmental impact statements"); *id.* § 1500.1(b). For the reasons identified in the Associations' 2012 DPEIS Comments, and as further set forth below, the FPEIS does not satisfy BOEM's obligation to use the best available science.

A. BOEM Discounts Marine Mammal Field Observational Data that Undermines its Modeled Quantification of G&G Impacts.

Data accumulated from Marine Mammal Observers demonstrate the absence of documented effects—in particular, injury or death to an animal—of seismic surveys on marine mammals. Nevertheless, the FPEIS estimates an enormous number of Level A and Level B takes from G&G activities in the Atlantic. Relying on the sound exposure criteria developed by the National Marine Fisheries Service (NMFS), the FPEIS predicts, for example, up to nearly 12,000 Level A takes of bottlenose dolphins per year from seismic survey operations, and over 1.1 million Level B takes. *See, e.g.*, FPEIS at xi. Because such estimates bear no relation to the minimal impacts actually observed from seismic survey activities, BOEM has apparently ignored the existing data on actual, observed impacts in derogation of its obligation to utilize the best available science. *Cf. San Juan Citizens Alliance v. Stiles*, No. 08-cv-144, 2010 WL 1780816, at *16 (D. Colo. May 3, 2010) (noting that Forest Service regulation requiring use of "best available science" means agency "cannot ignore existing data" (quotation omitted)); *Turtle Island Restoration Network v. U.S. Dep't of Commerce*, No. 12-cv-594, 2013 WL 4511314, at *22 (D. Hawai'i Aug. 23, 2013) (Under the ESA, "the 'best available data' requirement keeps agencies from ignoring available information."); *The Ecology Ctr., Inc. v. U.S. Forest Serv.*, 451

F.3d 1183, 1194 n.4 (10th Cir. 2006) (looking to meaning of "best available science" under other statutory regimes to inform meaning of requirement in National Forest Management Act).

Rather than rely on observational data, BOEM estimated impacts with a predictive computer model of sound propagation and exposure. *See* FPEIS at 2-17 & Appendices D, E. The FPEIS explains that Acoustic Integration Model (AIM), which is used to estimate takes, as "a 4D, individual-based, Monte Carlo statistical model" that "is by its very nature complex and requires numerous assumptions to predict results . . . ." FPEIS at 4-58. Even with that complexity, AIM does not incorporate animal behaviors, such as avoidance, which likely occur and would likely reduce the estimated number of exposures.

Notably, the D.C. Circuit has cautioned that "although computer modeling is a useful and often essential tool for performing the Herculean labors Congress imposes on administrative agencies, such models, despite their complex design and aura of scientific validity, are at best imperfect and subject to manipulation." *Gas Appliance Mfrs. Ass'n v. Dep't of Energy*, 998 F.2d 1041, 1045 (D.C. Cir. 1993) (quotation and alteration omitted). "Since the accuracy of any computer model hinges on whether the underlying assumptions reflect reality . . . [t]he agency's burden [to demonstrate the reasonableness of a model] becomes heavier when a method of prediction is being relied on to overcome adverse actual test data." *Id*. (quotations and alteration omitted).

Here, BOEM's modeling predicts levels of take that vastly exceed, *see infra*, the observational impact data accumulated by Marine Mammal Observers on survey vessels.[4] Far from supporting the FPEIS, the observed data conflicts with the enormous number of takes predicted by the models. *Cf. Conservation Congress v. U.S. Forest Serv.*, No. 10-17298, 489 F. App'x 151, 153 (9th Cir. June 4, 2012) (recognizing that agency's scientific support may be insufficient where scientific studies indicate the agency's "analysis is outdated or flawed or indicate any scientific information directly undermining" the agency's conclusion (quotation omitted)); *Native Ecosystems Council v. U.S. Forest Serv.*, 418 F.3d 953, 964 (9th Cir. 2005) ("To take the required 'hard look' at a proposed project's effects, an agency may not rely on incorrect assumptions or data in an EIS."). Thus, while a model fails to satisfy NEPA requirements if it "is so oversimplified that the agency's conclusions from it are unreasonable," *Small Refiner Lead Phase-Down Task Force v. U.S. EPA*, 705 F.2d 506, 535 (D.C. Cir. 1983), the FPEIS employs a model with the opposite, but equally fatal, flaw: complication that is not grounded in, and deviates significantly from, existing data.

Given the FPEIS's deviation from observed impact data, BOEM's defense of the FPEIS as providing "a detailed description for each step in the impact assessment process," FPEIS Vol II, Table L-6 at L-109, is non-responsive to the Association's concerns, *compare Montana Wilderness Ass'n v. McAllister*, No. 09-36051, 460 F. App'x 667, 670 (9th Cir. Dec. 1, 2011) (finding agency met its duty to respond to comments where is "adequately responded to the ***substance*** of . . . comments" (emphasis added)), or the agency's NEPA obligations.

[4] One BOEM review of Marine Mammal Observer data, for example, logged a total of 194,273 visual survey hours, with only 125.74 hours of down time attributed to protected species shutdowns. *See* BOEM, *Seismic Survey Mitigation Measures and Marine Mammal Observer Reports*, at 1 (June 2012).

In addition to its deviation from observed impacts, the FPEIS's underlying AIM model suffers from documented weaknesses. In 2006, NMFS initiated an independent peer review of the AIM model. *See* Summary Report: Review of Acoustic Integration Model (AIM), University of Miami Independent System for Peer Review at 1 (Dec. 11, 2006), *available at* http://www.nmfs.noaa.gov/pr/pdfs/permits/lfa_aim_review.pdf. The peer review did not reach a consensus on whether AIM meets the Council for Regulatory Monitoring (CREM) guidelines "since [AIM] is not an application model (but a tool for developing such models)." *Id.* (noting "there was some diversity of opinion"). Rather, the peer review noted "[t]he need for expertise in the use of AIM" as well as "the absence of appropriate uncertainty and sensitivity tests in the current applications of AIM." *Id.* While the peer review agreed that "the use of AIM ***can*** lead to models which will meet CREM guidelines . . ., such models, at this stage, would need to be evaluated on a case-by-case basis (i.e., merely using AIM is not sufficient . . .)." *Id.* (emphasis added). The FPEIS provides no verification that such a case-by-case analysis was undertaken of the use of AIM here. That lack of verification is particularly significant in this case because the peer review further identified the absence of data on "real" animal behavior as a fundamental limitation of AIM, *see id.* at 7–11 (noting "knowledge of marine mammals was identified as the weakest component"), and, as explained above, observed impact data undermines the model's predictions of G&G impacts.

Finally, BOEM's explanation that the sound "propagation models" employed by the FPEIS "have been extensively tested against field measurements," FPEIS Vol. III, Table L-6 at L-111–L-112, is likewise non-responsive to the Associations' concerns. The absence of observed impacts from seismic surveys relates to the sound exposure modeling conducted by BOEM, not the propagation modeling that is limited to determining the ways that sound moves through the ocean (and is an input in the exposure model). The fact that BOEM believes the propagation models are "appropriate" and "considered" acceptable, *see, e.g.*, FPEIS Vol. III, Table L-6 at L-109, fails to respond to the Association's showing that the sound exposure models are scientifically or practically flawed.

B. BOEM Relies on Assumptions Regarding Sound Exposure that Are Not Supported by the Best Available Science.

As explained in the Associations' 2012 DPEIS comments, BOEM's impact analysis improperly equates received sound levels to takes. *See, e.g.*, 2012 DPEIS Comments, Appendix 2 at 10–15. The FPEIS responds simply that the impact analysis is justified because it is (1) "conservative" and (2) based upon exposure criteria developed by NMFS that is beyond BOEM's control. *See, e.g.*, FPEIS Vol. III, Table L-6 at L-113; *id.* at L-111 (stating BOEM "cannot use the Southall criteria as the basis for take estimates because they have not been adopted by NMFS"); *id.* at L-112 (explaining that sound exposure criteria used to estimate take "are based on their acceptance by NMFS"); *id.* at L-114 ("[T]he choice of metric to use to determine takes was made by NMFS."); *id.* at L-118. The former explanation merely demonstrates BOEM's failure to adopt clear or consistent standards, and the latter abdication to NMFS violates BOEM's independent NEPA obligations.

<u>First</u>, the FPEIS simply states that its take estimates are "conservative" and the result of conservative—or "very conservative"—assumptions, "and this conservatism accumulates throughout the analysis." FPEIS at xii, xiii. The bare identification of an accumulated conservatism does not itself justify BOEM's decision to employ such a conservative bias. Indeed, the FPEIS compounds its conservative bias by classifying the impacts of G&G activities on the majority of species as "negligible," but nonetheless choosing the more conservative Alternative B. *See* FPEIS at x–xxv. Yet the FPEIS offers no data as justification; rather, Marine Mammal Observer data indicates little seismic survey impact on marine mammals and provides no support for the FPEIS' conservatism. As the Associations' 2012 DPEIS comments make clear, BOEM's overly conservative impact analysis is exacerbated by BOEM's failure to use consistent or objective standards for assessing the severity of impacts on species, which often conflates "minor," "moderate," and "severe" impacts. *See* 2012 DPEIS Comments, Appendix 2 at 6.[5]

Second, the FPEIS's repeated invocations of NMFS's decisions to justify BOEM's impact analysis runs counter to the best available science on sound exposure impacts and improperly abdicates BOEM's NEPA obligations. As the Associations' demonstrated in their 2012 DPEIS Comments, NMFS's sound exposure criteria for Level A and Level B takes—180 dB re: 1µPA (rms) SPL for the former, 160 dB re: 1µPA (rms) SPL for the latter—improperly rest upon outdated data, *see, e.g., N. Plains Res. Council, Inc. v. Surface Transp. Bd.*, 668 F.3d 1067, 1086–87 (9th Cir. 2011) ("Reliance on data that is too stale to carry the weight assigned to it may be arbitrary and capricious."), and fail to incorporate the more current science on this question developed by the Marine Mammal Noise Exposure Criteria Work Group ("Southall Work Group"), *see, e.g.*, 2012 DPEIS Comments, Appendix 2 at 10.[6]

In contrast to the FPEIS, the Southall Work Group does not subjectively label animal responses to sound as "minor," "moderate," or "severe," but rather uses a nine-point continuum and thirty-four separate types of behavioral responses, and emphasizes "extreme degree of group, species, and individual variability in behavioral responses in various contexts and conditions . . .," (Southall et al. 2007) at 449. With respect to Level A takes, the Southall Work Group recommended an increase in the sound threshold to 230 dB re: 1µPA (rms) SPL, *see id.*, at 442, and supports a more contextual approach to Level B takes, that is wholly absent from the FPEIS. Indeed, the Southall Work Group's analysis of what constitutes a Level B take is substantially more nuanced than the FPEIS's practice equating certain received levels of sound with takes. *See id*. at 447 (noting one must "differentiat[e] brief, minor, biologically unimportant reactions from profound, sustained, and/or biologically meaningful responses related to growth, survival, and reproduction").

While the FPEIS purports to provide analysis based on the Southall Work Group, *see* FPEIS Vol. III, Table L-6 at L-112, that analysis is, at best, incomplete because it is limited to Level A takes, *see, e.g.*, FPEIS at xi. Moreover, BOEM's principal response is that the FPEIS "cannot use the Southall criteria as the basis for take estimates because they have not been adopted by NMFS."

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[5] BOEM's lack of objective standards for categorizing effects will also foster arbitrary, and potentially conflicting, decisionmaking in assessing the vague boundaries between "minor," "moderate," and "severe" impacts. *See* 2012 DPEIS Comments, Appendix 2 at 6–7.

[6] Other reports on marine sound impacts released after the Southall Work Group, such as J.J. Finneran & A.K. Jenkins, *Criteria and Thresholds for U.S. Navy Acoustic and Explosive Effects Analysis* (2012), do not consider "[t]he criteria and thresholds for . . . airguns," *id*. at 2.

FPEIS Vol. III, Table L-6 at L-111; *see also, e.g.*, *id*. at L-112 (explaining that sound exposure criteria used to estimate take "are based on their acceptance by NMFS").[7] Such abdication to NMFS on an issue central to assessing the impacts of G&G activities falls short of BOEM's obligation to take a "hard look" at the environmental consequences of the proposed activities. "One agency cannot rely on another's examination of environmental effects under NEPA." *S. Or. Citizens Against Toxic Sprays, Inc. v. Clark*, 720 F.2d 1475, 1480 (9th Cir. 1983) (rejecting Interior Department's reliance on EPA decision with respect to herbicide) (quotation omitted). Rather, BOEM must "assess independently," *id.*, the environmental effects of the proposed actions it considers.

C. BOEM's Impact Analysis Rests on Speculation.

Because the FPEIS ignores existing data demonstrating the absence of significant impacts—in particular, a lack of injuries—from G&G activities, and relies on thinly supported or outdated sound exposure assumptions, *see supra*, the FPEIS's impact analysis ultimately provides little more than speculation about potential adverse effects of seismic surveys without regard to the probabilities of either occurrence or scope of such effects. Even with its flawed assumptions, moreover, the FPEIS concedes that the impact analysis—and the resulting choices regarding required mitigation—rests on predicted "possibility" of harm. *See, e.g.*, FPEIS at 2-20 (explaining that models predicted "possibility" of Level A takes, but did not take into account proposed mitigation measures); *id*. at 2-41 (explaining choice of Alternative B's Brevard County time-area closure to "reduce the possibility of temporarily displacing breeding and nesting"). Yet BOEM has no obligation to assess such mere possibilities of harm. *See, e.g., S. Fork Band Council of W. Shoshone of Nevada v. Dep't of Interior*, 588 F.3d 718, 727 (9th Cir. 2009); *Wyoming v. U.S. Dep't of Agriculture*, 661 F.3d 1209, 1253 (10th Cir. 2011) (explaining that an agency is "not required to consider 'speculative' impacts"); *Sierra Club v. Hodel*, 544 F.2d 1036, 1039 (9th Cir. 1976).

III. Alternative B Encourages BOEM to Impose Unnecessary, Vague, and Impracticable Mitigation Measures.

The overarching errors in the FPEIS identified *supra* greatly overstate the impacts of G&G activities and, as a consequence, greatly overstate the alleged necessity for mitigation measures generally, and for the additional mitigation measures in BOEM's preferred Alternative B in particular. By comparison, the FPEIS concludes that "the impacts associated with Alternative A would result in a ***minor*** incremental increase in underwater noise and a ***minor*** increase [in] impacts to marine mammals under the cumulative scenario." FPEIS at 4-75 (emphases added). In light of the FPEIS's overstatement of G&G impacts and the admittedly "minor" effect of G&G activities under Alternative A, BOEM's choice of Alternative B is unjustified.

Moreover, viewed individually, the mitigation measures proposed in Alternative B are likewise unnecessary in light of the best available science, vaguely phrased in a manner that encourages arbitrary enforcement, and/or impose impractical operational burdens that threaten to

[7] The FPEIS similarly attributes BOEM's failure to consider the frequency weighting advocated by recent studies, *see* (Southall et al., 2007), to NMFS's policy. *See* FPEIS Vol. III, Table L-6 at L119.

significantly limit seismic surveying that is necessary to meet OCSLA's goals, and may even threaten the overall viability of G&G activities in the Atlantic. Further, The PEIS incorporates significant new mitigation measures including dynamic management areas, acoustic buffer zones around closure areas, and a doubling of the time period required for observation of the exclusion zone before start-up is authorized. There has been insufficient justification and no opportunity for public comment; therefore, these mitigations should not be adopted.

A. The Proposed Seismic Survey Protocol.

Joint NTL 2012-G02 currently defines the current standard, "Seismic Survey Mitigation Measures and Protected Species Observer Program," in the Gulf of Mexico where the bulk of seismic surveys are conducted in U.S. waters.[8] It has proven effective, and is therefore the best baseline for assessing proposed mitigation for G&G activities. Among other things, Joint NTL 2012-G02 (1) establishes a 500 meter exclusion zone surrounding the center of an airgun array; (2) permits the array to recommence operations only following a 30-minute visual clearance of the exclusion zone; and (3) requires the array to shut down if visual monitoring reveals a marine mammal (excluding dolphins) or sea turtle within the exclusion zone. The monitoring is conducted by a visual observer who has successfully completed a protected species observer training course.

The FPEIS proposes unjustified and unjustifiable changes to the baseline provisions of Joint NTL 2012-G02.

First, the FPEIS provides that the exclusion zone "shall be calculated independently and shall be based on the configuration of the array and the ambient acoustic environment, but shall not have a radius of less than 500 m . . . ." FPEIS at 2-10. In contrast to the current, fixed 500 meter exclusion zone, the FPEIS's proposal would result in enormously expanded exclusion zones. Indeed, the FPEIS calculates the exclusion zone—based upon NMFS's 180 dB re: 1µPA (rms) SPL criteria for Level A takes—that would be required in particular scenarios based on the size of the airgun array, resulting in exclusion zone radii ranging from 800 to over 2100 meters. *See* FPEIS Vol. II, Table D-22. The latter results in a spatial area more than 17 times larger than required by Joint NTL. 2012-G02. More recent scientific research, however, undercuts this expansion; using the Southall Work Group's Level A sound threshold of 230 dB re: 1µPA (rms) SPL, (Southall et al. 2007) at 449, would in many instances result in an exclusion zone less than 500 meters.

The FPEIS's expansion of the exclusion zone—compounded by the extension of the shutdown requirement to delphinids, *see infra*—will significantly increase the number of array shutdowns required during a seismic survey, and thereby threaten the economic and operational feasibility of conducting a seismic survey in the Atlantic. Among other things, survey vessels continue to move along their tracklines even after the airgun array is shutdown. Once the exclusion zone has been visually cleared of marine mammals for, under the FPEIS, at least 60 minutes, the array can resume operations. To acquire seismic data for the region between the shutdown and start-up

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[8] U.S. Dep't of the Interior, Joint NTL No. 2012-G02, "Implementation of Seismic Survey Mitigation Measures and Protected Species Observer Program, *available at* http://www.boem.gov/Regulations/Notices-To-Lessees/2012/2012-JOINT-G02-pdf.aspx.

positions of the array requires maneuvering the seismic survey vessels (and miles of trailing streamers) back to the shutdown position. An increase in the number of shutdowns thus increases downtime and wasteful maneuvering. Because a survey's data quality is also tied to acquiring data along specific tracklines, by breaking acquisition along a trackline, a shutdown potentially impairs data quality and prolongs the length of the survey, increasing exposure of human health, safety and environmental risks. *See, e.g.*, Site-Specific Environmental Assessment of G&G Survey Application No. L11-020 (Jan. 23, 2012), at 7–8.

The FPEIS estimates that over 26,000 Level A takes would occur—thus indicating the number of shutdown events that would be necessary assuming perfect observation of species in the exclusion zone—in 2016 alone. *See* FPEIS at Tables-43.[9] That figure dwarfs the 55 shutdowns that are typically caused by whale sightings in the Gulf of Mexico (baseline) in a year. Yet the FPEIS threatens the level or viability of seismic surveying in the Atlantic based solely on its scientifically flawed assessment of impacts, *see supra*, and expansion of the shutdown requirement to include delphinids, *see infra*. For example, in the Gulf of Mexico, the average shutdown lasts for 58 minutes, *see, e.g.*, BOEM, *Seismic Survey Mitigation Measures and Marine Mammal Observer Reports*, at 1 (June 2012), which the FPEIS would extend by at least 30 minutes by increasing the visual monitoring period following a shutdown from 30 to 60 minutes. *See infra*. Multiplying a rough 1.5-hour average shutdown by 26,000 shutdowns would yield roughly 39,000 hours of shutdowns, or approximately 1625 days. Because the typical seismic survey operation costs roughly $1.5 million per day, the total potential costs arising from the FPEIS's assumptions equal a staggering $2.5 billion.

BOEM's revision of the exclusion zone is, moreover, incomplete. While the FPEIS requires a survey operator to model its array in order to calculate the proper exclusion zone, the FPEIS also mandates that the zone "shall not have a radius of less than 500 m." FPEIS at 2-10. The establishment of a 500-meter floor is an arbitrary departure from BOEM's rationale for amending the exclusion zone provision. Because BOEM justifies the new exclusion zone provision on the modeled footprint of the individual array's sound, the exclusion zone should always be based upon the modeled output of the array, even if the modeled output results in an exclusion zone of less than 500 meters. *See also supra*. In other words, the FPEIS must be consistent in its reliance on calculations of the exclusion zone and follow BOEM's own justification to its logical conclusion.

Notably, in response to the Associations' 2012 DPEIS Comments, BOEM acknowledged the need for logical consistency in calculating the size of the exclusion zone by revising the FPEIS to acknowledge that "the modeling could increase or decrease the size of the exclusion zone." FPEIS Vol. III, Table L-6 at L021. While the revision properly acknowledges the logic of decreasing an exclusion zone on the basis of the array's modeling, BOEM has not provided a justification for its failure to extend this logic below a 500-meter exclusion zone radius. *See, e.g.*, *Business Roundtable v. SEC*, 647 F.3d 1144, 1153 (D.C. Cir. 2011) (holding agency action arbitrary where discussion of issue was "internally inconsistent").

Second, the FPEIS extends the visual monitoring period for ramp-up of the airgun array—both prior to beginning the survey and after a shutdown—from 30 minutes to 60 minutes. *See* FPEIS

9 The Associations aggregated the estimated takes presented in the FPEIS at Tables-43.

at 2-10–2-11. The extension of the visual monitoring period compounds the other operational difficulties Alternative B imposes on seismic surveys.

The FPEIS itself offers no justification for the extension of the visual monitoring period. *See, e.g.*, FPEIS at 2-9–2-12; FPEIS Vol. III, Appendix C. Rather, BOEM's revision appears to be based on a comment from the Georgia Department of Natural Resources that existing "visual detection mitigation techniques for right whales are inadequate due to the animal's ability to lie just under the surface and remain undetected." FPEIS Vol. III, Table L-6 at L-71–L-72. Despite the specific context of the question—related to right whales—BOEM nevertheless created a broad 60 minute monitoring period "to assist visual observers locate marine mammals during their normal dive (or subsurface rest) frequency." *Id.* BOEM did not provide any evidence demonstrating (or even indicating) that the existing 30-minute period is inadequate to identify any marine mammal.[10] Indeed, in response to the Georgia Department of Natural Resources, BOEM stated generally "[t]hough right whales may lie below the surface for periods of time, it is expected that trained PSOs would spot exhalation plumes and surface disturbances." FPEIS Vol. III, Table L-6 at L-71–L-72.

Third, the FPEIS extends NTL 2012-G02's shutdown requirement, which presently applies only to whales, to include delphinids. *See* FPEIS at 2-11. Both the Associations' 2012 DPEIS Comments, *see, e.g.*, 2012 DPEIS Comments, Appendix 2 at 20–21, and BOEM's approval of past seismic survey applications, *see, e.g.*, *id.*, Appendix 1 at 6 n.9, illustrate that extending the shutdown requirement to delphinids is not scientifically justified because delphinids are mid-frequency specialists, with an effective hearing range largely outside of the low frequency range characteristic of airgun arrays. *E.g.* (Southall, et. al 2007) at 430–31. In response to the Associations' 2012 DPEIS Comments, BOEM again explained this provision based on NMFS's outdated sound exposure criteria. *See* FPEIS Vol. III, Table L-6 at L-122. Further, the illogical contradiction that dolphins that do not happen to bow ride require a different mitigation strategy makes no sense scientifically. Despite the lack of scientific justification, the FPEIS's extension of the shutdown requirement will vastly increase the likely number of shutdowns, with tens of thousands of shutdown events predicted for dolphins alone. *See* FPEIS, Table 4-10 at Tables 43.

Moreover, bow-riding of seismic survey vessels—a normal behavior seen with dolphins—further demonstrates the lack of injurious impact (or take) from seismic airguns. The FPEIS fails to analyze recent research into harbor porpoise (Linnenschmidt et al, 2012) and the bottlenose dolphin (Li et al, 2011, 2012) that suggest hearing control may apply to a number of different species of delphinids and cetaceans and that the animals have the ability to reduce their hearing sensitivity. The Associations appreciate BOEM's attempts, through creation of a bow-riding exception to shutdown requirements, to recognize the commonality of bow-riding and ameliorate the danger of unnecessary shutdowns brought-on by a dolphin's affirmative approach of a survey in order to bow-ride. *See, e.g.*, FPEIS Vol. III, Table L-6 at L-122. The proposed exception, however, offers little protection from unnecessary shutdowns. That exception provides:

[10] Likewise, NMFS's Biological Opinion for Programmatic G&G Activities in the Mid- and South Atlantic Planning Areas from 2013 to 2020 (July 19, 2013) simply recites the mitigation included in the FPEIS, *see* FPEIS, Appendix A, without justification for lengthening the visual monitoring period.

> Shutdown would not be required for delphinids approaching the vessel (or vessel's towed equipment) that indicates a "voluntary approach" on behalf of the delphinid. A "voluntary approach" is defined as a clear and ***purposeful*** approach toward the vessel by the delphinid(s) with a speed and vector that indicates that the delphinid(s) is approaching the vessels and remains near the vessel or towed equipment. ***The intent of the delphinid(s) would be subject to the determination of the PSO***. If the PSO determines that the delphinid(s) is actively trying to avoid the vessel or the towed equipment, the acoustic sources must be immediately [shutdown] as per his/her instruction.

FPEIS Vol. III, Appendix C at C-21 (emphases added). Even if implemented to preclude shutdowns for all purposefully approaching delphinids, BOEM has estimated that only roughly one-third of dolphins within 500 meters of a survey vessel exhibit bow-riding behavior, which still leaves many thousands of potential (and scientifically unjustified) shutdowns on account of delphinids.

However, the Associations doubt that the bow-riding exception could be implemented appropriately to preclude all purposeful approaches. Because a shutdown must occur upon a delphinid's entry into the exclusion zone, the determination as to the delphinid's "intent" must be made at a great distance—a distance the FPEIS now potentially extends up to more than 2000 meters. *See supra*. The decision as to the delphinid's intent, moreover, is left wholly to the subjective discretion of PSOs who (1) are likely to err on the side of precaution and order a shutdown when it does not prove necessary, and (2) are subject to training on NMFS's 2013 National Standards for a Protected Species Observer and Data Management Program, *see* FPEIS at 2-10, which may not be consistent with the best available science and technology, clearly written, transparently implemented, or fully informed by the public, *see* Attachment A.[11]

B. The Proposed Geographic Separation Between Simultaneous Seismic Airgun Surveys.

BOEM's choice of Alternative B "may establish a 40-km (25-mi) geographic separation between the sources of simultaneously operating seismic airgun surveys." FPEIS at 2-37. The FPEIS explains the creation of this separation requirement "to provide a corridor between vessels conducting simultaneous surveys where airgun noise is ***below Level B thresholds*** and approaching ambient levels such that animals ***may pass through*** rather than traveling larger distances to go around the survey vessels." *Id*. (emphases added). The FPEIS's justification, however, is scientifically unsupported. First, because the separation distance rests on NMFS's 160 dB re: 1µPA (rms) SPL exposure criteria for Level B takes,[12] it suffers from the same flaws

[11] Additionally, because the exception rests upon a PSO's discretionary assessment of a delphinid's subjective "intent" around and within the exclusion zone—as a proxy for the absence of harm to the animal—the PSO should have similar discretion to assess the intent of—and prevent a shutdown upon the purposeful approach of—other marine mammals.

[12] The absence of this measure from the Biological Opinion, *see* FPEIS, Appendix A, further undermines BOEM's reliance on NMFS to support a 40-km separation.

as NMFS's thresholds. *See supra*.[13] In addition, BOEM offers no evidence to support its underlying assumption that marine mammals would utilize the "corridor" that the separation requirement is designed to create.

The proposed 40-km separation is also inconsistent with BOEM practice in the Arctic. The 2006 Final Programmatic Environmental Assessment for Arctic Ocean OCS Seismic Surveys provided for a 24 kilometer separation between the seismic source vessels of simultaneous surveys.[14] Thus, the FPEIS imposes nearly twice the separation distance even though the physical environment of the Arctic—with its relatively shallow depth, rocky bottoms, and prevalent sea ice—results in greater sound propagation.

BOEM acknowledges that, even if seismic sound can theoretically propagate great distances, "it is unknown if detection of sound at these distances has any effect on marine mammals or other marine species." FPEIS at 2-38. Rather than question the propriety of its proposed 40-km separation distance, however, BOEM's sole concession to this scientific uncertainty is to claim the agency "will consider the value of this measure at the site-specific NEPA and environmental analyses level, as well as any new information available at that time. BOEM ***may not*** apply this specific mitigation measure programmatically." *Id*. (emphasis added). Setting aside the possibility that BOEM "may" actually employ the separation measure programmatically, the FPEIS does not explain how the uncertainty as to whether impacts occur at great distances can be resolved on site-specific information.

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[13] BOEM's secondary reliance on the assertion that "in some circumstances, airgun noise can be detected at great distances from the sound source, such as across ocean basins (Neukirk et al., 2012)," FPEIS at 2-38, is no more availing. The FPEIS does not identify any sections of the Mid- or South Atlantic planning areas that meet the specific "circumstances" of the cited study; nor does the FPEIS account for the rate of energy loss (*i.e.*, transmission loss) in specific propagating conditions in the Atlantic.

[14] Mineral Management Service, Final Programmatic Environmental Assessment for Arctic Ocean OCS Seismic Surveys - 2006 (OCS EIS/EA MMS 2006-038), at p. 235.

C. The Expanded Time-Area Closure for North Atlantic Right Whales (NARW).

Alternative B prohibits seismic airgun surveys in (1) the Mid-Atlantic and South Atlantic Seasonal Management Areas (SMAs) from November 1 to April 30, *see* FPEIS, Appendix C at C-16; (2) the NARW critical habitat area from November 15 to April 15, *see id*.; and (3) in a continuous 37 km-wide zone extending from Delaware Bay to the southern limit of the programmatic area, *see id*. at C-32.[15] In addition, "G&G surveys using airguns would not be allowed in [an] active" Dynamic Management Area" (DMA) created by NMFS based on "a reliable sighting of a NARW." FPEIS, Appendix C at C-36. And surveys conducted outside of the closure areas "would be required to remain such distance that received levels at those boundaries do not exceed" 160 db re: 1µPA (rms). *Id*. The time-area closure provisions lack sufficient basis in existing data, and are otherwise unsupported and unjustified.

First, according to the FPEIS, "[t]he purpose of the expanded time-area closure," through implementation of a 37 km-wide zone extending south from Delaware Bay, "is to prevent impacts to NARWs along their entire migration route and calving and nursery grounds." *Id*. at C-32. While the Associations share BOEM's concern for the health of the NARW population, as the Associations' 2012 DPEIS Comments demonstrate, there are no documented injuries, deaths, or significant disturbances to NARWs from airguns (even though the NARW is among the most studied species of whale). *See* 2012 DPEIS Comments at 5; *id*., Appendix 2 at 3, 17–18. Rather, the primary documented risks to the NARW population are vessel strikes and fishing gear entanglement. *See id*. at 5 & nn. 4, 5. Yet, while the NARW is particularly susceptible to lethal strikes from vessels exceeding 10 knots, seismic survey vessels—operating to carefully gather data—travel only at 4 to 5 knots (or half the mandatory speed limit under the NARW ship strike reduction rule (50 C.F.R. § 224.105)), and would have visual observers on board. *See* 2012 DPEIS Comments, Appendix 2 at 18. No closure for the NARW is therefore warranted.[16]

Although the Associations raised these concerns in their 2012 DPEIS Comments, BOEM's subsequent explanation missed the point of the Associations' comments and was therefore non-responsive. BOEM stated that "the potential for vessel strikes was not the main reason for proposing the closures . . . ." FPEIS Vol. III, Table L-6 at L-109–L-110. The Associations did not contend that BOEM based the closures on vessel strikes or the applicability of the NARW vessel strike rule. Instead, the Associations have shown that vessel strikes—not the sound from airguns[17]—is the primary, known danger to the NARW, and that this primary danger is largely inapplicable to seismic surveys that operate at reduced speeds, *cf. Utahns*, 305 F.3d at 1180 (finding that agency improperly "ignored the primary concern" of commenters on the project),

[15] Alternative A includes only the closures in the SMAs and critical habitat areas. *See* FPEIS, Appendix C at C-16.

[16] BOEM's response that it "would not be prudent based on the endangered status of these whales," *see* FPEIS Vol. III, Table L-6 at L-107, to issue an FPEIS without a time-area closure for the NARW is improperly conclusory in light of other species that do not similarly trigger a closure.

[17] To the extent the closure is "based" on impacts from acoustic sources, FPEIS Vol. III, Table L-6 at L-109–L-110, there is no documented evidence of any such impact.

and only "represent a small percentage (i.e., 1.5–2.9%) of the projected vessel activity" in the area of interest, FPEIS at 3-52.

Moreover, Alternative B's expansion nearly doubles the size of the closure area proposed in Alternative A. *See* FPEIS, Appendix C at C-16, C-32. Yet the FPEIS predicts, at most, only a 13 percentage point reduction in incidental takes of NARWs. *See*, *e.g.*, FPEIS at 2-66. Not only does BOEM fail to explain the differential between the expanded closure area and the predicted benefit, the FPEIS concedes that "incidental take was not modeled for Alternative B," and that the alleged benefit of doubling the time-area closures was only "estimated." FPEIS at 4-229.

Second, the FPEIS prohibits airgun surveys in DMAs without explaining the process by which a DMA is established. Rather, the FPEIS simply recites that the "locations vary as designated by NMFS," FPEIS, Appendix C at C-17, based on "a reliable sighting of a NARW," *id*. at C-36. The 15-day duration, *see id*. at C-23, of such vaguely established DMAs threatens severe disruption and significantly increased costs to surveys, *see supra* (describing data quality and economic burdens of survey interruption). The vague and discretionary DMA standard both lacks the requisite specificity necessary for BOEM to make a reasonable decision on implementation of the measure, and significantly hampers G&G activities despite the minimal danger G&G activities pose to the NARW. *See supra*. The unnecessary burdens also extend to HRG surveys, which must be "discontinued within 24 hr" of the establishment of a DMA in the survey area. *See* FPEIS, Appendix C at C-23.

Third, these problems with Alternative B's expanded time-area closures is exacerbated by the creation of a further buffer at "such distance that received levels at those boundaries do not exceed" 160 db re: 1µPA (rms). FPEIS, Appendix C at C-36. The buffer effectively extends the extends of the (already unjustified) time-area closures. This further extension is likewise unjustified given that (a) available evidence indicates that vessel strikes—rather than such sound levels—pose the primary danger to the NARW, *see supra*, (b) BOEM offers no evidence that any adverse effects are probable from such sound levels at the boundaries of the closure areas, *see supra*, and (c) the buffer assumes that NARW distribution along the closure area boundaries without actual PSO confirmation.

D. The High Resolution Geophysical (HRG) Protocol Requirements.

In addition to the new limitations placed on seismic airgun surveys, the FPEIS proposes unprecedented observation and shutdown requirements for HRG activities. *See* FPEIS at 2-12–2-15.

Survey Protocols for HRG activities mimic closely those required of deep penetration seismic surveys, despite the fact they are significantly different in many ways. Airgun seismic sources are almost exclusively deployed from surface, where sounds are propagated through the water column to image the subsurface. Imaging targets can be at great depths, requiring complementary frequencies and volumes that propagate throughout the water column.

By contrast, HRG surveys are frequently conducted subsea from autonomous underwater vehicles (AUVs) pre-programmed at surface to survey along set transects. The frequency of the sources is typically mid- to high-frequency, with the associated high transmission loss of those wavelengths. Multibeam systems commonly employed on AUVs operate in the 200-400 kHz range (Reson 7125 or Kongsberg EM 2040). Sidescan systems operate in the same range or at even higher frequencies. Sub-bottom CHIRP profilers typically operate in the 1 – 12 kHz range (and use a 10-50 ms swept frequency pulse). AUV surveys are conducted 20 meters above seabed (maximum 40 meters) to maintain high resolution. At these depths, sound is refracted along the seabed, with minimal loss upward into the water column.

A survey protocol based on surface deployment does not consider activities conducted close to the sea floor, with little to no sound propagation into the water column. Employing Protected Species Observers and deploying passive acoustic monitoring from surface vessels during these types of HRG surveys is impractical and unwarranted. Additional protocols of ramp-up and shut-down for these surveys cannot be adopted for surveys that are pre-set prior to subsea deployment as direct communication with these vehicles is not always possible. Regardless, surface or near-surface activity of cetaceans would not be expected to be impacted by the activity of an autonomous vehicle deployed at depth and maneuvering at long distances from the deployment vessel along pre-programmed transects.

High-resolution AUV surveys are a key tool for identifying culturally sensitive areas, such as marine archaeological sites, environmentally sensitive areas, such as cold water corals, and complex seafloor topography that could pose a hazard for future seafloor installation or drilling operations. The ability to accurately identify these types of features is not always possible with surface based seismic or multibeam bathymetry surveys, especially in deeper water environments, so AUV surveys are an efficient, low power, method of collecting regulatory and safety-critical data beneficial to a wide range of regulatory agencies and future operations. In addition, AUV platforms can carry a wide payload of sensors, which all tend to benefit from integration with the acoustic bathymetry, backscatter, and sidescan data. The benefits of these payload systems, such as still cameras, turbidity sensors, ADCP's, methane sensors, and other environmental sensors would be reduced by restrictions placed on acoustic surveys.

Industry recommends that BOEM amend the Atlantic PEIS to exclude all AUV Surveys conducted at depth from the described HRG Survey Protocol.

E. BOEM's Commitment to Adaptive Management.

The Associations appreciate and encourage BOEM's general commitment to adaptive management. In particular, the Associations agree that "its use can ensure mitigation measures effectively match existing conditions and knowledge," FPEIS Vol. III, Table L-6 at L-120, and we feel it is very important to establish that adaptive management may be used to remove mitigation measures (in addition to adding them) where the circumstances do not warrant the measures. *See*, *e.g.*, 2012 DPEIS Comments, Appendix 2 at 17.

The FPEIS's discussion of adaptive management raises two further concerns. First, that the FPEIS uses the term as justification for the proposed imposition of mitigation measures, such as the 40-km separation distance between simultaneous surveys, *see* FPEIS Vol. III, Table L-6 at L-121–L-122, that otherwise lack scientific or practical justification. Second, it is not clear how BOEM intends to implement its planned adaptive management. While the FPEIS includes a general discussion of adaptive management from programmatic NEPA documents to site-specific analyses, *see* FPEIS at 1-26–1-28, it is unclear how this process fits into BOEM's (or BSEE's) governing regulations. For example, would the agencies be required to implement adaptive management through a new rulemaking to ensure that the applicants' and Government's respective rights and obligations are clearly defined?

The Associations look forward to further discussions with BOEM regarding the effective, and balanced, implementation of adaptive management.

F. Imposing the Proposed Mitigation Measures Would Violate the Administrative Procedure Act.

In addition to the scientific and practical failings with the mitigation measures endorsed by Alternative B, because the FPEIS's measures would plainly "supplement existing law and . . . impose additional duties and requirements," their imposition may only be accomplished pursuant to Administrative Procedure Act (APA) notice-and-comment procedures. *See, e.g.*, *Ensco Offshore Co. v. Salazar*, 10-cv-1941, 2010 WL 4116892, at *5 (E.D. La. Oct. 19, 2010) (vacating NTL for failure to comply with notice and comment requirements).

That BOEM intends ultimately to apply the measures through site-specific NEPA analyses cannot evade the APA requirements because the notice and comment requirement "turns on an agency's intention to bind itself to a particular legal policy position." *U.S. Telephone Ass'n v. FCC*, 28 F.3d 1232, 1234 (D.C. Cir. 1994).[18] Consistent imposition of the measures through site-specific analyses represents the precise intent to be bound that triggers the notice-and-comment requirement. *See id*. at 1234–36 (FCC violated APA by issuing schedule for fines and consistently applying the schedule with limited departures). And the FPEIS fails to indicate any circumstances under which BOEM believes the measures may not be applied.

Similarly, that the FPEIS has been subject to comment does not cure this procedural defect. *Cf. In re Polar Bear Endangered Species Act Listing & § 4(D) Rule Litig*., 818 F. Supp. 2d 214, 236 (D.D.C. 2011) (rejecting argument that following APA notice-and-comment procedures satisfied NEPA comment procedures).

IV. BOEM Failed to Provide a Reasoned Justification for Choosing Alternative B as the Preferred Alternative.

Although the FPEIS justifies the choice of Alternative B as providing "the highest practicable level of mitigation measures . . .," FPEIS at 2-68, NEPA requires only "a discussion of 'all practicable means to avoid or minimize environmental harms,'" *The Protect Our Communities Foundation*, No. 12-cv-2211, 2013 WL 5947137, at *10 (S.D. Cal. Nov. 6, 2013) (quoting 40 C.F.R. § 1505.2(c)). By grafting "highest" onto its obligation to consider practicable mitigation, BOEM appears improperly "to elevate environmental concerns over other valid concerns." *Utahns for Better Transportation*, 305 F.3d at 1162–63.

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[18] Nor are certain measures—such as the separation requirement and NARW time-area closure—clearly amenable to site-specific reevaluation. These measures apply on their face from the FPEIS *ab initio*.

Indeed, with respect to several additional mitigation measures proposed by Alternative B, BOEM failed properly to support the selection of mitigation beyond Alternative A. Rather, the FPEIS simply assumes that additional or expanded mitigations would necessarily achieve significant environmental benefits. For example, while Alternative B added a 40-km separation zone between surveys, "[t]he degree of improvement has not been estimated . . . ." *See* PEIS at xxiv. Because BOEM did not calculate any improvement, it did not conduct any balancing against the additional burdens placed upon applicants' operations, *see supra*, applicants' interests, *see infra*, or OCSLA's purpose to expedite development of the OCS, *see supra*.

V. The FPEIS Fails to Take into Account the Context and Economic Consequences of Alternative B's Proposed Mitigation Measures.

"Where the action subject to NEPA review is triggered by a proposal or application from a private party, it is appropriate to give substantial weight to the goals and objectives of that private actor." *Citizens' Committee to Save Our Canyons*, 297 F.3d at 1030. *See also*, *e.g.*, *Sylvester v. U.S. Army Corps of Eng'rs*, 882 F.2d 407, 409 (9th Cir. 1989) (explaining that agency has a duty to take into account objectives of applicant's project). An alternative considered in an EIS is not reasonable where it renders the applicant's proposed project "impractical," or not "technologically or economically feasible." *Citizens' Committee to Save Our Canyons*, 297 F.3d at 1031–32. *See also Sylvester*, 882 F.2d at 409 (explaining that agency must consider whether alternative is "economically advantageous" to applicant's objective). As demonstrated above, and in the Associations' 2012 DPEIS Comments, the mitigation measures imposed by the FPEIS's Alternative B threaten the operational and economic viability of G&G activities in the Mid- and South Atlantic.

BOEM concedes that "technical feasibility and economic viability" are necessary for an alternative to satisfy NEPA's reasonableness requirement. *See* FPEIS Vol. III, Table L-6 at L-115. Yet the FPEIS's only response to the Associations' showing that one of the many mitigation measures imposed by Alternative B is likely to render seismic surveys impractical is simply:

> BOEM and NMFS appreciate the comment and are committed to ensuring that mitigation requirements are feasible. The Programmatic EIS has been revised to clarify the shutdown requirement for delphinids.

FPEIS Vol. III, Table L-6, at L-110. It is not, however, a lack of clarity in the mitigation measures, but rather their substantive requirements, that threaten the viability of G&G activities. To take only the delphinid shutdown example; even the allegedly clarified provision is—by BOEM's own estimation—likely to result in tens of thousands of shutdowns. *See supra*. Under the operational conditions created by Alternative B, G&G surveys may no longer be practicable in exchange for little or no perceived environmental benefits. And the FPEIS both ignores this impracticability and fails to balance such cost against the alleged environmental benefits of Alternative B. *See Cape May Greene, Inc. v. Warren*, 698 F.2d 179, 187 (3rd Cir. 1993) (noting

NEPA "requires a balancing between environmental costs and economic and technical benefits").[19]

Indeed, BOEM's failure to fully consider the impact of mitigation measures on G&G activities compounds a second error in the FPEIS's analysis of impacts. As the Associations' 2012 DPEIS Comments illustrate, the FPEIS overstates the level of reasonably anticipated G&G activities because industry interest has decreased following exclusion of the Atlantic planning areas from the 2012-2017 OCS Leasing Program. *See* 2012 DPEIS Comments, Appendix 2 at 1–2 (noting "it is unrealistic to expect significant, if any, geophysical activity within this timeframe"). The significant operational limitations (and resulting economic costs) arising from Alternative B's required mitigation measures will further depress the number of G&G activities that will actually be conducted in the Atlantic. Accordingly, the FPEIS's estimate of anticipated industry activity—and resulting estimates of anticipated environmental impacts—is doubly overstated.

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[19] BOEM's observation that "[t]here is no NEPA requirement for a cost-benefit analysis," FPEIS Vol. III, Table L-6 at L-116, is irrelevant because (1) BOEM acknowledges its obligation to consider non-environmental factors relevant to a proposed project, *see, e.g., id.*, and (2) the observation ignores BOEM's independent obligations under Executive Order 13563, *see* 2012 DPEIS Comments, Appendix 1 at 4. Moreover, the Associations comments provide a general discussion on economic burdens. *See* FPEIS Vol. III, Table L-6 at L-116 (stating that cost benefit analysis not conducted "because of the proprietary nature of cost information").

Attachment A

Via Electronic Mail

May 2, 2014

Kyle Baker
NOAA Fisheries Service
Southeast Regional Office
263 13th Avenue South
St. Petersburg, FL 33701
kyle.baker@noaa.gov

Subject: Comments of the American Petroleum Institute, the International Association of Geophysical Contractors, and the National Ocean Industries Association on NOAA Technical Memorandum NMFS-OPR-49, *National Standards for a Protected Species Observer and Data Management Program: A Model Using Geological and Geophysical Surveys*

Mr. Baker,

This letter provides the comments of the American Petroleum Institute ("API"), the International Association of Geophysical Contractors ("IAGC"), and the National Ocean Industries Association ("NOIA") (collectively, the "Associations") on the National Oceanic and Atmospheric Administration ("NOAA") Technical Memorandum NMFS-OPR-49, *National Standards for a Protected Species Observer and Data Management Program: A Model Using Geological and Geophysical Surveys* ("Observer Standards"). We appreciate your consideration of the comments set forth below.

API is a national trade association representing over 600 member companies involved in all aspects of the oil and natural gas industry. API's members include producers, refiners, suppliers, pipeline operators, and marine transporters, as well as service and supply companies that support all segments of the industry. API and its members are dedicated to meeting environmental requirements, while economically developing and supplying energy resources for consumers. API is a longstanding supporter of the Marine Mammal Protection Act ("MMPA") regulatory process as an effective means of balancing and rationalizing responsible oil and gas activities with the conservation of marine mammals. We continue to support issuance of incidental take authorizations under the MMPA because, for example, it has been demonstrably effective in the Arctic in protecting marine mammal species without unduly and unnecessarily burdening industry.

IAGC is the international trade association representing the industry that provides geophysical services (geophysical data acquisition, processing and interpretation, geophysical information ownership and licensing, associated services and product providers) to the oil and natural gas industry. IAGC member companies play an integral role in the successful exploration and development of offshore hydrocarbon resources through the acquisition and processing of geophysical data.

NOIA is the only national trade association representing all segments of the offshore industry with an interest in the exploration and production of both traditional and renewable energy resources on the U.S. Outer Continental Shelf ("OCS"). The NOIA membership comprises more than 275 companies engaged in a variety of business activities, including production, drilling, engineering, marine and air transport, offshore construction, equipment manufacture and supply, telecommunications, finance and insurance, and renewable energy.

General Comments

The Associations commend NOAA's National Marine Fisheries Service ("NMFS"), together with the Bureau of Ocean Energy Management ("BOEM") and the Bureau of Safety and Environmental Enforcement ("BSEE"), (collectively "the agencies") for providing recommendations for a Protected Species Observer and Data Management Program ("PSO program"). We understand that a technical memorandum is used for timely documentation and communication of preliminary results, interim reports, or more localized or special purpose information that may not have received formal outside peer reviews or detailed editing and that there is not a formal comment process. It is evident, however, that the agencies intend the recommendations in this technical memorandum to be immediately implemented for G&G surveys in the US OCS, and have incorporated the Observer Standards in the Atlantic OCS Proposed Geological and Geophysical Activities Mid-Atlantic and South Atlantic Planning Areas Final Programmatic Environmental Impact Statement ("Atlantic PEIS"). The Atlantic PEIS "Seismic Airgun Survey Protocol" requires that protected species observers complete a PSO training program "in accordance with the recommendations described in [the Observer Standards]."

In general, we are supportive of a process to standardize PSO eligibility requirements, training courses, data collection and reporting requirements. After carefully reviewing the Observer Standards, however, we have identified a number of concerns and opportunities for improvement, which are briefly summarized below and described in more detail in the following sections of this letter. Although we appreciate the agencies' attempt to clarify and standardize observer guidelines and requirements, it is imperative that the agencies consider public input on the Observer Standards and make the revisions necessary to ensure that the standards are workable, accurate, and appropriate. The standards should encourage adaptive technology, such as remote visual and acoustic monitoring and infrared technology, reduction of health and safety risks, and also the use of an updated reporting form that would be able to provide substantive data from observations to substantiate the implementation of appropriate mitigation measures.

The Associations' comments are intended to be constructive and further the goal of improving the PSO Program for G&G surveys consistent with the best available science and technology, clearly written, transparently implemented, and fully informed by the public.

<u>Role of the US Fish and Wildlife Service</u>

With jurisdiction over several marine mammals, the US Fish and Wildlife Service (USFWS) is an important stakeholder to the PSO process; however, it does not appear that USFWS was a part the Protected Species Working Group or that USFWS provided any input into the development of the Observer Standards. While the Observer Standards provide recommendations of report requirements for PSO sightings of polar bear and walrus (*see* p.31), the Observer Standards specifically exclude these species and all other species under USFWS jurisdiction from the purview of the standards (*see* p.v). A comprehensive national PSO program necessitates the review and input of the USFWS in addition to NMFS.

<u>Establishment of a PSO Standardized Training Program</u>

The Associations generally support the establishment of a standardized training program for PSOs and are interested in working with the agencies to ensure that appropriate standards are set for the "approved" vendors. We are concerned, however, that some of the recommendations for the program are based on unsupported assertions that current PSO training and reporting is inconsistent. The agencies should provide context to these assertions so that stakeholders can better understand the improvement the recommendations seek to achieve.

The Observer Standards recommend that any standardized training program should not only provide training in mitigation and monitoring requirements, but also provide health and safety considerations. The Associations agree. All PSOs should be trained to ensure complete compliance with all applicable safety procedures. A standardized training program should cover knowledge of the heightened risks working offshore on a vessel in remote locations with no or limited shore side infrastructure, and should teach personnel how to minimize risks. Training should also include information on safe travel, logistics, onboard medical infrastructure, and security including International Ship and Port Facility Security (ISPS) information.

As the Observer Standards acknowledge, many geophysical companies will also have specific requirements related to health and safety risks associated with their operations. The PSO is required to adhere to those requirements as well as any PSO provider or agency requirements. The Observer Standards should note, and any PSO training program should advise, that industry standards often exceed those of the federal agencies. Most oil and gas companies and geophysical companies require contractors to provide evidence of safety programs and requirements that meet those defined through company management systems. This should be acknowledged in any discussion of health and safety, and the agencies should also clarify whether the program intends to include medical and helicopter underwater egress training (HUET) typically required of PSOs by the industry.

The Observer Standards recommend that as part of "health and safety training," a vessel owner should "allow a PSO to briefly walk through the vessel to ensure no hazardous conditions exist according to a safety checklist, and to visually examine any safety item, upon request." PSOs are not, however, safety professionals qualified to conduct safety walkthroughs or inspections on every vessel to which they are assigned. The agencies should provide additional information on what information will be included on the safety checklist to clarify what the PSO would be looking for during this initial walkthrough to prevent misunderstandings and unnecessary effort.

The Associations suggest that a standardized training program for PSOs should include a course in effective communications. It is vital that PSOs establish direct communications with the instrument room on a seismic vessel to prevent problems and delays in the event of sightings that trigger shutdown requirements and to ensure the visual observation timeframes are adhered to before ramp up and after shutdown. All parties must work effectively together to ensure compliance: PSO, Seismic Technicians, Vessel Captain, and crew.

In addition, as the use of Passive Acoustic Monitoring ("PAM") to identify marine mammals increases in geophysical operations, the PSO Program should also include a course specific to PAM operations. PAM is a highly specialized skill and it is not appropriate to expect PSOs to possess those skills. If PAM is included in the program, training should also include rigging, mobilization and demobilization of equipment.

Finally, while the Observer Standards provide opportunity for PSO candidates who do not successfully pass an approved training course to reapply, there should be a limit on the number of times a potential PSO candidate can reapply for training.

<u>Recommendations for BOEM/BSEE</u>

The Observer Standards provide a list of recommendations for BOEM and BSEE to satisfy the objectives of the national standards. The Associations respectfully request that as BOEM and BSEE act on these recommendations, they solicit input from industry stakeholders and consider the following comments.

The Observer Standards recommend that BOEM and BSEE "develop permits or agreements detailing expectations and data collection and reporting of third-party PSO provider companies, including performance standards, conflicts of interest, and standards of conduct." The Associations respectfully request the agencies provide additional information and opportunity for stakeholder input regarding any proposed permitting program for PSO provider companies, including the requirements, process times, reporting requirements, and any penalties for alleged permit violations. Without well-defined boundaries, an open-ended PSO provider permitting program will provide little utility.

In addition, the Observer Standards recommend that BOEM and BSEE "develop a mechanism, procedure, or regulation to ensure that selected PSO providers are being compensated prior to deployment of approved observers." The Observer Standards do not, however, provide sufficient explanation of the need for PSO provider compensation prior to deployment of observers. More information would need to be provided to support the development of any requirement for prior compensation.

Development of Permit Fees

The Observer Standards recommend that BOEM and BSEE "consider assessing permit fees to financially support the PSO program needed for industry activities." It is unclear how the agencies would determine the amount of the fees or how the fees would be assessed. The Associations recommend that all monies generated from any such permit fees be developed solely for, and directly benefit, the PSO program and not be used for any other, non-related federal activities. Because other industries conduct similar activities requiring PSOs, the agencies should also ensure that any permitting fees are equitable to supporting the PSO program.

Recommended PSO Eligibility Requirements

In addition to a national PSO training course and PSO eligibility standards, the Observer Standards recommend the development of a policy for national PSO qualifications and eligibility. The difference between these two objectives is not immediately apparent. Qualifications, including education and competency, should be satisfied with completion of the training program. An additional policy on qualifications and eligibility is unnecessary and the Associations are concerned that limiting qualified PSO candidates to those who possess a science degree would result in a shortage of personnel.

In the recommended PSO training and provider services model, *NMFS-Approved Private Sector PSO Trainers and PSO Providers*, the Observer Standards explain that "PSO providers and PSO eligibility requirements would be defined by NMFS." While the Associations agree that the recommended mechanism for PSO training would provide more flexibility and less concern of the availability of PSO staff than the other mechanisms analyzed (*see* p.10), the agencies should clarify that NMFS' definition of PSO providers would only entail identification of those providers that meet eligibility requirements.

In the recommended waiver of education and experience requirements for PSOs, PSO candidates can provide proof of previous work experience as a PSO overseas. Some additional detail or information should be required for eligibility based on overseas work as programs and processes in other countries can vary substantially from what is expected/required for US programs. The Observer Standards also provide that the approving federal agency official has the sole discretion to waive eligibility requirements on a case-by-case basis after reviewing a waiver request and written justification. The Associations are concerned that the agency can waive "some or all of the education/experience requirements on a case-by-case basis if a lack of qualified PSOs is demonstrated." It would not be in the best interests of the regulators or the geophysical industry to employ PSOs who lack some critical or all necessary qualifications or experience. The Associations respectfully request that the waiver request, supporting justification and agency decision be made available to the PSO provider to ensure that a complete record of a PSO's experience is on file should issues arise.

The Associations agree that PSO candidates should also be in good health and have no physical impairments that would prevent them from performing their assigned tasks. The agencies should clarify, however, whether documentation or medical certification would be required similar to the *National Minimum Eligibility Standards for Marine Fisheries Observers*.

PSO Demand & Cost Estimates

The Observer Standards estimate that currently 30 PSOs are needed on a daily basis for G&G surveys in the Gulf of Mexico, with an average of 15 PSOs at sea on any given day. Based on 2009 data in the GOM, the total estimated annual costs are $2,116,547. BOEM and BSEE indicate, however, that future demand for PSOs is likely to "significantly increase over the next 5 years, and many G&G surveys are expected to occur in federal water of the Atlantic EEZ." Accordingly, the Observer Standards severely underestimate the costs and level of PSO demand. Assuming daily rates of $700.00 for each PSO, a reasonable estimate of 30 PSOs would cost $21,000 per day or $3.8M for 6 months. Travel, reporting, and health insurance would likely entail additional costs. The Associations request that the agencies update the cost and level of demand estimates with more recent data.

In addition, the Observer Standards estimate the training for each PSO in the Gulf of Mexico to cost $3,000.00. The agencies should provide a description of the various training costs detailed in this estimate, as described in Table 3, recognizing the uncertainties/unknowns associated with each estimate. For example, the estimated costs of safety training and medical examination appear lower than the industry standard.

PSO Evaluation During Permit/Authorization Approval

The Observer Standards specify that the recommended time to evaluate PSO coverage required for all G&G projects is during BOEM's permit application review or when applications for incidental take authorizations are submitted to NMFS. When weighing factors to determine the number of PSOs required for each survey, in addition to vessel size, the agencies should consider the number of bunks available on board the survey vessel.

Once the number of required PSOs is determined, the agencies assert that a single entity responsible for scheduling and deploying PSOs would result in "a greater level of consistency in many aspects of the PSO program…including maintaining an appropriate number of PSOs to meet scheduling and deployment needs." The Associations are concerned, however, that the selection of a single entity, whether a third-party provider or federal agency, to meet PSO scheduling demand would be inefficient and would result in a strain on the ability to timely contract with and obtain the number of PSOs required for each geophysical survey.

In addition, the Associations are concerned that requiring a senior-level (or lead) PSO who has specific experience observing protected species in the proposed survey geographic area will drastically limit the number of available senior-level PSOs, potentially resulting in unnecessary project delays.

During monitoring, the Observer Standards recommend that in order to reduce bias, observation periods should be limited to "favorable viewing conditions." It is unclear what is meant by unfavorable viewing conditions. During periods of "low visibility" PAM is currently required in water depths greater than 100 meters (328 feet) in the Gulf of Mexico. The agencies should be careful not to define unfavorable conditions as anything different than low visibility or nighttime to ensure there is no gap in monitoring coverage.

Conflicts of Interest

Throughout the Observer Standards, the agencies reference "inherent conflicts of interests" between PSO providers and industry, allegedly influencing accurate reporting of data. There are several unsupported assertions of inappropriate influence and pressure by industry. These assertions are unsubstantiated, and in the absence of supporting statements or examples provided by the agencies, should be deleted. If a statement denying conflict of interest is required from the PSOs prior to deployment as recommended, the statement should also include language to the effect that the PSO will conduct all their activities and report all data in full compliance with all applicable laws and regulations.

The Observer Standards defines "a direct financial interest" as payment or compensation received directly from the owner of the seismic survey's vessel, the G&G surveying company, or associated shore-based facility. The definition should also include any entity or leaseholder who employs or contracts with the survey company.

Standardized Data Collection

The Associations agree with and reaffirm the recommendation of the agencies to implement "standardization including data collection methods, standardized electronic forms, and software used in collaboration with NMFS and non-federal stakeholders." Collaboration with NMFS should result in a form that produces data the agency can use and rely on to assess population numbers, stock assessments, and effects on marine species. The Associations note that Industry best practices already recommend the use of a standard reporting form, *the Marine Mammal Recording Form*, developed under a project funded by the Exploration and Production (E&P) Sound and Marine Life Joint Industry Programme.[1] The Associations would be interesting in working with the agencies to update current reporting forms to enable the reporting of substantive data from observations that could substantiate the implementation of appropriate mitigation measures.

Creation of PSO Database

The Associations support the creation and maintenance of a database to manage PSO data for geological and geophysical surveys. This information is already supplied to NMFS and BSEE, but it would be useful for interested stakeholders to have full and timely access to such a database as a means to assess PSO activities and monitor their effectiveness.

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[1] *See* Barton, Carolyn J.S., Jaques, Robert, and Mason, Mike. 2008. Identification of Potential Utility of Collation of Existing Marine Mammal Observer Data. RSK Environmental Ltd., Cheshire, UK. The Marine Mammal Recording Form can be accessed at: http://www.iagc.org/files/3193/.

Conclusion

We appreciate the effort that the agencies have devoted to the development of PSO and data management programs for geological and geophysical surveys. We support this effort generally but, as detailed above, we have a number of concerns about the implementation of the recommendations. We respectfully request that the agencies engage with stakeholders prior to taking action on many of the recommendations, including the development of a PSO provider permit program, and system for permitting fees. We also encourage the agencies to pursue a program that encourages technology and remote monitoring, reducing health and safety risks. In addition, any program established should provide opportunity for feedback not only from PSOs, but also industry stakeholders. The Associations look forward to working with the agencies towards implementation of a PSO Program for geophysical surveys that is consistent with the best available science and technology, clearly written, transparently implemented, and fully informed by interested stakeholders.

Should you have any questions, please contact the undersigned at 202.682.8584, or via e-mail at radforda@api.org. Thank you for considering and responding to these comments.

Sincerely,

Andy Radford
American Petroleum Institute

Karen St. John
International Association of Geophysical Contractors

Jeffrey Vorberger
National Ocean Industries Association

cc: Deborah Epperson, BSEE Environmental Enforcement Division
Gregg Gitschlag, NMFS Southeast Fisheries Science Center
Howard Goldstein, NMFS Office of Protected Resources

Jill Lewandowski, BOEM Environmental Assessment Division
Kimberly Skrupky, BOEM Environmental Assessment Division
Brad Smith, NMFS Alaska Region Office
Teresa Turk, NMFS Office of Science and Technology

Spectrum
spectrumgeo.com

August 28, 2015

VIA EMAIL (ITP.Laws@NOAA.gov)

Jolie Harrison
Chief, Permits and Conservation Division Office of Protected Resources
National Marine Fisheries Service
1315 East-West Highway
Silver Spring, MD 20910

Re: Comments and Clarifications on Incidental Harassment Authorization Applications for the Incidental Taking of Marine Mammals During Geophysical Surveys in the Atlantic Ocean

Dear Ms. Harrison:

This letter provides the comments on Spectrum Geo Inc. (Spectrum) IHA application in response to the National Marine Fisheries Service's ("NMFS") request for comments on four pending Incidental Harassment Authorization ("IHA") applications for geophysical surveys in the outer continental shelf ("OCS") of the Atlantic Ocean. We appreciate this opportunity to preliminarily comment on our pending application and we strongly support geophysical surveying in the Mid- and South Atlantic OCS. Spectrum is only commenting on the application that Spectrum filed on its behalf.

Spectrum is in the process of amending our application that will better address the science available and reiterate that the scientific record proves that injury and harm does not happen to marine mammals from our operations, nor has industry seen this ever from a seismic survey. This amendment will be filed in due course and address our concerns.

Sincerely,

Richie Miller
Spectrum Geo Inc.
President

Spectrum Geo Inc, 11750 Katy Freeway, Suite 900, Houston, Texas 77079, USA.
tel: +1 281 647 0602 **fax:** +1 281 589 8111

August 28, 2015

VIA EMAIL (ITP.Laws@NOAA.gov)

Jolie Harrison
Chief, Permits and Conservation Division Office of Protected Resources
National Marine Fisheries Service
1315 East-West Highway
Silver Spring, MD 20910

Re: Comments on Incidental Harassment Authorization Applications for the Incidental Taking of Marine Mammals During Geophysical Surveys in the Atlantic Ocean

Dear Ms. Harrison:

This letter provides the comments of TGS-NOPEC Geophysical Company ("TGS") in response to the National Marine Fisheries Service's ("NMFS") request for comments on four pending Incidental Harassment Authorization ("IHA") applications for geophysical surveys in the outer continental shelf ("OCS") of the Atlantic Ocean. TGS has submitted one of these four IHA applications and welcomes this opportunity to provide preliminary comments.[1] We have taken a proactive approach to our IHA application, which, among other things, proposes a suite of mitigation measures that is more stringent than is typically required by NMFS. We look forward to working with the agency to complete this regulatory process and we strongly support NMFS's approval of our IHA Application.[2]

I. TGS-NOPEC GEOPHYSICAL COMPANY

TGS provides global geoscientific data products and services to the oil and gas industry to assist with licensing rounds and preparation of regional data programs. TGS has a long and

[1] *See* Request by TGS-NOPEC for an Incidental Harassment Authorization for the Incidental Take of Marine Mammals in Conjunction with a Proposed Marine 2D Seismic Program Mid- and South Atlantic Outer Continental Shelf, 2016-2017 (July 21, 2015) ("IHA Application"), *available at* http://www.nmfs.noaa.gov/pr/permits/incidental/oilgas/atlg_tgs-nopec_2015iha_appl.pdf.

[2] In addition to the comments set forth in this letter, TGS adopts and incorporates by reference the joint comments submitted by the International Association of Geophysical Contractors, the American Petroleum Institute, and the National Ocean Industries Association in their letter to NMFS dated August 28, 2015 ("Joint Trades Letter").

successful history surveying oil and gas resources all over the world. In the last 33 years, TGS has successfully conducted 2.5 million kilometers (km) of 2D seismic surveys and over 200,000 square km of 3D seismic, without any known significant or long-term impact to the environment. Furthermore, TGS has extensive experience acquiring seismic data in operationally challenging areas. For example, TGS has recently (since 2011) acquired 85,000 km of new 2D data from the Labrador Sea down to the southeastern portion of the Grand Banks, while working closely with Canadian authorities, fishing agencies and communities, and local villages. Additionally, in 2013, TGS successfully acquired a 2D survey over the Chukchi Sea off the west coast of Alaska. In completing the Chukchi Sea survey, TGS garnered praise from the U.S. Bureau of Ocean Energy Management ("BOEM") for its professionalism during the operation and its commitment to full engagement and coordination with local stakeholders. TGS strongly believes in and abides by all of its core values, one of which states: *we are responsible to the communities and environment in which we live and work.*

TGS is also committed to leading the industry in minimizing the effects of its activities on the environment. This commitment is achieved by assessing effects on those environments; planning operations to minimize those environmental effects; monitoring performance against those plans; complying with applicable laws, regulations, and guidance; monitoring the environmental performance of hired contractors; and seeking means for continuous improvement.

II. TGS'S PROPOSED GEOPHYSICAL SURVEY

As set forth in detail in our IHA Application, TGS seeks to identify and map potential hydrocarbon-bearing formations (and associated geological formations) in the Mid- and South Atlantic OCS. In support of this effort, TGS proposes to conduct 2D seismic surveys of approximately 55,133 linear km of pre-determined survey lines (and 9,986 km of turns and transits) extending from waters offshore of Delaware Bay to areas offshore of Cape Canaveral, Florida. Proposed survey lines extend west to east from approximately 40 to 700 km offshore over water depths ranging approximately from 25 to 5,500 meters (m). Seismic operations will occur at speeds of about 4-5 knots up to 24 hours per day over an estimated 308 days between February 2016 and February 2017. No seismic activities will occur in state waters. TGS is committed to this survey plan and wishes to expressly affirm its ability and intent to carry out the survey as proposed in the IHA Application.

To image these areas of subsurface geology in a one-year time frame, TGS will use two modern 2D seismic vessels with dedicated seismic and maritime crews. The seismic vessels will operate alongside several chase and support vessels whose main purpose is to ensure the safety of the in-sea equipment. Chase and support vessels keep watch for nearby ships, help to transport crew to and from shore, scout for the area for other activity and navigational hazards, and can tow the seismic vessel in case of emergencies or be used to transfer data shipments to shore. Similar to the seismic vessels, the chase and support vessels will operate 24 hours-a-day.

Notwithstanding these operational precautions, and like all geophysical surveys, TGS's program has the potential to cause the incidental harassment (or "take") of marine mammals. To avoid and minimize incidental take, TGS's IHA Application sets forth a comprehensive mitigation plan to limit any potential impact. TGS's mitigation plan is designed to meet or exceed the mitigation recommended in the U.S Bureau of Ocean Energy Management's ("BOEM's") final Programmatic Environmental Impact Statement ("PEIS") and associated Record of Decision.[3] *See generally*, IHA Application at 115-28. The best scientific information available indicates that implementation of these mitigation measures (which are as or more stringent than those employed by seismic operations for which NMFS has authorized incidental take) will limit the effects of TGS's survey to temporary, minor impacts to marine mammal behavior, resulting in no more than negligible impacts to marine mammal populations.[4]

III. COMMENTS

A. Mitigation measures employed by TGS will effectively avoid and minimize the incidental take of marine mammals.

More than four decades of worldwide seismic surveying and scientific research indicate that, with implementation of effective mitigation programs, the risk of direct physical injury to marine life from seismic survey activities is extremely low. Consistent with this successful history of mitigation, TGS proposes to implement a systematic suite of mitigation measures designed first to avoid any potential incidental harassment and, second, to limit the effects of any take that may occur to temporary, minor behavioral changes. The following sections summarize TGS's key proposed mitigation protocols.

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[3] *See* Record of Decision, BOEM PEIS, available at http://www.boem.gov/Record-of-Decision-Atlantic-G-G/.

[4] As stated by BOEM in its August 22, 2014, *Science Note*:

> 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.

http://www.boem.gov/BOEM-Science-Note-August-2014/.

1. Vessel strike avoidance

Consistent with the conservative approach recommended by BOEM in the PEIS, TGS's IHA Application adopts vessel strike avoidance measures that are more stringent than what NMFS has previously required seismic operators to use to effectively avoid vessel strikes. Specifically, TGS commits to the following protocols:

- Reduction of vessel speed to 10 knots or less when traversing designated time/area closures for North Atlantic Right Whales ("NARW");
- Maintenance of a 500 meter distance from any NARW and a 100 meter distance from any ESA-listed species; and
- Report of any sightings of injured or dead marine mammals to NMFS where death appears to be caused by seismic activities.

TGS also commits to speed or course alterations for marine mammals detected in the exclusion zone where doing so will not compromise the safety of the operations.

2. Protected species observers

TGS commits to employing trained Protected Species Observers ("PSOs") to maintain watch for marine mammals, including those protected under the ESA. The use of PSOs is a long-established, effective means of limiting the potential incidental take of cetaceans and pinnipeds. NMFS should approve TGS's proposed PSO monitoring program as it is substantially consistent with BOEM's PEIS.

We also recommend that NMFS not uniformly require implementation of the recommendations described in NOAA Technical Memorandum NMFS-OPR-49, *National Standards for a Protected Species Observer and Data Management Program: A Model Using Geological and Geophysical Surveys* (Nov. 2013) ("Observer Standards"). Although TGS appreciates the agencies' attempt to clarify and standardize observer guidelines and requirements, we believe the Observer Standards are flawed in a number of respects and have not yet been subject to public review and input. Among other things, the standards should encourage adaptive technology, remote monitoring, reduction of health, safety, and environmental risks, and use of an updated reporting form that provides substantive data from observations to inform the need (if any) for additional or revised mitigation measures. Although one of the IHA applicants has voluntarily proposed to adopt the Observer Standards, NMFS should not impose those standards on other applicants. We request an opportunity to discuss this further with NMFS, if necessary.

3. Exclusion zones

TGS is committed to employing exclusion zones to prevent marine mammal exposure to levels of 180 dB re 1 µPa or more for cetaceans and 190 dB re 1 µPa for pinnipeds. TGS has invested significant resources in modeling its exclusion zone and in all cases (except where a single 90 in^3 air gun is in use) will exceed the minimum exclusion zone of 500 m recommended in the PEIS. As there are no available datasets to suggest that a 500 m exclusion zone is required where a single seismic source is in use, NMFS should approve the conservative approach set forth in TGS's IHA Application. TGS also notes for the record that the exclusion thresholds used in its IHA Application are more stringent than the thresholds at which Level A harassment may potentially occur, as indicated by the best available science. *See* Joint Trades Letter at §§ II.A and II.B.

4. Buffer zone between concurrent surveys

TGS also plans to meet or exceed BOEM's recommendation that seismic operations be conducted at least 40 km apart. TGS plans to maintain at least a 100 km buffer between its own seismic ships and will coordinate with other seismic operators to meet BOEM's 40 km spacing recommendation. TGS considers this to be an extremely conservative approach as the best available scientific information, and well-established past agency practice, support buffer zones much smaller than 40 km. Indeed, to our knowledge no other IHA applicant has been required to maintain buffer zones that are anything near the size of BOEM's recommended 40 km buffer. We also specifically disagree that buffer zones of 60 km, as currently proposed by one applicant, are necessary or appropriate.

5. Shut down protocols

TGS's proposed mandatory shut down protocols are largely consistent with BOEM's PEIS. However, TGS does not believe that the best available science supports a mandatory shut down policy for all dolphins except those that voluntarily enter the exclusion zone. For the reasons stated in the Joint Trades Letter, mandatory dolphin shutdown mitigation measures would broadly and substantially impact seismic operations without any corresponding environmental benefit and without any scientific support. Although other IHA applicants have proposed mandatory dolphin shut downs, TGS respectfully maintains that the best available science supports the approach that TGS has proposed in the IHA Application.[5]

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[5] In addition, as described in the IHA Application, TGS commits to employing a mandatory 60-minute "all clear" period prior to ramp-up of seismic activities, consistent with BOEM's PEIS. This proposed "all clear" period is substantially more stringent than has commonly been required by NMFS.

6. Ramp up procedures

TGS proposes to ramp up it seismic operations over a 20 min period; initiating ramp up by firing a single air gun. This proposed approach is consistent with well-established best practices.

7. Passive acoustic monitoring

TGS further proposes to use passive acoustic monitoring ("PAM") during all seismic operations and especially where visibility is compromised due to nighttime conditions or inclement weather. PAM is one of several monitoring techniques that complements (rather than replaces) traditional visual monitoring and is helpful as a secondary source of monitoring.

8. Time-area closures

TGS will recognize time-area closures in areas where NARWs can be expected to be found—from Delaware Bay to Wilmington, North Carolina and off the coast of Georgia. In addition, TGS has designed its survey transects so that they pass any National Marine Sanctuaries by a distance of 15 km or more.

B. TGS's incidental take modeling accurately estimates take and confirms that the proposed survey would result, at most, in a negligible impact to small numbers of marine mammals.

Employing the best available science on marine mammal population density data and recommended mitigation and monitoring measures, TGS estimates that its proposed 2D survey has the potential to result in a small number of Level B takes of 28 cetacean and porpoise species.[6] The incidental "take" most likely to occur is that associated with exposure to pulsed noise received sound levels of $\geq$ 160 dB (rms) produced by seismic profiling survey equipment. TGS does not request Level A take authorization because the proposed mitigation and monitoring measures are designed, and expected (based on a long history of documented success), to avoid, reduce, and minimize potential negative impacts to marine mammals. *See* Joint Trades Letter at §§ II.A and II.B.

The majority of pending IHA applications (including TGS's application) request IHA coverage for Level B harassment and not Level A harassment. TGS respectfully disagrees with the approach taken by one applicant in requesting Level A take authorization, which is specific to the unique configuration of that applicant's project, voluntary, and based upon mitigation assumptions that are significantly different than those proposed by TGS. We welcome the

[6] TGS does not anticipate take of pinnipeds or white beaked dolphins and, therefore, does not request incidental take authorization for those species.

opportunity to discuss this issue in more detail with NMFS as may be necessary, but reiterate here that TGS does not expect any Level A marine mammal take incidental to its proposed survey, based upon the best available data and information, and is not requesting authorization for Level A take.

IV. CONCLUSION

TGS appreciates this preliminary opportunity to comment on its pending IHA Application. We believe our application presents a robust approach to marine mammal mitigation as well as state-of-the-art technical analyses that are based upon the best available scientific information and modeling techniques. We are committed to working openly with the agency during this permitting process and we encourage NMFS to contact us if there are any questions regarding our application.

Sincerely,

Peter Seidel

Director, Marine Acquisition

ion

[CHARGED WITH INNOVATION]

August 28, 2015

VIA EMAIL (ITP.Laws@NOAA.gov)

Jolie Harrison
Chief, Permits and Conservation Division
Office of Protected Resources, National Marine Fisheries Service
1315 East-West Highway
Silver Spring, MD 20910

Re: Comment on Incidental Harassment Authorization Application Submitted by Spectrum Geo Inc. for the Incidental Taking of Marine Mammals During Geophysical Surveys in the Atlantic Ocean

Dear Ms. Harrison

We appreciate the opportunity to comment on the applications submitted to NMFS for incidental harassment authorization under the Marine Mammal Protection Act to take marine mammals incidental to conducting geophysical survey activity in the Atlantic Ocean.

Whereas we believe that NMFS should continue to authorize incidental take for geophysical surveys, in further support of these applications, please accept the following.

(1) The best available evidence shows that seismic surveys do not cause Level A take

Although rare, it is possible that some marine mammals have been exposed to sound levels greater than those specified as the criterion for Level A take (180 dB SPL rms). When that has occurred, the best available science indicates that those animals would not, in fact, be injured until sound levels were much higher.[1] And even though past monitoring around seismic operations has reported the implementation of mitigation measures for animals occurring within the 180 dB SPL rms zone, there is no credible evidence that those animals were injured.

Avoidance reactions by several species of mysticetes to seismic vessels have been observed at ranges up to 6–8 km and occasionally as far as 20–30 km from the source vessel. However, reactions at the longer distances appear to be atypical of most species and situations. Odontocete reactions to seismic pulses, or at least the reactions of delphinids, are expected to extend to lesser

[1] *See* 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. Aquat. Mamm. 33(4):411-522 *and* NOAA's draft acoustic guidance for assessing the effects of anthropogenic sound on marine mammal species (http://www.nmfs.noaa.gov/pr/acoustics/guidelines.htm).

2105 CityWest Blvd., Suite 400
Houston, TX 77042
p +1 281 933 3339 f +1 281 879 3626
www.iongeo.com

distances than are those of mysticetes. At low frequencies, odontocete hearing is less sensitive than that of mysticetes, and delphinids are often seen from seismic vessels. In fact, there are documented instances of dolphins approaching active seismic vessels. However, delphinids as well as some other types of odontocetes sometimes show avoidance responses and/or other changes in behavior near operating seismic vessels.

(2) Mitigation during seismic surveys is effective in avoiding exposure of most marine mammals to sound levels at or above the current criteria for Level A take

Taking into account the mitigation measures that are planned, effects on cetaceans are generally expected to be limited to avoidance of the area around the seismic operation and short-term changes in behavior, falling within the MMPA definition of "Level B harassment". Furthermore, the estimated numbers of animals potentially exposed to sound levels sufficient to cause appreciable disturbance are generally low percentages of the regional population sizes. The estimates of the numbers of individuals that would be exposed to sounds ≥160 dB re 1 μParms represent, for most species, <1% of the regional population.

The requested "take authorization" for each species is the estimated maximum number of individuals that could be exposed to ≥160 dB re 1 μParms. That figure likely overestimates (in most cases by a large margin) the actual number of animals that will be exposed to and will react to the seismic sounds. The reasons for that conclusion are outlined in the IHA application and describe the anticipated impacts to the species. The relatively short-term exposures are unlikely to result in any long-term negative consequences for the individuals or their populations. The sound exposure modeling indicated that, even in the absence of avoidance reactions, no cetaceans were likely to receive sufficient sound energy to incur auditory damage.

The many cases of apparent tolerance by cetaceans of seismic exploration, vessel traffic, and some other human activities show that co-existence is possible. Mitigation measures such as pre-cruise planning, controlled speed, course alternation, look outs, non-pursuit, ramp ups, power downs or shut downs when marine mammals are seen within defined ranges, and special measures for species of particular concern, should further reduce short-term reactions, and avoid or minimize any auditory effects. In all cases, the effects are expected to be short-term, with no lasting biological consequence.

The mitigation proposed by Spectrum Geo Inc.'s application, that is, an exclusion zone of 500 m around the survey vessel, is well below their modeled 180-dB SPL rms ranges, which were all greater than 1,000 m. This 500-m exclusion zone was selected based on their inability to "implement effective monitoring" beyond that distance in the field, yet it is arguable that "effective monitoring" can and does occur beyond that range. Mitigation measures more reflective of the results of their acoustic propagation model would eliminate most of these exposures.

In summary, ION appreciates NMFS's review of the IHA applications and consideration of these comments. Building on decades of industry experience, the four pending IHA applications set forth aggressive mitigation programs designed to effectively avoid and limit incidental take. Many of the proposed mitigation measures are more stringent than measures that have commonly been employed and, indeed, many of the proposed mitigation measures are unnecessary, based on the best available scientific information. ION supports the issuance of

IHAs for Level B harassment that prescribes mitigation measures that are effective and consistent with the best available data and information.

Sincerely,

Shawn L Rice
SVP, Operations & Engineering

STATE OF DELAWARE
DEPARTMENT OF NATURAL RESOURCES & ENVIRONMENTAL CONTROL

DELAWARE COASTAL 901 89 KINGS HIGHWAY Phone: (302) 739- 9283

August 28, 2015

Jolie Harrison, Chief
Permits and Conservation Division
Office of Protected Resources
National Marine Fisheries Service
1315 East-West Highway
Silver Spring, MD 20910

Sent via email to *ITP.Laws@noaa.gov*

RE: Taking Marine Mammals Incidental to Geophysical Surveys in the Atlantic Ocean
Comments from the Delaware Coastal Management Program

Dear Ms. Harrison,

There are four proposed geophysical surveys in the South and Mid-Atlantic seeking to receive incidental takings authorizations for harassment of marine mammals in correlation with seismic testing. The notice of receipt of applications for incidental harassment authorizations (IHA) under the Marine Mammal Protection Act (MMPA) was published in the Federal Register July 29, 2015. The concerns of the Delaware Coastal Management Program (DCMP) regarding these applications are reflected in the following comments.

The DCMP is concerned that the National Marine Fisheries Service (NMFS) does not address cumulative impacts when assessing IHA's under the MMPA. The DCMP understands that the current review process assesses potential impacts from proposed projects individually. As such, the IHA determination does not take into account frequency, duration, and spatial overlap between multiple surveys. The proposed surveys span the majority of the South and Mid-Atlantic region, potentially exposing marine mammals to seismic disturbance over vast areas of the ocean, and possibly during the entirety of their migration depending on the species and time of year. Noise levels associated with seismic testing may affect hearing abilities, which in turn can impact location of prey species and communication between individuals.

The DCMP contends that considering the four survey permits collectively, rather than individually, is a logical approach and is more protective of the resource. NMFS should estimate the entire stock of each species and determine what percentage of "takes" of those species would hinder the annual rates of recruitment and survival. This estimation could then be used to determine the maximum number of IHA's given for each species within a certain range at any given point. The takes anticipated from the four survey applications would have to fall within this threshold. Therefore, potential impacts to marine mammals would be assessed cumulatively rather than individually.

The Bureau of Ocean Energy Management (BOEM) acknowledges the need for consideration of cumulative impacts in the Record of Decision for the Atlantic OCS Proposed Geological and Geophysical (G&G) Activities Programmatic Environmental Impact Statement. BOEM concedes that upon review of individual G&G permit requests, the Agency's "evaluations will also consider any potential aggregate effects from existing permitted or authorized surveys." The DCMP urges NMFS to take this same approach in evaluating the four companies' requests for incidental take from the seismic surveys.

Thank you for the opportunity to comment on the NMFS incidental harassment authorization review process.

Sincerely,

Sarah W. Cooksey

Sarah W. Cooksey, Administrator
Delaware Coastal Programs

Florida Department of Environmental Protection

Marjory Stoneman Douglas Building
3900 Commonwealth Boulevard
Tallahassee, Florida 32399-3000

Rick Scott
Governor

Carlos Lopez-Cantera
Lt. Governor

Jonathan P. Steverson
Secretary

August 28, 2015

Ms. Jolie Harrison, Chief
Permits and Conservation Division
Office of Protected Resources
National Marine Fisheries Service
1315 East-West Highway
Silver Spring, Maryland 20910

Re: National Marine Fisheries Service, National Oceanic and Atmospheric Administration, Department of Commerce. Federal Register Notice: Taking and Importing Marine Mammals; Taking Marine Mammals Incidental to Geophysical Surveys in the Atlantic Ocean, July 29, 2015

Dear Ms. Harrison:

The Marine Mammal Protection Act (16 U.S.C. 1361 *et seq.*) allows for incidental taking of small numbers of marine mammals if the National Marine Fisheries Service (NMFS) finds that the total taking by the activity during the specified time period will have a negligible impact on the species or stock(s) and necessary prescriptions are established. Through the above referenced Federal Register Notice, the NMFS requested comment and information regarding four applications for taking of marine mammals incidental to oil and gas industry geophysical surveys in the Atlantic Ocean. Incidental Harassment Authorization (IHA) applications were submitted to the NMFS by Spectrum Geo Inc., TGS–NOPEC Geophysical Company, ION GeoVentures and TDI-Brooks International, Inc. Florida has completed its review of the applications and offers the following comments and recommendations.

The U.S. Department of the Interior, Bureau of Ocean Energy Management (BOEM) recently publicly noticed geological and geophysical (G&G) permit applications to conduct G&G activities in the Atlantic Ocean, including those of the four companies who have submitted IHA applications to NMFS. In an April 20, 2015, response to the BOEM notice, Florida recommended delaying the issuance of G&G permits until more definitive information regarding the effects on marine and coastal resources including sea turtles, marine mammals and fishery resources and their habitats can be obtained. A copy of that letter is enclosed.

To adequately protect Florida's marine and coastal resources, we continue to recommend delaying the issuance of any authorizations for G&G activities in the Atlantic until more data necessary to definitively determine effects can be collected and analyzed. Should, however, the NMFS proceed with the issuance of IHAs for any of the four applications received to date, we recommend that effects monitoring studies suggested in our April 20 letter, as well as, the mitigation recommendations included in the enclosed letter from the Florida Fish and Wildlife Conservation Commission, be included.

We appreciate the opportunity to provide comments and look forward to working with you and other relevant federal and state agencies on this important issue. Should you have questions, please contact Debby Tucker, Environmental Administrator of the Florida Department of Environmental Protection's Outer Continental Shelf Program, at Debby.Tucker@dep.state.fl.us or 850-245-2181.

Sincerely,

Carla Gaskin Mautz

Carla Gaskin Mautz
Deputy Chief of Staff

Enclosures

cc: Jennifer Fitzwater, Florida Fish and Wildlife Conservation Commission

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION

MARJORY STONEMAN DOUGLAS BUILDING
3900 COMMONWEALTH BOULEVARD
TALLAHASSEE, FLORIDA 32399-3000

RICK SCOTT
GOVERNOR

CARLOS LOPEZ-CANTERA
LT. GOVERNOR

JONATHAN P. STEVERSON
SECRETARY

April 20, 2015

Mr. John C. Johnson, Supervisor
Data Acquisition and Special Projects Unit
Resource Evaluation
Bureau of Ocean Energy Management
Gulf of Mexico OCS Region
1201 Elmwood Park Boulevard
New Orleans, Louisiana 70123-2394

Dear Mr. Johnson:

Following a 2010 Congressional mandate, the Bureau of Ocean Energy Management (BOEM) developed a Programmatic Environmental Impact Statement (PEIS) analyzing the potential impacts of Geological and Geophysical (G&G) exploration off the Mid- and South Atlantic Planning Areas since there was no National Environmental Policy Act (NEPA) coverage for permitting G&G activities in this area. The final PEIS examined G&G activities for three program areas: (1) oil and gas, (2) renewable energy, and (3) marine minerals for activities between 2012 and 2020. The National Oceanographic and Atmospheric Administration (NOAA), National Marine Fisheries Service (NMFS), U.S. Fish and Wildlife Service (USFWS) and other federal, state and local agencies were consulted during preparation of the PEIS. The Record of Decision (ROD) for the PEIS released in July 2014 allows BOEM to consider permit applications for G&G activities throughout the Planning Areas, consistent with the mitigation measures set forth in the PEIS.

BOEM's Atlantic Outer Continental Shelf (OCS) Region currently has 10 applications to conduct G&G activities in the Atlantic Ocean offshore the mid- and south Atlantic states. Five of those applications have proposed G&G activities offshore Florida, with several directly adjacent to state waters. In addition, one of the pending applications is for activities in BOEM's Straits of Florida Planning Area.

Florida is concerned about the effects of G&G activities on its marine and coastal resources including sea turtles, marine mammals (including the North Atlantic Right Whale) and fishery resources and their habitats located in these areas. Much of Florida's economy is dependent on these healthy and sustainable marine and coastal resources.

While the final PEIS and ROD establishes a framework for further environmental review of specific actions and identifies mitigation requirements that focus on avoiding injury and impact to marine animals, discussions in both the PEIS and NOAA's NMFS Endangered Species Act Section 7 Consultation Biological Opinion (BO) for the mid- and south Atlantic indicate that data and information concerning the effects of activities to be conducted under the PEIS are either severely limited or absent.

Without the data necessary to definitively determine effects to these resources, Florida recommends delaying permitting until data/information that is currently not available can be collected and effects assessed using this new information. Florida would appreciate the opportunity to work with BOEM, NMFS, USFWS and others to help develop a prioritized list of data gaps and the studies necessary to address them. Should BOEM, however, decide to proceed with G&G permitting in the mid-or south Atlantic, we recommend that permits require studies identified by federal and state agencies be conducted during the activity to assist in filling data gaps. Again, Florida stands ready to work with all relevant agencies in determining which studies are most critical and would provide the most useful information.

We look forward to working with you on this issue. Should you have questions, please contact Debby Tucker, Environmental Administrator of the Department of Environmental Protection's OCS Program, at Debby.Tucker@dep.state.fl.us or 850-245-2181.

Sincerely,

Carla Gaskin Mautz

Carla Gaskin Mautz
Deputy Chief of Staff

cc: Donna S. Wieting, NOAA
Brian Cameron, BOEM
Jennifer Fitzwater, Florida Fish and Wildlife Conservation Commission (FWC)
Lisa Gregg, FWC

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and Wildlife
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Panama City

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Tallahassee

Executive Staff
Nick Wiley
Executive Director

Eric Sutton
Assistant Executive Director

Jennifer Fitzwater
Chief of Staff

Office of the
Executive Director
Nick Wiley
Executive Director

(850) 487-3796
(850) 921-5786
FAX

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620 South Meridian Street
Tallahassee, Florida
32399-1600
Voice: (850) 488-4676

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(800) 955-8770 (V)

MyFWC.com

August 24, 2015

Ms. Debby Tucker
Outer Continental Shelf Program
Department of Environmental Protection
3900 Commonwealth Bldg., MS 47
Tallahassee, FL 32399-3000
Debby.Tucker@dep.state.fl.us

Re: Request for Comments and Information, Federal Register Notice filed 7-28-15; National Oceanic and Atmospheric Administration (NOAA); Taking Marine Mammals Incidental to Geophysical Surveys in the Atlantic Ocean

Dear Ms. Tucker:

The Florida Fish and Wildlife Conservation Commission (FWC) has coordinated an agency review of the above document and would like to provide the following comments to contribute to any state-coordinated correspondence that may be generated in response to the request for public comment. The comments below are provided to the National Oceanic and Atmospheric Administration (NOAA) for their consideration for the Incidental Harassment Authorization applications for four of the Atlantic geological and geophysical (G&G) permit request companies (Spectrum, ION, TGS-NOPEC and TDI Brooks).

Most applications indicate agreement with the Bureau of Ocean Energy Management (BOEM) Programmatic Environmental Impact Statement (PEIS) to avoid seismic surveys in right whale critical habitat, seasonal management areas, and dynamic management areas when active. The BOEM PEIS includes an additional closure zone off central Florida out to 20 nautical miles (nmi) for November 15 – April 15. However, sightings from dedicated right whale aerial surveys and distribution modeling work demonstrate that right whales occur outside of these management areas (Garrison 2007, Keller et al. 2012, Gowan and Ortega-Ortiz 2014). The data analyzed by Gowan and Ortega-Ortiz (2014) included right whale sightings observed out to 65 km (35 nmi) despite limited offshore survey effort. In addition, methods used to estimate the number of takes were generally based on models (http://seamap.env.duke.edu/search/?app=serdp) that did not include data from Early Warning System (EWS) aerial surveys. Furthermore, although visual surveys and acoustic monitoring (e.g., PAM) are commonly used to document marine mammal presence, both have limitations and are unlikely to detect all animals during surveys. Marine mammal detections from visual surveys are limited by observers' ability and amount of time animals are at the surface (Marsh and Sinclair 1989), and detections from acoustic monitoring are limited by animal calling behavior, source levels, detector capabilities, and environment (Soldevilla et al. 2014). Right whales have dark coloration and lack a dorsal fin, and cow-calf pairs in the southeast United States have low vocalization rates (http://www.onr.navy.mil/reports/FY13/mbparks.pdf). Right whale parameters used in Spectrum Geo, Inc.'s application (Animal Acoustic Exposure Modeling [Appendix A]) were primarily from data in the feeding grounds where behavior is expected to be different than the calving grounds.

FWC would like to make the following recommendations for NOAA's consideration while reviewing the applications for the authorization of take for marine mammals incidental to oil and gas industry geophysical surveys in the Atlantic Ocean:

1. Due to the occurrence of right whales outside established management areas and the limitations in detecting right whales from visual and acoustic monitoring, we recommend

that NOAA consider extending the 20nmi closure zone off central Florida's coast out to 30 nmi from November 15 to April 15. This is consistent with an additional time-area closure requested by Georgia.

2. We are requesting that all survey and support vessels are equipped with Automatic Identification System (AIS) technology and that FWC staff receives a list of engaged vessel call names and Maritime Mobile Service Identity (MMSI) numbers. FWC staff also requests notification when seismic vessels are operating off Florida to document cumulative impacts to marine resources. The list of call names, MMSI numbers, and notifications can be provided to Tim Gowan and Tom Pitchford (Tim.Gowan@MyFWC.com and Tom.Pitchford@MyFWC.com).

3. We appreciate that all applicants propose to report sightings of marine mammals and turtles. We recommend that data collection, including that for survey effort (e.g., time, location, and survey conditions), be standardized among applicants in such a way that the data will be suitable for distance sampling analysis. We also recommend that sightings and effort data be submitted to OBIS-SEAMAP, spatially referred online database. This will increase the availability of data documenting the presence and distribution of species offshore where surveys have generally been limited.

4. We found the application from TDI-Brooks International, Inc., lacked details and mitigation measures. For example, the map and description of the proposed survey area is insufficient to determine how close the surveys are to the coastline. The description of how the number of takes was estimated is inadequate to address its validity. There is no mention of PAM or other contingencies for marine mammal monitoring when conditions (visibility, daylight) limit visual monitoring. Details (source levels, frequencies, and duration) of the soft-start (ramp-up) implementation were not included. There is also no mention of observing the 10 knot ship speed rule or avoiding seismic operations in active right whale management areas. We recommend these issues be clarified prior to issuance of permits.

We appreciate the opportunity to provide technical assistance to NOAA for this request. If you need any further assistance, please do not hesitate to contact Jane Chabre either by phone at (850) 410-5367 or at FWCConservationPlanningServices@MyFWC.com. If you have specific technical questions regarding the content of this letter, please contact Leslie Ward at (727) 896-8626 or Leslie.Ward@MyFWC.com.

Sincerely,

Jennifer D Goff

Jennifer D. Goff
Land Use Planning Program Administrator
Office of Conservation Planning Services

jdg/lw/md
ENV 1-3-2

cc: Ms. Kelie Moore, GaDNR, Kelie.Moore@dnr.g.gov

References

Garrison, LP. (2007) Defining the North Atlantic right whale calving habitat in the southeastern United States: An application of a habitat model. NOAA Technical Memorandum NMFS-SEFSC-553. National Marine Fisheries Service, Miami, Florida. 66 p.

Keller CA, Garrison L, Baumstark R, Ward-Geiger LI, Hines E (2012) Application of a habitat model to define calving habitat of the North Atlantic right whale in the southeastern United States. Endanger Species Res 18: 73–87.

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Marsh H, Sinclair DF (1989) Correcting for visibility bias in strip transect aerial surveys of aquatic fauna. J Wildl Manage 53: 1017–1024.

Soldevilla M, Rice A, Clark C, Garrison L (2014) Passive acoustic monitoring on the North Atlantic right whale calving grounds. Endanger Species Res 25: 115-140.

GEORGIA
DEPARTMENT OF NATURAL RESOURCES
COASTAL RESOURCES DIVISION

MARK WILLIAMS
COMMISSIONER

A.G. 'SPUD' WOODWARD
DIRECTOR

August 26, 2015

Jolie Harrison, Chief
Permits & Conservation Division
NMFS Office of Protected Resources
1315 East-West Highway
Silver Springs, MD 20910

RE: Request for Comments on IHA Applications to Conduct Geophysical Surveys in the Atlantic Ocean, RIN 0648-XE070

Dear Ms. Harrison:

Staff of the Georgia Coastal Management Program (GCMP) has reviewed the July 29, 2015 Federal Register notice announcing NMFS's receipt of four applications requesting authorization to take marine mammals under the Marine Mammal Protection Act (MMPA) incidental to conducting geophysical survey (G&G) surveys in the Atlantic Ocean. We have also reviewed the accompanying applications submitted by Spectrum Geo Inc. (BOEM G&G Application #E14-006), ION GeoVentures (BOEM G&G Application #E14-003 d/b/a GXT), TGS (BOEM G&G Application #E14-0001) and TDI-Brooks (BOEM G&G Application #14-0010).

Previous Comments and Correspondence:

The Georgia Department of Natural Resources (GaDNR) previously commented on potential environmental impacts of G&G surveys in letters to BOEM during the G&G Draft Programmatic Environmental Impact Statement (PEIS) process on May 17, 2010 and May 30, 2012. BOEM addressed many of our concerns in the Final G&G PEIS, but additional measures are needed to fully mitigate potential impacts of airguns and G&G vessels on endangered North Atlantic right whales and loggerhead sea turtles. With that goal in mind the GaDNR's GCMP submitted letters to BOEM and NOAA's Office of Ocean and Coastal Management between August 22 and October 23, 2014 requesting authorization to review six BOEM G&G survey applications (including the four applicants referenced above) under the federal consistency provisions of the Coastal Zone Management Act. Since then, three of the four applicants (Spectrum, GXT and TGS) have coordinated with the GCMP and voluntarily agreed to incorporate four additional mitigation measures while conducting seismic airgun surveys in waters adjacent to the State of Georgia:

- Airguns will not be discharged within 20 nm of Georgia from April 1 to September 15 to protect nesting loggerhead sea turtles,
- Airguns will not be discharged within 30 nm of Georgia from November 15 to April 15 to

protect wintering North Atlantic right whales,

- Applicants will notify GaDNR when survey vessels are operating offshore and adjacent to Georgia, and
- All vessels will have functioning AIS (Automatic Identification System) onboard and operating at all times, and vessel names and call signs will be provided to GaDNR.

These measures were developed in coordination with the applicants to further minimize reasonably foreseeable effects to Georgia's endangered species and to enhance monitoring and compliance with airgun and vessel speed measures required under the G&G PEIS. Spectrum stated their intention to comply with these measures explicitly in their IHA application; GXT and TGS did not. The GCMP did not coordinate with TDI-Brooks because they are not proposing to use airguns or operate within 30 miles of the Georgia coast.

Comments on IHA Applications

The GCMP supports BOEM's use of time-area closures to separate right whales from airgun sound energy. However, the time-area closure boundaries that BOEM has proposed are not sufficiently protective for airgun surveys given the distance that airgun sound energy is expected to propagate from the seismic vessel (2.8-8.3 nautical miles (nmi) at sound pressure levels up to 160 dB re 1 µPa rms; G&G PEIS Table D-22). BOEM acknowledged this problem in the G&G PEIS and proposed that airgun surveys must "remain at a distance such that received levels [the time-closure area closure boundary] do not exceed the Level B harassment threshold [i.e., 160 dB], as determined by field verification or modeling" (G&G PEIS page 2-36). It remains unclear how "field verification and modeling" will be implemented in the field, how effective it will be and how BOEM will enforce it. Therefore, we recommended to BOEM previously, and restate here, that a simpler and more conservative approach is to require airgun survey vessels to maintain a 10 nmi distance from right whale time-area closure boundaries. A 10 nmi airgun buffer is also prudent because right whales inhabit waters east of the proposed time-closure area boundaries (Gowan and Ortega-Ortiz 2014, Keller et al. 2012, Good 2008).

In addition to the vessel strike mitigation measures already outlined by BOEM, the GCMP recommends that NMFS require Automatic Identification System (AIS) transceivers be installed and operational on all vessels used in conjunction with G&G surveys, including seismic vessels, support boats and supply boats. Applicants should be required to provide the vessel names and identification numbers to BOEM and NMFS prior to entering any right whale time-area closure boundary. Doing so will enable BOEM, NMFS and state partners to monitor cumulative increases in vessel traffic, and assess compliance with vessel speed and time-area closure requirements.[1] Note that most vessels less than 65 ft in length are currently exempt from U.S.

[1] The U.S. Coast Guard collects AIS data transmitted by AIS-equipped vessels remotely using a shore-based AIS receiver network. NMFS has used these data for a variety of whale research, management and enforcement purposes (e.g., monitoring compliance with the right whale ship speed rule). The same approach could be used to monitor G&G survey vessels. Note that shore-based receivers can only detect AIS transmissions from vessels when they are 30-50 nmi or closer to shore. This distance is sufficient for monitoring vessel activities within right whale habitat from FL to NC.

Coast Guard AIS carriage requirements. We recommend that NMFS require all vessels, including those less than 65 ft, be required to carry AIS because right whale injuries and mortalities have been caused by vessels in the 30-65 ft size range (Henry et al. 2015; Knowlton and Costidis 2013a,b; Jensen and Silber 2003).

BOEM's vessel strike avoidance measures require all survey vessels regardless of size to operate at 10 knots or less within right whale Seasonal Management Areas (SMAs) and Dynamic Management Areas (DMAs). However, it is unclear if speed restrictions also apply to support vessels and supply vessels, which will likely be responsible for most of the vessel traffic within right whale habitat. It is also unclear if speed restrictions apply within time-area closure boundaries that are not SMAs (i.e., "Additional 20-nmi Closure Zone North" and "Additional 20-nmi Closure Zone South"; G&G PEIS Fig. 2.3). We recommend that NMFS require all vessels used in conjunction with G&G surveys, regardless of size, to comply with 10 knot speed restrictions within all active time-area closure boundaries.

The GCMP recognizes that NMFS cannot address potential impacts to loggerhead sea turtles through the IHA process. However, we encourage NMFS to require a 20 nmi time-area closure from April 1 to September 15 along the Southeast U.S. coast for all airgun surveys when NMFS consults with BOEM under Section 7 of the Endangered Species Act.

We appreciate the opportunity to comment on these IHA applications, and look forward to continued cooperation with NMFS on this and other issues. Please feel free to contact me or Kelie Moore if we can be of additional assistance.

Sincerely,

A.G. "Spud" Woodward
Director

SW/km

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Larry Hogan, *Governor*
Boyd K. Rutherford, *Lt. Governor*
Mark J. Belton, *Secretary*
Mark L. Hoffman, *Acting Deputy Secretary*

August 28, 2015

Jolie Harrison, Chief
Permits and Conservation Division
Office of Protected Resources
National Marine Fisheries Service
1315 East-West Highway
Silver Spring, MD 20910

Dear Ms. Harrison:

RE: 7/29/15 *Federal Register Notice* Taking and Impacting Marine Mammals: Taking Marine Mammals Incidental to Geophysical Surveys in the Atlantic Ocean

Thank you for the opportunity to comment on the above. In 2014, NOAA/NMFS received four separate requests for authorization for take of marine mammals incidental to the oil and gas industry geological and geophysical (G & G) surveys in the Atlantic. After some interaction with the G & G survey companies, NMFS posted the above notice and provided access to information regarding the revised versions of the authorization requests from the G & G surveys that NMFS deemed adequate and complete to begin processing. NMFS is seeking public input on these requests for authorizations, especially regarding the following topics:

- Best available scientific information and appropriate use of such information in assessing potential effects of the specified activities on marine mammals and their habitat;
- Application approaches to estimating acoustic exposure and take of marine mammals; and
- Appropriate mitigation measures and monitoring requirements for these activities.

As director of Maryland's Chesapeake and Coastal Service, I am providing the following comments in response the 7/29/15 *Federal Register Notice,* especially as it relates to Spectrum Geo, GXT/ ION GeoVentures and TGS.

General Comments:

The State of Maryland is working closely with our regional partners and stakeholders as the federal government considers G & G surveying of federal waters off the Atlantic coast. We are having regular conversations with the U.S. Department of the Interior, NOAA and the companies involved to ensure that any proposed activity is consistent with the Maryland Coastal Zone Management Program, is conducted in an environmentally-responsible manner that considers sensitive marine life, and that respects the rights of commercial and recreational boaters and watermen.

Maryland considers marine mammals such as whales, dolphins, porpoises and seals vital coastal resources. We are committed to balancing economic growth and opportunity with protecting our natural resources. As evidence of our commitment to protecting marine mammals, Maryland is spending millions of dollars of state monies to study their abundance and distribution in both state and federal waters. Maryland is funding the following three surveys and we encourage NOAA to consider this new data and information in its analyses:

1. Aerial surveys to collect data on presence, density and seasonality of large whale species were conducted along the coastal waters of Maryland from July 2013 to June 2015. There were twenty-four surveys over 16,579 km of track-line. Here are a few highlights:
   - 23 large whale groups sighted (9 fin whale, 2 humpback, 1 minke whale, 8 right whale and 3 unidentified whales);
   - 417 bottlenose dolphin groups sighted and 36 groups of other dolphin species (25 common dolphin groups, 1 spotted dolphin group, 10 unidentified dolphin groups); and
   - 809 loggerhead turtle sightings and 142 sightings of other turtle species (45 green, 14 leatherback, 1 Kemp's and 82 unidentified).

   The study was conducted by the Virginia Aquarium and Marine Science Center and the Riverhead Foundation for Marine Research and Preservation.

2. Maryland is cost-sharing a three-year study with the Bureau of Ocean Energy Management (BOEM) to collect acoustic data to:
   - characterize patterns of temporal and spatial occurrence of vocalizing marine mammal species (including right whales, fin whales, humpback whales, minke whale and any small cetacean species); and
   - characterize the existing ambient noise environment in and around the Maryland Wind Energy Area.

   The project is being undertaken by the University of Maryland Center for Environmental Science and the Bioacoustics Research Program at Cornell University.

3. Maryland provided funds to the Biodiversity Research Institute to expand their on-going work with the U.S. Department of Energy (DOE) to:
   - assess wildlife distribution and abundance patterns and examine temporal variation in these patterns;
   - development of statistical models to identify ecological drivers of these patterns and predict important habitat and aggregation areas; and
   - identification of species likely to be exposed to offshore wind energy development or other anthropogenic activities.

   Maryland funded an extension of the DOE-funded surveys that included the expansion of existing boat surveys into Maryland state waters, the extension of video aerial surveys into areas west and south of the Maryland Wind Energy Area; and an extra aerial survey in Maryland waters.

Marine mammals, fish, sea turtles and other aquatic life that inhabit the ocean offshore Maryland contribute significantly to the economy and quality of life of our coastal communities. The presence of these creatures and healthy ocean waters often define coastal recreational experiences and support numerous coastal uses such as swimming and surfing, boating, recreational and commercial fishing, wildlife watching and diving.

The ocean environment and our impacts to its health are not fully understood, but there is growing evidence that existing, emerging and cumulative human activities are having a significant impact on ocean health. Among the growing list of impacts to the ocean – increasing anthropogenic noise, climate change, coastal eutrophification, pollution, ocean acidification, plankton decline, overfishing, invasive species – G & G surveys may add to the factors influencing our ocean environment. Growing numbers of ocean scientists and coastal managers consider that these multiple stressors have pushed the ocean to a tipping point.[1] Recognizing the importance of a healthy marine environment to Maryland's economy, there are a number of issues that we would like to highlight:

- Cumulative and Trophic Effects. On an activity-specific permit and species-by-species estimate of "takes" basis, more can be done to consider the cumulative effects of multiple, sometimes overlapping noise sources on our marine environment and its creatures. The IHA process should strongly consider how to more fully understand and address ecosystem-wide impacts on marine mammals. For instance, how would the proposed activities affect

[1] http://www.stateoftheocean.org/

trophic interactions and marine mammal communications across larger distances (e.g., changes in predator/prey interactions and populations and the effects that increased stress, reduced vocalization and diminished foraging activity may have on overall health and breeding).

- Ocean Noise. Ocean noise, while significant and increasing globally, continues to be poorly understood. There are also discrepancies among researchers and policy-makers about its ultimate impacts on the marine environment. Further, we request that NMFS review the IHA process to determine whether the same standards should be applied to all activities contributing noise to the marine environment to ensure a high level of protection. It is clear that over the past several decades the ocean has become increasingly noisy from multiple sources with varying energy levels and frequencies such as ship traffic, piling driving, naval sonar, fishing sonar, and seismic surveys. It is not clear how sound impacts life processes and ecosystem health and the degree to which monitoring and mitigation measures protect coastal resources and avoid or minimize coastal use conflicts.[2] [3]

Specific Comments:

Best available scientific information and appropriate use of such information in assessing potential effects of the specified activities on marine mammals and their habitat

As noted in this and previous communications to NOAA, there is a need to more fully understand marine mammal and benthic habitat density and distribution in the Mid-Atlantic ocean region. As noted by the IHA applicants and others, the current lack of information on marine mammal distributions and migration patterns forces the NMFS and IHA applicants to use models to help estimate potential takes due to seismic surveys. While models can be useful tools for coastal resource management, they do not replace the need for reliable data. As noted above,
to address the limitations of available data, Maryland recently entered into a Cooperative Agreement with BOEM to collect baseline data via passive acoustic monitoring to better understand the geographic distribution, abundance, and densities of large whales, dolphins, and porpoises. Information from this and other studies should be used in order to ensure an accurate analysis of the potential impacts of oil and gas G & G activities on marine mammals off the Maryland coast.

As NOAA and BOEM move forward through G & G permitting processes, we would request a permitting requirement be provision of the on-board observational and monitoring data on marine mammals as well as other aquatic life (e.g. sea turtles, birds, schools of fish) be provided to the State to support sound coastal management.

Application approaches to estimating acoustic exposure and take of marine mammals

G & G surveys are one of the exceptional activities that allow incidental takes of small numbers of marine mammals. Given the definitions of "incidental take" and "take," estimating the potential "takes" of marine mammals associated with seismic surveys requires the use risk characterization. Risk is determined by two factors: exposure and response. In the context of seismic surveys, exposure is the overlap of distribution of marine mammals and potential harmful impacts from seismic surveys, where sound energy is the principal factor contributing to a "take." Seismic airguns have the potential to impact organisms directly as well as inter-organism and intersystem relationships and life-supporting functions.

Major questions regarding the exposure-response relationship include[4]:

1. What are the hearing capabilities of the many marine mammal species that have not yet been tested by behavioral or physiological methods and how do they vary within species by such factors as age and sex?

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[2] Weilgart, L. (2013). "A review of the impacts of seismic airgun surveys on marine life." Submitted to the CBD Expert Workshop on Underwater Noise and its Impacts on Marine and Coastal Biodiversity, 25-27 February 2014, London, UK. Available at: http://www.cbd.int/doc/?meeting=MCBEM-2014-01 1 A Review of the Impacts of Seismic Airgun Surveys on Marine Life

[3] Marine Mammals and Noise: A Sound Approach to Research and Management. A Report to Congress from the Marine Mammal Commission. March 2007

[4] Marine Mammals and Noise: A Sound Approach to Research and Management. A Report to Congress from the Marine Mammal Commission. March 20007

2. What are the non-auditory sensitivities of marine mammals to sound?
3. How do marine mammals respond to different sounds and how do responses vary within species and among species?
4. How does the environment influence marine mammal response to sound?
5. What are the effects of both short- and long-term sound exposures?

More information about and answers to the above questions would provide a better framework for understanding the exposure-response risks to mammals from seismic surveys. The application approaches and the IHA process in general do not adequately answer many of these questions.

Mitigation Measures and Monitoring Requirements

The degree of protection provided to marine mammals to a large degree depends on the following factors: (1) the size of the exclusion zone surrounding the G & G surveys and (2) the ability to detect marine mammals and other ocean creatures within the exclusion zones, (3) the ability to shut down operations in a timely manner when a marine mammal is observed within the exclusion zone and (4) maintaining safe distances between multiple survey operations and other coastal uses (e.g. commercial fishing or fishing tournaments). Recommendations about each follow.

Exclusion Zones. Seismic surveys are similar in acoustic energy, but it appears that G & G survey companies are offering different exclusion zones. For instance, Spectrum Geo's exclusion zone radius is 500 meters while Ion GeoVentures is only 150 meters. Given the amount of uncertainty regarding the potential impacts acoustic energy on marine mammals, all applicants should apply the largest exclusion zone possible to provide equivalent protection.

Detection of Marine Mammals. All applicants will use a combination of onboard visual observation and passive acoustic monitoring to detect marine mammals. The ability of these techniques to detect marine mammals depends on sea conditions and the skill and experience of observers. They also tend to work best when marine mammals are near the surface or when marine mammals vocalize. These detection techniques are not effective when marine mammals stop vocalizing or when they dive to greater depths when the survey is approaching. Further, visual observation is less effective during the nighttime or in foggy or stormy conditions.

Shutting Down Surveys. The ability to shut down operations when a marine mammal is observed within the exclusion zone is a crucial element to marine mammal protection. Given this, it is important for survey crews to have experience with shut downs before actual surveys via mock drills. Having well-qualified marine biologists familiar with the Mid-Atlantic is also critically important.

Maintaining Distance and Effective Communication Among Surveys and Other Coastal Uses. There are also web-based tools such as Seasketch that support collaborative planning among stakeholders. Sound advance planning, communication and coordination among stakeholders is absolutely essentially to ensuring that the seismic surveys collect the data needed to assess energy resources while minimizing and avoiding coastal resource impacts and coastal use conflicts. Sharing data on ocean activities and utilizing a variety of existing communications channels will help avoid potential conflicts between multiple surveys as well as other activities such as fish tournaments, commercial shipping, and naval or coast guard operations.

Understanding Acoustic Exposure. Jim Cummings of the Acoustic Ecology Institute offers several approaches pertinent to mitigating impacts from seismic surveys – especially related to understanding acoustic exposure. One of the issues addressed relates to the development of technologies to reduce the source levels of airguns. Efforts could include limiting the frequency output (range) of airguns to better avoid frequencies important to marine species, development of techniques that can adjust sound levels during the survey, to maintain the most modest sub-surface penetration necessary, development of more sensitive hydrophones or improved data analysis algorithms that could discern the needed geological information in much weaker echoes, use of bubble-curtains to provide some sonic baffling near the source, and investigations of lower power sound-generating technologies including evacuated spheres[i] or other now-experimental techniques (this would involve a degree of industry cooperation, as new techniques may be considered proprietary). Research could also be encouraged toward developing geological interpretation techniques that could make use of surveys which do not penetrate so deeply into the ocean-bottom crust; alternatively, such lower-power surveys could become the norm, with very site-specific return surveys to probe more deeply into areas of special promise."[5]

Summary

We offer the above described comments to help protect our coastal resources and minimize coastal use conflicts during the operations of the proposed G & G surveys. We look forward to working with you and other partners as we strive to balance economic growth, energy development and protection of our coastal resources. Thank you again for the opportunity to comment on the proposed Incidental Harassment Authorizations for the G & G surveys offshore Maryland.

If you have specific questions, please contact Joe Abe of my staff at joseph.abe@maryland.gov or 410-260-8740.

Sincerely,

Matt Fleming, Director

Cc:
Joseph Abe, Maryland DNR
Gwynne Schultz, Maryland DNR
Catherine McCall, Maryland DNR

References

Cummings, Jim and Natalie Brandon, "SONIC IMPACT: A Precautionary Assessment of Noise Pollution from Ocean Seismic Surveys," June 2004.

Marine Mammals and Noise: A Sound Approach to Research and Management. A Report to Congress from the Marine Mammal Commission. March 2007.

Weilgart, L. (2013). "A review of the impacts of seismic airgun surveys on marine life." Submitted to the CBD Expert Workshop on Underwater Noise and its Impacts on Marine and Coastal Biodiversity, 25-27 February 2014, London, UK. Available at: http://www.cbd.int/doc/?meeting=MCBEM-2014-01 1 A Review of the Impacts of Seismic Airgun Surveys on Marine Life.

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[i] "Imploding acoustic sources offer potential advantages in terms of operation depth, ease of field operation, bandwidth for shallow reflection purposes, and a significantly reduced bubble pulse presence. While their *peak* energy output may be relatively high, …their overall energy output is generally low. However, the ability to detect a light globe implosion at 1.2km range is promising." Hoffman 2000

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[5] Cummings, Jim and Natilie Brandon, "SONIC IMPACT: A Precautionary Assessment of Noise Pollution from Ocean Seismic Surveys," June 2004.

North Carolina Department of Environment and Natural Resources

Pat McCrory
Governor

Donald R. van der Vaart
Secretary

Aug. 28, 2015

Jolie Harrison, Chief
Permits and Conservation Division
Office of Protected Resources, National Marine Fisheries Service
1315 East-West Highway
Silver Spring, MD 20910

Dear Ms. Harrison,

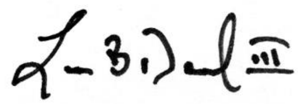
The NOAA Federal Register RIN 0648-XE070, Wednesday July 29, 2015 (45195-45196) seeks input relevant to “marine mammal species that occur in US waters of the Mid- and South Atlantic and the potential effects of geophysical survey activities on those species”. The proposed lease program and seismic survey areas include North Carolina’s coastal and offshore waters. These waters are inhabited by a diverse number of whales and dolphins, including seven species of baleen whales and twenty-seven species of toothed whales. In addition, the area off Cape Hatteras is believed to have the greatest marine mammal biodiversity of any area off the entire east coast of the United States.

The North Carolina Division of Marine Fisheries (NCDMF) provided comments on the National Science Foundation (NSF) proposal and required the NSF to adhere to the mitigation measures identified in the Final Atlantic Geological and Geophysical Activities Programmatic Environmental Impact Statement (PEIS) to protect marine animals to the maximum extent practical. The NSF project proposal was identical to the projects currently being proposed. At this point in time we are unaware of any adverse impacts from the testing NSF conducted off North Carolina’s coast last fall. The NCDMF has not received any reports of disturbances or injury to marine wildlife potentially resulting from the survey activities.

It is important to note that these types of seismic testing events have occurred throughout the world, and that as reported in the Federal Register dated March 4, 2014, NOAA has not found any definitive evidence that exposure to strong pulsed sounds during seismic testing results in injury and/or stranding even for marine mammals in close proximity to large arrays of air guns. The NCDMF believes that these programs can move forward if the activity is limited to the extent practicable. From discussions with industry, we understand that multiple surveys overlapping the same geographic areas are unlikely to occur and economics dictates that surveys will indeed be limited. We are requiring that pre-testing meetings with the North Carolina Division of Coastal Management (NCDCM) and NCDMF be conducted prior to any testing events to discuss specific seasonal and geographic conflicts and concerns, both culturally and biologically, that may be avoided or mitigated prior to testing.

The NCDMF is supportive of seismic testing so long as the very fragile balance between our important coastal fisheries and their associated species and habitats is not negatively impacted. The PEIS mitigation measures including visual monitoring by trained protected species observers; exclusion zones around vessels; shut-down and ramp-up procedures; passive acoustic monitoring; and time-area closures to protect marine mammals and pre-testing meetings with the Geological and Geophysical contractors should help us to achieve this balance.

Sincerely,



Dr. Louis B. Daniel III, Director
N.C. Division of Marine Fisheries

City of Southport

August 28, 2015

Jolie Harrison
Chief Permits and Conservation Division
Office of Protected Resources
National Marine Fisheries Service
1315 East – West Highway
Silver Spring, MD 20910

Dear Ms. Harrison,

The National Oceanic and Atmospheric Association (NOAA) and the National Marine Fisheries Service (NMFS) are commended for their continued efforts to inform and engage the public about the ION GeoVentures IHA application for a federal permit to conduct deep-water seismic surveying in the Atlantic Ocean to better evaluate the evolution of the petroleum system at the basin level.

The Aldermen of the City of Southport recognize that Southport's economic survival solely depends on the sustainability of the existing environment; and submit for your consideration the following comments about this important issue.

Southport is located in southeastern North Carolina where the Cape Fear River and Atlantic Ocean intersect and our residents and others along our coast will be the most affected by results of the proposed seismic surveying and its related activities.

The City of Southport is committed to being a sound steward of the unique coastal environment and has a long history and profound connection to the Atlantic Ocean. Southport residents remain overwhelmingly opposed to seismic surveying and oil/gas exploration and drilling as proposed by Bureau of Energy Management.

The surveying proposed by ION GeoVentures in its recent IHA application to the North Carolina Department of Energy and Natural Resources (DENR) and BOEM, will extend 24/7 summer through fall of 2016. The proposed survey grid is five widely-spaced transect lines (~20–190 km apart) roughly parallel to the coast and 14 widely-spaced transect lines in the onshore-offshore direction. Numerous prominent marine scientists have indicated that seismic surveying of shorter durations may have an impact on marine animals, sea turtles and fish stocks. Many scientists are concurring that a survey conducted with seismic air guns of 263 dB to 270 dB, over tens of thousands of acres could harass these and other species and impact behaviors, migratory patterns, food supply, safety and communication. Of the 39 species listed in the application, six are endangered. The application indicates no ESA-listed as threatened; the application makes no mention of the sea turtles that feed, mate, nest and hatch on all the barrier islands and coastline from Florida to Virginia.

1029 N. HOWE STREET • SOUTHPORT, NORTH CAROLINA 28461
www.cityofsouthport.com • PHONE: (910) 457-7900 • FAX: (910) 457-7905

The City of Southport is concerned that the noise created by seismic surveying will startle, impair and preclude sea turtles from returning to lay their nests in our surrounding communities. Sea turtle conservation is a major economic driver for our region and Southport citizens' request assurance that seismic surveying and any anticipated oil/gas exploration and drilling will not negatively impact the turtle population. Leatherback, loggerhead and green turtles are evident offshore and in the Cape Fear River from spring until late fall.

Southport's concerns seem confirmed by a statement from the 2006 Draft Environmental Impact Statement on the OCS Leasing Program: 2007-2012, which acknowledged that in the Gulf of Mexico planning areas, *"Noise generated by seismic surveys may have physical and/or behavioral effects on marine mammals, such as (1) hearing loss, discomfort, and injury; (2) masking of important sound signals; and (3) behavioral responses such as fright, avoidance and changes in physical or vocal behavior."* It is further stated within the draft that *"...Sea turtles could be directly affected by seismic surveys, vessel traffic and construction of offshore and onshore facilities and removal of platforms. Sea turtles may also be exposed to a variety of waste materials, such as produced water, which have the potential to cause a variety of lethal and sub-lethal effects."*

Loggerheads are considered threatened in the United States and endangered globally. Leatherbacks are considered "vulnerable." Adult sea turtles enter the waters offshore of North Carolina in April, nesting takes place from May until September and hatching takes place at night from July until November. Only one in 1000 are expected to survive to come back and lay a nest. The ION GeoVentures application does not acknowledge the endangered or threatened sea turtles in as far as proposed takes, exclusion zones or mitigation.

The ION GeoVentures application was prepared by LGL Ecological Research Associates, a Texas based consulting firm. LGL's website states they have "*expertise with sensitive species in Canada, the United States and abroad of marine mammals and sea turtles*," yet the application does not have any reference to the Atlantic Seaboard migration patterns of the endangered and threatened sea turtles and fish stocks.

The application does mention the North Atlantic Right Whales, but does not include the observations much farther out to the continental shelf. Mariners are under special rules when transiting the western mid-Atlantic and south-Atlantic offshore waters from November until April. *"Large whales, such as right whales, rely on their ability to hear far more than their ability to see. Chronic noise is likely reducing their opportunities to gather and share vital information that helps them find food and mates, navigate, avoid predators and take care of their young."* Leila Hatch, Ph.D., NOAA's Stellwagen Bank National Marine Sanctuary marine ecologist. *"...noise from an individual ship could make it nearly impossible for a right whale to be heard by other whales,"* said Christopher Clark, Ph.D., director of Cornell's bioacoustics research program (*CONSERVATION BIOLOGIST, Underwater noise decreases whale communications in Stellwagen Bank sanctuary*, August 15, 2012). It is hard to conceive what impact adding Ultra-deep lines of 36 seismic air guns at a decibel level of 257dB-263dB, a low-level acoustic pinger system (operating between 50–100 kHz) and standard single-beam navigational echosounders will have on the 39 species listed including the six endangered populations mentioned in the survey and the endangered and threatened sea turtle populations.

Page 34 of the ION GeoVentures IAH application states "*All anticipated takes would be 'takes by harassment' involving temporary changes in behavior. The mitigation measures to be applied (see § XI below) would minimize the possibility of injurious takes. However, as noted earlier and in Appendix C, there is no specific information demonstrating that injurious 'takes' would occur if animals were exposed to sound levels >180 dB re 1μPa SPL rms even in the absence of the planned mitigation measures.*" More than 100 scientists have asked the Obama administration for survey applications not be approved until NOAA's Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammals has been reviewed and adopted.

This application is specifically for summer and fall of 2016, on page 22 the application says "*Cuvier's beaked whales have been regularly sighted during summer and fall line transect surveys in the mid-Atlantic shelf break area (Martinez and Garrison 2005, 2006; Wicker et. al 2011; Wicker and Mullin 2012; Palka 2012). DoN (2008a,b) reported eight sightings offshore from Georgia and North Carolina in the fall, most of which occurred near the shelf break. Several summer and fall strandings have also been reported along the coast from south Florida to North Carolina (DoN 2007a, 2008a,b).* According to Barlow and Gisiner, 2006, "*Beaked whales are both visually and acoustically difficult to detect*" and "*Currently, none of the available detection methods (visual search and passive acoustic monitoring) has a high probability of detecting and identifying beaked whales*" "*beaked whales stay silent for long periods of time.*" To make matters worse, "*some mitigation methods may actually harm beaked whales since they approach the air guns they are ramping up. (Barlow and Gisiner, 2006)*"

No peer-reviewed studies appear to exist that inform scientists about the chronic impact of seismic surveying on marine wildlife, including sea turtles. No studies exist to prove that the surveys will not adversely impact the species beyond the accidental take or harassment. On page 40 the application admits, "*Permanent hearing impairment, in the unlikely event that it occurred, would constitute injury, but temporary threshold shift (TTS) is not considered an injury (Southall et al. 2007; Le Prell 2012). Rather, the onset of TTS has been considered an indicator that, if the animal is exposed to higher levels of that sound, physical damage is ultimately a possibility. Recent research has shown that sound exposure can cause cochlear neural degeneration, even when threshold shifts and hair cell damage are reversible (Liberman 2013). These findings have raised some doubts as to whether TTS should continue to be considered a non-injurious effect.*"

Although proven facts cannot directly relate the seismic surveying of the ocean floor that occurred this spring off Bald Head Island, a beaked whale and a dolphin were stranded and died on Bald Head Island on May 11, 2015, within days of a Geophysical Survey ship coming into the Port of Wilmington, NC, on May 8, 2015.

Care must be given to all marine life. From July 2013 to date, the Atlantic bottlenose dolphins have suffered die-offs from cetacean morbillivirus. Adding additional stress upon these marine populations with seismic blasting could result in higher than predicted takes.

The Southport community also has concerns for the fish stocks in the surrounding waters: "*Bony fish may be particularly vulnerable to intense sound because most of them possess an air-filled swim bladder. Although marine fish typically have less acute hearing than marine mammals, many are more sensitive than odontocetes in the range 100-500 Hz where most seismic sound is produced. Effects of air gun pulses on fish range from serious injury at short ranges, to avoidance behavior, possibly at the range of many kilometers (Turnpenny & Nedwell, 1994). Reduced catch rates have been reported for several species of fish in areas of seismic surveying activity (see review in McCauley, 1994).*

Most importantly, the predicted Level A & B takes of all the species seem low given the unknown effects on the fish stocks upon which they feed. "*Concerns about the potential effects of human-generated noise on marine species have been growing as scientific evidence indicates that certain classes of noise produced during naval exercises, geophysical exploration, and underwater construction may cause temporary or permanent auditory damage to some marine vertebrates, including marine mammals, turtles, and fishes (NRC, 1994, 2000; Popper, 2003, Popper et al., 2004a). Of equal concern is the potential for concomitant changes in normal behavior that may reduce foraging efficiency, reproductive success, or individual longevity, any of which could result in reduced populations. Negative impacts for any population will in turn negatively affect their predator or initiate a cascade of changes that alter an entire ecosystem if top predators are reduced or eliminated." (TECHNICAL REPORT 1939,* April 2006; *Evaluation of Evidence for Altered Behavior and Auditory Deficits in Fishes Due to Human-Generated Noise Sources,* P. L. Edds-Walton and J. J. Finneran) There is no way to quantify the level of disruption seismic surveying may inflict upon this critical process of nature.

Southport is also in the Atlantic migration flyway. Thousands of water birds and shore birds of several species traverse the coast within this flyway, with some choosing to stay for several consecutive months. To date, our neighbor the BHI Conservancy has documented over 243 species of birds in our region. Many of these bird species have been designated as protected by the government since their populations are diminished, and many of these bird species rely on coastal fish for sustenance during their migration. It is estimated that the BP Horizon spill killed over one million sea and shore birds, including 32% of the brown pelican population. There is no empirical data to confirm that seismic testing will not displace the fish stocks that the birds in the flyway and all the other marine animals that frequent the survey area rely on for survival.

Other concerns of note:

- ION GeoVentures admits the uncertainty of the metrics put forth in their take and harassment metrics. The application states on page 151: "*The total uncertainty in the predicted exposure level is the product of all the possible sources of uncertainty in the modeling procedure. These can be grouped into three categories: acoustic propagation,* *animal behavior, and animal density. Acoustic propagation uncertainty largely results from the natural variability in sound velocity profiles, which can be precisely measured but changes rapidly. The other contribution is seafloor composition. This changes slowly, but it is difficult to measure precisely."*

- Surface observers during the tests are able only to monitor a small percentage of the total impact. The subsurface impact remains undetected and undocumented. This concern is magnified because surveying will occur both during the daytime and nighttime hours.

- The seismic application proposes mitigation by underwater monitoring for whale songs to determine their presence. Sea turtles do not emit sound underwater, so their presence would be completely undetectable by the seismic application mitigation proposal, but for their occasional and intermittent need to surface. The 10,000+ incredibly small and vulnerable hatchling turtles leaving the Bald Head beaches (included in the 145,000 + hatchlings leaving North Carolina beaches) are at high risk by nature, and they would be completely undetectable by the seismic application mitigation proposal.

- Although mitigation steps such as exclusion zones, ramped-up sound levels, PSOs and PAMs are being promoted, how can your organization actually monitor the activities to ensure compliance with federal rules? How will your organization enforce appropriate penalties if/when the rules are violated?

ION GeoVentures makes no mention of the threatened sea turtle migration season.

In conclusion, we call into question the ION GeoVentures IHA application and their use of seismic airguns at the proposed intensity levels, frequency of discharge, duration and scale, the likes of which have never been done in the mid-Atlantic.

It is of vital importance that all stakeholders recognize the globally unmatched bio diversity that exists off the coast of North Carolina. That all stakeholders understand that this diverse marine life, much of which is little understood by the scientific community, has not been studied to determine the short and long term effects of the large scale seismic surveying as proposed in this permit application and the concurrent overlapping areas under consideration in all 4 permit applications. We respectfully ask that NOAA and NMFS not allow the absence of complete data to serve as de facto evidence that seismic surveying on this scale and intensity is not harmful to marine life in the Atlantic.

Please find enclosed a copy of the resolution passed by the City of Southport Board of Aldermen as demonstration of our community's opposition of seismic surveying and oil and gas offshore exploration and drilling on the continental shelf off the coast of North Carolina.

Thank you, once again for the opportunity to comment on the ION GeoVentures IHA application to conduct seismic surveying off the coast of North Carolina. The members of the Southport community look forward to working with NOAA and NMFS as this process unfolds.

Sincerely,

Mary Ellen Poole

City of Southport Mayor Pro Tem Mary Ellen Poole

Michele Windham

City Clerk

CITY OF SOUTHPORT CORPORATE SEAL 1792 NORTH CAROLINA

Enclosure

RESOLUTION IN CONTINUED OPPOSITION OF SEISMIC SURVEYING AND STATED OPPOSITION TO OIL AND GAS OFFSHORE EXPLORATION AND DRILLING ON THE CONTINENTAL SHELF OFF THE COAST OF NORTH CAROLINA

WHEREAS, the City of Southport is committed to being a sound steward of the unique coastal environment, including the rare maritime forest, estuaries, marshes, and pristine beaches on and around our regional coastal communities; and

WHEREAS, the Aldermen of the City of Southport recognize that Southport's economic survival solely depends on the sustainability of the existing environment; and

WHEREAS, on March 5, 2015, a letter was sent to President Obama signed by 75 leading marine scientists expressing their concern over the significant threat to marine life posed by the introduction of seismic oil and gas exploration along the U.S. Mid-Atlantic and South Atlantic coasts. The letter further states, "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." The scientists' letter serves as additional confirmation of the City of Southport's previous resolution in opposition of the use of seismic airguns.

WHEREAS, exploratory and commercial drilling, extraction, and transportation of offshore oil and gas resources pose a significant risk of spill; and

WHEREAS, offshore drilling requires substantial onshore infrastructure, such as pipelines and/or refineries, which will further risk the health and safety of the environment, character and natural beauty of North Carolina's coast; and

WHEREAS, it is known that the 20 counties that comprise North Carolina's coastal region generate more commercial and personal income, public revenues, and employment opportunities than the petroleum and natural gas industry is estimated to generate for the State, specifically,

1. In 2014, a record $21.3 billion in domestic visitor/tourism spending was realized in North Carolina; and
2. In 2014, North Carolina was the sixth most visited state in the nation. Out of the 100 counties in the State of North Carolina, in terms of travel expenditures, three of the top 10 counties were coastal counties; and
3. In 2014, direct tourism employment in North Carolina is approximately 204,800 persons, with direct tourism payroll of $4.9 billion; and
4. Visitors to North Carolina generated more than $3.2 billion in federal, state and local taxes in 2014; and
5. The NC Division of Marine Fisheries (NCDENR) reported 2014 commercial fish landings in North Carolina to be worth $93,843,254; and
6. Because of North Carolina's tourism industry, each North Carolina household in 2014 saved $455 in state and local taxes as a direct result of visitor spending in the state; and

WHEREAS, visitors from all over the world come to enjoy the natural beauty of our clean beaches, salt and freshwater marshes, inlets, estuaries and tributaries; and

WHEREAS, the City of Southport and her surrounding coastal communities are rich in natural areas that provide sanctuary, nesting and breeding grounds for diverse groups of migratory birds, turtles, dolphin, whales, fish and other wildlife, some of which are on the endangered species list; and

WHEREAS, North Carolina's coastal waters and natural habitats provide the world with some of the best wild-caught seafood, renowned for its freshness and exceptional quality; and

WHEREAS, the inherent risks to North Carolina's 320 miles of valued coastline from seismic surveying, offshore oil and natural gas exploration and drilling have the potential to irrevocably harm our natural environment, our economic well-being and our overall quality of life; and

NOW, THEREFORE, BE IT RESOLVED, the Aldermen of the City of Southport reaffirm the resolution passed in 2014 in opposition to seismic surveying and are opposed to the exploration and development of oil/gas resources on the continental shelf or elsewhere off the coast of North Carolina; and

BE IT FURTHER RESOLVED the Aldermen of the City of Southport stand in solidarity with North Carolina coastal communities and communities who may be affected by the onshore infrastructure supporting offshore exploration and drilling and who may suffer long-term social, economic and environmental impacts from offshore exploration and production of petroleum resources on the continental shelf off the coast of North Carolina.

BE IT FURTHER RESOLVED the Aldermen of the City of Southport call upon all North Carolina municipal and county governing bodies of North Carolina to pass similar resolutions to this one and that the League of Municipalities joins in this effort.

BE IT FURTHER RESOLVED the Aldermen of the City of Southport urge the Governor McCrory and the entire North Carolina General Assembly to oppose offshore petroleum production policies that risk the health, safety and sound environmental stewardship of North Carolina's coastline whose natural beauty attracts a proven tourism-driven economy.

On Behalf of the City of Southport Board of Aldermen:

Southport Mayor, Robert D. Howard

Attest: ______________________

City Clerk

CITY OF SOUTHPORT CORPORATE SEAL 1792 NORTH CAROLINA

City of Southport

August 28, 2015

Jolie Harrison
Chief Permits and Conservation Division
Office of Protected Resources
National Marine Fisheries Service
1315 East – West Highway
Silver Spring, MD 20910

Dear Ms. Harrison,

The National Oceanic and Atmospheric Association (NOAA) and the National Marine Fisheries Service (NMFS) are commended for their continued efforts to inform and engage the public about the Spectrum Geo, Inc. application for a federal permit to conduct seismic surveying in the Atlantic Ocean.

The Aldermen of the City of Southport recognize that Southport's economic survival solely depends on the sustainability of the existing environment; and submit for your consideration the following comments about this important issue.

Southport is located in southeastern North Carolina where the Cape Fear River and Atlantic Ocean intersect and our residents and others along our coast will be the most affected by results of the proposed seismic surveying and its related activities.

The City of Southport is committed to being a sound steward of the unique coastal environment and has a long history and profound connection to the Atlantic Ocean. Southport residents remain overwhelmingly opposed to seismic surveying and oil/gas exploration and drilling as proposed by Bureau of Energy Management.

The surveying proposed by Spectrum Geo, Inc. in its recent IHA application to the North Carolina Department of Energy and Natural Resources (DENR) and BOEM, will extend 24/7 during an entire year. Numerous prominent marine scientists have indicated that seismic surveying of shorter durations may have an impact on marine animals, sea turtles and fish stocks. Many scientists are concurring that a survey conducted with seismic air guns over tens of thousands of acres during an entire year would harass these and other species and impact behaviors, migratory patterns, food supply, safety and communication.

The City of Southport is concerned that the noise created by seismic surveying will startle, impair and preclude sea turtles from returning to lay their nests in our surrounding communities. Sea turtle conservation is a major economic driver for our region and Southport citizens request assurance that seismic surveying and any anticipated oil/gas exploration and drilling will not negatively impact the turtle population. Leatherback, loggerhead and green turtles are evident offshore and in the Cape Fear River from spring until late fall.

The City of Southport's concerns seem confirmed by a statement from the 2006 Draft Environmental Impact Statement on the OCS Leasing Program: 2007-2012, which acknowledged that in the Gulf of Mexico planning areas, *"Noise generated by seismic surveys may have physical and/or behavioral effects on marine mammals, such as (1) hearing loss, discomfort, and injury; (2) masking of important sound signals; and (3) behavioral responses such as fright, avoidance and changes in physical or vocal behavior."* It is further stated within the draft that, *"...Sea turtles could be directly affected by seismic surveys, vessel traffic and construction of offshore and onshore facilities and removal of platforms. Sea turtles may also be exposed to a variety of waste materials, such as produced water, which have the potential to cause a variety of lethal and sub-lethal effects."*

Loggerheads are considered threatened in the United States and endangered globally. Leatherbacks are considered "vulnerable." Adult sea turtles enter the waters offshore of North Carolina in April, nesting takes place from May until September and hatching takes place at night from July until November. Only one hatchling in 1000 is expected to survive to come back and lay a nest. The TGS-NOPEC application does not acknowledge the endangered or threatened sea turtles in as far as proposed takes, exclusion zones or mitigation (except off of Brevard County in Florida). Additionally, the mitigation plans listed in the application do not seem to address them.

The Spectrum GEO IHA application does not recognize the proposed expansion of the designated critical habitat for endangered North Atlantic Right Whales in the northwestern Atlantic Ocean, including areas that will support calving and nursing. This critical habitat extends up to the Cape Fear River entrance and Bald Head Island. The application only acknowledges the area close to shore from Georgia to south of Jacksonville, Florida. The North Atlantic Right Whales have been observed much farther north and deep out to the continental shelf. Mariners are under special rules when transiting the western mid-Atlantic and south-Atlantic offshore waters from November until April. *"Large whales, such as right whales, rely on their ability to hear far more than their ability to see. Chronic noise is likely reducing their opportunities to gather and share vital information that helps them find food and mates, navigate, avoid predators and take care of their young." Leila Hatch, Ph.D., NOAA's Stellwagen Bank National Marine Sanctuary marine ecologist. "...noise from an individual ship could make it nearly impossible for a right whale to be heard by other whales," said Christopher Clark, Ph.D., director of Cornell's bioacoustics research program.* It is hard to conceive what impact adding 32 seismic air guns fired every 10 seconds, 24/7, for a year will have on this endangered species and the other 38 cetacean types in the proposed survey area.

A question remains among members of the recognized scientific community whether seismic surveying will harm marine animals and sea turtles. No peer-reviewed studies appear to exist that inform scientists about the chronic impact of seismic surveying on marine wildlife, including sea turtles. No studies exist to prove that the surveys will not adversely impact the species beyond the accidental take or harassment. Although proven facts cannot directly relate the seismic surveying of the ocean floor that occurred this spring off Bald Head Island, a beaked whale and a dolphin were stranded and died on Bald Head Island, on May 11, 2015, within days of a Geophysical Survey ship coming into the Port of Wilmington, NC, on May 8, 2015.

Beaked whales are difficult to locate in the ocean: *"Beaked whales are both visually and acoustically difficult to detect...Currently, none of the available detection methods has a high probability of detecting and identifying beaked whales...All beaked whale strandings associated with anthropogenic sound have been detected by chance, without dedicated search efforts."* (Barlow, J. and Gisiner R. (2006). Mitigating, monitoring and assessing the effects of anthropogenic sound on beaked whales. *J. CETACEAN RES. MANAGE.)*

Care must be given to all marine life. From July 2013 to date the Atlantic bottlenose dolphins have suffered die-offs from cetacean morbillivirus. Adding additional stress upon these marine populations with seismic blasting could result in higher than predicted takes.

The Southport community also has concerns for the fish stocks in the surrounding waters: "*In an example from a complex, open-ocean ecosystem, the removal of cod (Gadus morhua) and other ground fishes by sustained overfishing in the northwest Atlantic during the 1980s and 1990s resulted in increases in the abundance of the prey species for these ground fishes, particularly smaller fishes and invertebrates such as the northern snow crab (Chionoecetes opilio) and northern shrimp (Pandalus borealis). The increased abundance of these prey species altered the community of zooplankton that serve as food for smaller fishes and invertebrates as an indirect effect." (Frank, K. T.; Petrie, B.; Choi, J. S.; Leggett, W. C. (2005). "Trophic Cascades in a Formerly Cod-Dominated Ecosystem". Science **308**.*

Most importantly, the predicted Level A & B takes of all the species seem low given the unknown effects on the fish stocks upon which they feed. From page 60 of the Spectrum Geo IHA application *"Temporary disruption of spawning aggregations or schools of fishes important as prey for marine mammals may occur during a seismic survey."* There is no way to quantify the level of disruption seismic surveying may inflict upon this critical process of nature. Not only does Southport have recreational fisherman and great seafood restaurants enjoyed by the local and visiting populations, the NC Division of Marine Fisheries (NCDENR) reported 2014 commercial fish landings in North Carolina to be worth $93,843,254.

Southport is in the Atlantic migration flyway. Thousands of water birds and shore birds of several species traverse the coast within this flyway, with some choosing to stay for several consecutive months. To date, our neighbor the BHI Conservancy has documented over 243 species of birds in our region. Many of these bird species have been designated as protected by the government since their populations are diminished, and many of these bird species rely on coastal fish for sustenance during their migration. It is estimated that the BP Horizon spill killed over one million sea and shore birds, including 32% of the brown pelican population. There is no empirical data to confirm that seismic testing will not displace the fish stocks that the birds in the flyway and all the other marine animals that frequent the survey area rely on for survival.

Page 32 of the Spectrum GEO IHA application states: *"Given the predominant low-frequency sound sources, limited sound production levels (SPLs) and durations, and directionality of higher frequency sound sources associated with seismic sound sources, it is not likely that the proposed survey would generate sounds loud enough to cause direct mortality (Det Norske Veritas Energy, 2007)."* This quote was provided by DNVL, an organization whose main source of income is derived from the oil and gas industry. The members of the BHI community question this conclusion. The Spectrum GEO IHA application also states on page 36: *"If a sound source displaces marine mammals from an important feeding or breeding area for a prolonged period, impacts on both individuals and the population could be important."* This is a major concern for all the species in or migrating through the survey area.

Other concerns of note:

- Surface observers during the tests are able only to monitor a small percentage of the total impact. The subsurface impact remains undetected and undocumented. This concern is magnified because surveying will occur both during the daytime and nighttime hours.

- The seismic application proposes mitigation by underwater monitoring for whale songs to determine their presence. Sea turtles do not emit sound underwater, so their presence would be completely undetectable by the seismic application mitigation proposal, but for their occasional and intermittent need to surface. The 10,000+ incredibly small and vulnerable hatchling turtles leaving the Bald Head beaches (included in the 145,000 + hatchlings leaving North Carolina beaches) are at high risk by nature, and they would be completely undetectable by the seismic application mitigation proposal.

- Although mitigation steps such as exclusion zones, ramped-up sound levels, PSOs and PAMs are being promoted, how can your organization actually monitor the activities to ensure compliance with federal rules? How will your organization enforce appropriate penalties if/when the rules are violated?

- Spectrum GEO's plan proposes arriving at the center of the seismic testing survey area by simultaneously starting one boat at the south end of the survey area and one at the north end. This proposed process does not consider and/or allow for the essential North Atlantic Right Whale critical habitat period or the threatened sea turtle migration season.

The Southport community respectfully requests that the National Marine Fisheries Service not allow any seismic activity to take place in the Mid-Atlantic Planning Area at any time of year. The North Atlantic Right Whale protection period is from November 15th until April 15th from Florida to North Carolina and should be from near shore to the continental shelf. The threatened

Sea Turtles are migrating from offshore to the coast (and back) from Florida to the North Carolina/Virginia border from April until November 1st. There is no safe time or place for seismic testing here that will not impact marine life that this community cares deeply about or partially depends on for its sustainability.

In conclusion, we call into question the Spectrum GEO IHA application and their use of seismic airguns at the proposed intensity levels, frequency of discharge, duration and scale, the likes of which have never been done in the mid-Atlantic.

It is of vital importance that all stakeholders recognize the globally unmatched bio diversity that exists off the coast of North Carolina. That all stakeholders understand that this diverse marine life, much of which is little understood by the scientific community, has not been studied to determine the short and long term effects of the large scale seismic surveying as proposed in this permit application and the concurrent overlapping areas under consideration in all 4 permit applications. We respectfully ask that NOAA and NMFS not allow the absence of complete data to serve as de facto evidence that seismic surveying on this scale and intensity is not harmful to marine life in the Atlantic.

Please find enclosed a copy of the resolution passed by the City of Southport Aldermen as demonstration of our community's opposition of seismic surveying and oil and gas offshore exploration and drilling on the continental shelf off the coast of North Carolina.

Thank you, once again for the opportunity to comment on the Spectrum GEO IHA application to conduct seismic surveying off the coast of North Carolina. The members of the Southport community look forward to working with NOAA and NMFS as this process unfolds.

Sincerely,

Mary Ellen Poole
City of Southport Mayor Pro Tem Mary Ellen Poole

Michele Windham
City Clerk

CITY OF SOUTHPORT CORPORATE SEAL 1792 NORTH CAROLINA

Enclosure

RESOLUTION IN CONTINUED OPPOSITION OF SEISMIC SURVEYING AND STATED OPPOSITION TO OIL AND GAS OFFSHORE EXPLORATION AND DRILLING ON THE CONTINENTAL SHELF OFF THE COAST OF NORTH CAROLINA

WHEREAS, the City of Southport is committed to being a sound steward of the unique coastal environment, including the rare maritime forest, estuaries, marshes, and pristine beaches on and around our regional coastal communities; and

WHEREAS, the Aldermen of the City of Southport recognize that Southport's economic survival solely depends on the sustainability of the existing environment; and

WHEREAS, on March 5, 2015, a letter was sent to President Obama signed by 75 leading marine scientists expressing their concern over the significant threat to marine life posed by the introduction of seismic oil and gas exploration along the U.S. Mid-Atlantic and South Atlantic coasts. The letter further states, "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." The scientists' letter serves as additional confirmation of the City of Southport's previous resolution in opposition of the use of seismic airguns.

WHEREAS, exploratory and commercial drilling, extraction, and transportation of offshore oil and gas resources pose a significant risk of spill; and

WHEREAS, offshore drilling requires substantial onshore infrastructure, such as pipelines and/or refineries, which will further risk the health and safety of the environment, character and natural beauty of North Carolina's coast; and

WHEREAS, it is known that the 20 counties that comprise North Carolina's coastal region generate more commercial and personal income, public revenues, and employment opportunities than the petroleum and natural gas industry is estimated to generate for the State, specifically,

1. In 2014, a record $21.3 billion in domestic visitor/tourism spending was realized in North Carolina; and
2. In 2014, North Carolina was the sixth most visited state in the nation. Out of the 100 counties in the State of North Carolina, in terms of travel expenditures, three of the top 10 counties were coastal counties; and
3. In 2014, direct tourism employment in North Carolina is approximately 204,800 persons, with direct tourism payroll of $4.9 billion; and
4. Visitors to North Carolina generated more than $3.2 billion in federal, state and local taxes in 2014; and
5. The NC Division of Marine Fisheries (NCDENR) reported 2014 commercial fish landings in North Carolina to be worth $93,843,254; and
6. Because of North Carolina's tourism industry, each North Carolina household in 2014 saved $455 in state and local taxes as a direct result of visitor spending in the state; and

WHEREAS, visitors from all over the world come to enjoy the natural beauty of our clean beaches, salt and freshwater marshes, inlets, estuaries and tributaries; and

WHEREAS, the City of Southport and her surrounding coastal communities are rich in natural areas that provide sanctuary, nesting and breeding grounds for diverse groups of migratory birds, turtles, dolphin, whales, fish and other wildlife, some of which are on the endangered species list; and

WHEREAS, North Carolina's coastal waters and natural habitats provide the world with some of the best wild-caught seafood, renowned for its freshness and exceptional quality; and

WHEREAS, the inherent risks to North Carolina's 320 miles of valued coastline from seismic surveying, offshore oil and natural gas exploration and drilling have the potential to irrevocably harm our natural environment, our economic well-being and our overall quality of life; and

NOW, THEREFORE, BE IT RESOLVED, the Aldermen of the City of Southport reaffirm the resolution passed in 2014 in opposition to seismic surveying and are opposed to the exploration and development of oil/gas resources on the continental shelf or elsewhere off the coast of North Carolina; and

BE IT FURTHER RESOLVED the Aldermen of the City of Southport stand in solidarity with North Carolina coastal communities and communities who may be affected by the onshore infrastructure supporting offshore exploration and drilling and who may suffer long-term social, economic and environmental impacts from offshore exploration and production of petroleum resources on the continental shelf off the coast of North Carolina.

BE IT FURTHER RESOLVED the Aldermen of the City of Southport call upon all North Carolina municipal and county governing bodies of North Carolina to pass similar resolutions to this one and that the League of Municipalities joins in this effort.

BE IT FURTHER RESOLVED the Aldermen of the City of Southport urge the Governor McCrory and the entire North Carolina General Assembly to oppose offshore petroleum production policies that risk the health, safety and sound environmental stewardship of North Carolina's coastline whose natural beauty attracts a proven tourism-driven economy.

On Behalf of the City of Southport Board of Aldermen:

Robert D. Howard

Southport Mayor, Robert D. Howard

Attest: Michele Windham

City Clerk

CITY OF SOUTHPORT CORPORATE SEAL 1792 NORTH CAROLINA

City of Southport

August 28, 2015

Jolie Harrison
Chief Permits and Conservation Division
Office of Protected Resources
National Marine Fisheries Service
1315 East – West Highway
Silver Spring, MD 20910

Dear Ms. Harrison,

The National Oceanic and Atmospheric Association (NOAA) and the National Marine Fisheries Service (NMFS) are commended for their continued efforts to inform and engage the public about the TDI-Brooks IHA application for a federal permit to a regional multibeam (bathymetry, backscatter, water column) and sub-bottom profiler acquisition program over an area of approximately 90,434 square miles stretching from the east coast of Florida to North Carolina.

The Aldermen of the City of Southport recognize that Southport's economic survival solely depends on the sustainability of the existing environment; and submit for your consideration the following comments about this important issue.

The City of Southport is committed to being a sound steward of the unique coastal environment and has a long history and profound connection to the Atlantic Ocean. Southport is located in southeastern North Carolina where the Cape Fear River and Atlantic Ocean intersect and our residents and others along our coast will be the most affected by results of the proposed multibeam echo sounder activity off the coast of North Carolina.

The surveying proposed by TDI-Brooks in its recent IHA application to the North Carolina Department of Energy and Natural Resources (DENR) and BOEM, will extend 24/7 for 30-day periods but does not specify the duration of the survey permit being requested. The applications does state "*that approximately 40-45,000 square kilometers of seafloor will be surveyed in each 30 day leg.*" Numerous prominent marine scientists have indicated that seismic surveying of shorter durations may have an impact on marine animals, sea turtles, and fish stocks. Many scientists are concurring that a survey conducted with a multibeam echo sounder (MBES), sub-bottom profiler that emits a beam where sound intensity reaches at least 180dB, over tens of thousands of acres could harass these and other species and impact behaviors, migratory patterns, food supply, safety and communication.

The City of Southport is concerned that the noise created by seismic surveying will startle, impair and preclude sea turtles from returning to lay their nests in our surrounding communities. Sea turtle conservation is a major economic driver for our region and Southport citizens' request

1029 N. HOWE STREET • SOUTHPORT, NORTH CAROLINA 28461
www.cityofsouthport.com • PHONE: (910) 457-7900 • FAX: (910) 457-7905

assurance that multibeam echo sounder and seismic activity and any anticipated oil/gas exploration and drilling will not negatively impact the turtle population. Leatherback, loggerhead and green turtles are evident offshore and in the Cape Fear River from spring until late fall.

Southport's concerns seem confirmed by a statement from the 2006 Draft Environmental Impact Statement on the OCS Leasing Program: 2007-2012, which acknowledged that in the Gulf of Mexico planning areas, *"Noise generated by seismic surveys may have physical and/or behavioral effects on marine mammals, such as (1) hearing loss, discomfort, and injury; (2) masking of important sound signals; and (3) behavioral responses such as fright, avoidance and changes in physical or vocal behavior."* It is further stated within the draft that *"...Sea turtles could be directly affected by seismic surveys, vessel traffic and construction of offshore and onshore facilities and removal of platforms. Sea turtles may also be exposed to a variety of waste materials, such as produced water, which have the potential to cause a variety of lethal and sub-lethal effects."*

Leatherback (not mentioned in application), hawksbill, Kemp's Ridley, loggerhead and green turtles are evident offshore in the proposed survey area year round. The females come ashore and nest in North Carolina from May until September and the hatchlings emerge from their nests and swim out to the Sargasso Sea from July until November. Hatchlings and juveniles, swimming underwater or floating (year round) within algal mats, would be undetectable to (mitigation) spotters and sound monitoring devices day or night. Loggerheads are considered threatened in the United States and endangered globally. Only one in 1000 hatchlings are expected to survive to come back and lay a nest. The TDI-Brooks application does not acknowledge any sea turtle takes, exclusion zones or mitigation.

The application does mention the North Atlantic Right Whales, but does not include the observations much farther out to the continental shelf. Mariners are under special rules when transiting the western mid-Atlantic and south-Atlantic offshore waters from November until April. *"Large whales, such as right whales, rely on their ability to hear far more than their ability to see. Chronic noise is likely reducing their opportunities to gather and share vital information that helps them find food and mates, navigate, avoid predators and take care of their young." Leila Hatch, Ph.D., NOAA's Stellwagen Bank National Marine Sanctuary marine ecologist. "...noise from an individual ship could make it nearly impossible for a right whale to be heard by other whales," said Christopher Clark, Ph.D., director of Cornell's bioacoustics research program.* It is hard to conceive what impact adding a MBES, sub-bottom profiler that emits two beams whose sound intensity reaches at least 180dB up to 245 dB each will have.

In the TDI-Brooks IAH application on page 24 states "*Au and Hastings (2008) found that sound from echosounders used during regular hydrographic survey operations could lead to behavioral changes in marine mammals that might affect migration, feeding, breeding, and the ability to avoid predators.*" Over 100 scientists have asked the Obama administration for survey applications not be approved until NOAA's Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammals has been reviewed and adopted.

This application is specifically for summer and fall of 2016, on page 22 the application says *"Cuvier's beaked whales have been regularly sighted during summer and fall line transect surveys in the mid-Atlantic shelf break area (Martinez and Garrison 2005, 2006; Wicker et. al 2011; Wicker and Mullin 2012; Palka 2012). DoN (2008a,b) reported eight sightings offshore from Georgia and North Carolina in the fall, most of which occurred near the shelf break. Several summer and fall strandings have also been reported along the coast from south Florida to North Carolina (DoN 2007a, 2008a,b).* According to Barlow and Gisiner, 2006, *"Beaked whales are both visually and acoustically difficult to detect"* and *"Currently, none of the available detection methods (visual search and passive acoustic monitoring) has a high probability of detecting and identifying beaked whales" "beaked whales stay silent for long periods of time."* To make matters worse, *"some mitigation methods may actually harm beaked whales since they approach the air guns they are ramping up.* (Barlow and Gisiner, 2006)"

No peer-reviewed studies appear to exist that inform scientists about the chronic impact of seismic surveying or MBES on marine wildlife, including sea turtles. No studies exist to prove that the surveys will not adversely impact the species beyond the accidental take or harassment. On page 24 the application admits it use of sound levels beyond permanent threshold shift (permanent hearing loss) (PTS), "*The MBES system utilized for this study will produce sound at a level that only just barely exceeds the proposed NMFS guidelines PTS threshold for high-frequency cetaceans using the peak sound metric.*" In their proposal they suggest they may upgrade from the EM 3002 to the EM 122 to achieve a Depth range from 20 to 11000 m and a Swath width up to 6 times water depth/30 km.

Although proven facts cannot directly relate the seismic surveying of the ocean floor that occurred this spring off our coast, a beaked whale and a dolphin were stranded and died on Bald Head Island on May 11, 2015, within days of a Geophysical Survey ship coming into the Port of Wilmington, NC, on May 8, 2015.

Care must be given to all marine life. From July 2013 to date, the Atlantic bottlenose dolphins have suffered die-offs from cetacean morbillivirus. Adding additional stress upon these marine populations with MBES and/or seismic blasting could result in higher than predicted takes.

The Southport community also has concerns for the fish stocks in the surrounding waters: "*Bony fish may be particularly vulnerable to intense sound because most of them possess an air-filled swim bladder. Although marine fish typically have less acute hearing than marine mammals, many are more sensitive than odontocetes in the range 100-500 Hz where most seismic sound is produced. Effects of air gun pulses on fish range from serious injury at short ranges, to avoidance behavior, possibly at the range of many kilometers (*Turnpenny & Nedwell, 1994*). Reduced catch rates have been reported for several species of fish in areas of seismic surveying activity* (see review in McCauley, 1994).

Most importantly, the predicted Level A & B takes of all the species seem low given the unknown effects on the fish stocks upon which they feed. *"Concerns about the potential effects of human-generated noise on marine species have been growing as scientific evidence indicates that certain classes of noise produced during naval exercises, geophysical exploration, and underwater construction may cause temporary or permanent auditory damage to some marine vertebrates, including marine mammals, turtles, and fishes (NRC, 1994, 2000; Popper, 2003, Popper et al., 2004a). Of equal concern is the potential for concomitant changes in normal behavior that may reduce foraging efficiency, reproductive success, or individual longevity, any of which could result in reduced populations. Negative impacts for any population will in turn negatively affect their predator or initiate a cascade of changes that alter an entire ecosystem if top predators are reduced or eliminated." (TECHNICAL REPORT 1939,* April 2006; *Evaluation of Evidence for Altered Behavior and Auditory Deficits in Fishes Due to Human-Generated Noise Sources,* P. L. Edds-Walton and J. J. Finneran) There is no way to quantify the level of disruption MBES surveying may inflict upon this critical process of nature.

Southport and the surrounding region is also in the Atlantic migration flyway. Thousands of water birds and shore birds of several species traverse the coast within this flyway, with some choosing to stay for several consecutive months. To date, our neighbor the BHI Conservancy has documented over 243 species of birds in the region. Many of these bird species have been designated as protected by the government since their populations are diminished, and many of these bird species rely on coastal fish for sustenance during their migration. It is estimated that the BP Horizon spill killed over one million sea and shore birds, including 32% of the brown pelican population. There is no empirical data to confirm that MBES surveying will not displace the fish stocks that the birds in the flyway and all the other marine animals that frequent the survey area rely on for survival.

Other concerns of note:

- Surface observers during the tests are able only to monitor a small percentage of the total impact. The subsurface impact remains undetected and undocumented. This concern is magnified because surveying will occur both during the daytime and nighttime hours.

- The application proposes mitigation by underwater monitoring for whale songs to determine their presence. Sea turtles do not emit sound underwater, so their presence would be completely undetectable by the seismic application mitigation proposal, but for their occasional and intermittent need to surface. The 10,000+ incredibly small and vulnerable hatchling turtles leaving the Bald Head beaches (included in the 145,000 + hatchlings leaving North Carolina beaches) are at high risk by nature, and they would be completely undetectable by the seismic application mitigation proposal.

- Although mitigation steps such as exclusion zones, ramped-up sound levels, PSOs and PAMs are being promoted, how can your organization actually monitor the activities to ensure compliance with federal rules? How will your organization enforce appropriate penalties if/when the rules are violated?

The Southport community respectfully requests that the National Marine Fisheries Service not allow the any seismic or multibeam echo sounder activity to take place in the Mid-Atlantic Planning Area at any time of year. The North Atlantic Right Whale protection period is from November 15th until April 15th from Florida to North Carolina and should be from near shore to the continental shelf. The threatened sea turtles are migrating from offshore to the coast from Florida to the North Carolina/Virginia border from April until November 1st. They are floating around well offshore year round. There is no safe time or place for seismic or multibeam echo sounder activity here that will not impact marine life that this community cares deeply about or partially depends on for its sustainability.

In conclusion, we call into question the TDI-Brooks IHA application and their use of multibeam echo sounder equipment at the proposed intensity levels, frequency of discharge, duration and scale, the likes of which have never been done in the mid-Atlantic.

It is of vital importance that all stakeholders recognize the globally unmatched bio diversity that exists off the coast of North Carolina. That all stakeholders understand that this diverse marine life, much of which is little understood by the scientific community, has not been studied to determine the short and long term effects of the large scale multibeam echo sounder activity as proposed in this permit application and the concurrent overlapping areas under consideration in all 4 permit applications. We respectfully ask that NOAA and NMFS not allow the absence of complete data to serve as de facto evidence that seismic surveying on this scale and intensity is not harmful to marine life in the Atlantic.

Please find enclosed a copy of the resolution passed by the City of Southport Board of Aldermen as demonstration of our community's opposition of oil and gas offshore exploration and drilling on the continental shelf off the coast of North Carolina.

Thank you, once again for the opportunity to comment on the TDI-Brooks IHA application to conduct multibeam echo sounder surveying off the coast of North Carolina. The members of the Southport community look forward to working with NOAA and NMFS as this process unfolds.

Sincerely,

Mary Ellen Poole
City of Southport Mayor Pro Tem
Mary Ellen Poole

Michele Windham
City Clerk

CITY OF SOUTHPORT
CORPORATE
SEAL
1792
NORTH CAROLINA

Enclosure

RESOLUTION IN CONTINUED OPPOSITION OF SEISMIC SURVEYING AND STATED OPPOSITION TO OIL AND GAS OFFSHORE EXPLORATION AND DRILLING ON THE CONTINENTAL SHELF OFF THE COAST OF NORTH CAROLINA

WHEREAS, the City of Southport is committed to being a sound steward of the unique coastal environment, including the rare maritime forest, estuaries, marshes, and pristine beaches on and around our regional coastal communities; and

WHEREAS, the Aldermen of the City of Southport recognize that Southport's economic survival solely depends on the sustainability of the existing environment; and

WHEREAS, on March 5, 2015, a letter was sent to President Obama signed by 75 leading marine scientists expressing their concern over the significant threat to marine life posed by the introduction of seismic oil and gas exploration along the U.S. Mid-Atlantic and South Atlantic coasts. The letter further states, "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." The scientists' letter serves as additional confirmation of the City of Southport's previous resolution in opposition of the use of seismic airguns.

WHEREAS, exploratory and commercial drilling, extraction, and transportation of offshore oil and gas resources pose a significant risk of spill; and

WHEREAS, offshore drilling requires substantial onshore infrastructure, such as pipelines and/or refineries, which will further risk the health and safety of the environment, character and natural beauty of North Carolina's coast; and

WHEREAS, it is known that the 20 counties that comprise North Carolina's coastal region generate more commercial and personal income, public revenues, and employment opportunities than the petroleum and natural gas industry is estimated to generate for the State, specifically,

1. In 2014, a record $21.3 billion in domestic visitor/tourism spending was realized in North Carolina; and
2. In 2014, North Carolina was the sixth most visited state in the nation. Out of the 100 counties in the State of North Carolina, in terms of travel expenditures, three of the top 10 counties were coastal counties; and
3. In 2014, direct tourism employment in North Carolina is approximately 204,800 persons, with direct tourism payroll of $4.9 billion; and
4. Visitors to North Carolina generated more than $3.2 billion in federal, state and local taxes in 2014; and
5. The NC Division of Marine Fisheries (NCDENR) reported 2014 commercial fish landings in North Carolina to be worth $93,843,254; and
6. Because of North Carolina's tourism industry, each North Carolina household in 2014 saved $455 in state and local taxes as a direct result of visitor spending in the state; and

WHEREAS, visitors from all over the world come to enjoy the natural beauty of our clean beaches, salt and freshwater marshes, inlets, estuaries and tributaries; and

WHEREAS, the City of Southport and her surrounding coastal communities are rich in natural areas that provide sanctuary, nesting and breeding grounds for diverse groups of migratory birds, turtles, dolphin, whales, fish and other wildlife, some of which are on the endangered species list; and

WHEREAS, North Carolina's coastal waters and natural habitats provide the world with some of the best wild-caught seafood, renowned for its freshness and exceptional quality; and

WHEREAS, the inherent risks to North Carolina's 320 miles of valued coastline from seismic surveying, offshore oil and natural gas exploration and drilling have the potential to irrevocably harm our natural environment, our economic well-being and our overall quality of life; and

NOW, THEREFORE, BE IT RESOLVED, the Aldermen of the City of Southport reaffirm the resolution passed in 2014 in opposition to seismic surveying and are opposed to the exploration and development of oil/gas resources on the continental shelf or elsewhere off the coast of North Carolina; and

BE IT FURTHER RESOLVED the Aldermen of the City of Southport stand in solidarity with North Carolina coastal communities and communities who may be affected by the onshore infrastructure supporting offshore exploration and drilling and who may suffer long-term social, economic and environmental impacts from offshore exploration and production of petroleum resources on the continental shelf off the coast of North Carolina.

BE IT FURTHER RESOLVED the Aldermen of the City of Southport call upon all North Carolina municipal and county governing bodies of North Carolina to pass similar resolutions to this one and that the League of Municipalities joins in this effort.

BE IT FURTHER RESOLVED the Aldermen of the City of Southport urge the Governor McCrory and the entire North Carolina General Assembly to oppose offshore petroleum production policies that risk the health, safety and sound environmental stewardship of North Carolina's coastline whose natural beauty attracts a proven tourism-driven economy.

On Behalf of the City of Southport Board of Aldermen:

Southport Mayor, Robert D. Howard

Attest: Michele Windham
City Clerk

CITY OF SOUTHPORT
CORPORATE SEAL
1792
NORTH CAROLINA

City of Southport

August 28, 2015

Jolie Harrison
Chief Permits and Conservation Division
Office of Protected Resources
National Marine Fisheries Service
1315 East – West Highway
Silver Spring, MD 20910

Dear Ms. Harrison,

The National Oceanic and Atmospheric Association (NOAA) and the National Marine Fisheries Service (NMFS) are commended for their continued efforts to inform and engage the public about the TGS-NOPEC IHA application for a federal permit to conduct seismic surveying in the Atlantic Ocean.

The Aldermen of the City of Southport recognize that Southport's economic survival solely depends on the sustainability of the existing environment; and submit for your consideration the following comments about this important issue.

Southport is located in southeastern North Carolina where the Cape Fear River and Atlantic Ocean intersect and our residents and others along our coast will be the most affected by results of the proposed seismic surveying and its related activities.

The City of Southport is committed to being a sound steward of the unique coastal environment and has a long history and profound connection to the Atlantic Ocean. Southport residents remain overwhelmingly opposed to seismic surveying and oil/gas exploration and drilling as proposed by Bureau of Energy Management.

The surveying proposed by TGS-NOPEC in its recent IHA application to the North Carolina Department of Energy and Natural Resources (DENR) and BOEM, will extend 24/7 during an entire year. Numerous prominent marine scientists have indicated that seismic surveying of shorter durations may have an impact on marine animals, sea turtles and fish stocks. Many scientists are concurring that a survey conducted with seismic air guns over tens of thousands of acres during an entire year would harass these and other species and impact behaviors, migratory patterns, food supply, safety and communication. Of the 39 species listed in the application, six are endangered. The application indicates no ESA-listed as threatened and the application makes no mention of the sea turtles that feed, mate, nest and hatch off the coastline from Florida to Virginia.

The City of Southport is concerned that the noise created by seismic surveying will startle, impair and preclude sea turtles from returning to lay their nests in our surrounding communities. Sea turtle conservation is a major economic driver for our region and Southport citizens request assurance that seismic surveying and any anticipated oil/gas exploration and drilling will not negatively impact the turtle population. Leatherback, loggerhead and green turtles are evident offshore and in the Cape Fear River from spring until late fall.

The Southport's concerns seem confirmed by a statement from the 2006 Draft Environmental Impact Statement on the OCS Leasing Program: 2007-2012, which acknowledged that in the Gulf of Mexico planning areas, *"Noise generated by seismic surveys may have physical and/or behavioral effects on marine mammals, such as (1) hearing loss, discomfort, and injury; (2) masking of important sound signals; and (3) behavioral responses such as fright, avoidance and changes in physical or vocal behavior."* It is further stated within the draft that, *"...Sea turtles could be directly affected by seismic surveys, vessel traffic and construction of offshore and onshore facilities and removal of platforms. Sea turtles may also be exposed to a variety of waste materials, such as produced water, which have the potential to cause a variety of lethal and sub-lethal effects."*

Loggerheads are considered threatened in the United States and endangered globally. Leatherbacks are considered "vulnerable." Adult sea turtles enter the waters offshore of North Carolina in April, nesting takes place from May until September and hatching takes place at night from July until November. Only one hatchling in 1000 is expected to survive to come back and lay a nest. The TGS-NOPEC application does not acknowledge the endangered or threatened sea turtles in as far as proposed takes, exclusion zones or mitigation (except off of Brevard County in Florida). Additionally, the mitigation plans listed in the application do not seem to address them.

The TGS-NOPEC application was prepared by Smultea Sciences, a California-based consulting firm. The Atlantic Seaboard migration patterns of the endangered and threatened marine mammals are reflected in the application but not the endangered and threatened sea turtles and fish stocks. There is concern from the residents of Southport as to the prevalence of current data on the migration patterns and the effects of seismic testing referenced in the application. We encourage NMFS to suspend the application until more recent migration data sets and the NOAA's Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammals can be compared to TGS-NOPEC assumptions.

The North Atlantic Right Whales have been observed much farther north and out to the continental shelf. Mariners are under special rules when transiting the western mid-Atlantic and south-Atlantic offshore waters from November until April. *"Large whales, such as right whales, rely on their ability to hear far more than their ability to see. Chronic noise is likely reducing their opportunities to gather and share vital information that helps them find food and mates, navigate, avoid predators and take care of their young." Leila Hatch, Ph.D., NOAA's Stellwagen Bank National Marine Sanctuary marine ecologist. "...noise from an individual ship could make it nearly impossible for a right whale to be heard by other whales," said Christopher Clark, Ph.D., director of Cornell's bioacoustics research program.* It is hard to conceive what impact adding 40 seismic air guns going off every 10 seconds and two echo sounders emitting up to 200 dB at 750 pings per minute, 24/7, for a year will have on this endangered species.

A question remains among members of the recognized scientific community whether seismic surveying will harm marine animals and sea turtles. No peer-reviewed studies appear to exist that inform scientists about the chronic impact of seismic surveying on marine wildlife. No studies exist to prove that the surveys will not adversely impact the species beyond the accidental take or harassment. Although proven facts cannot directly relate the seismic surveying of the ocean floor that occurred this spring off Bald Head Island, a beaked whale and a dolphin were stranded and died on Bald Head Island on May 11, 2015, within days of a Geophysical Survey ship coming into the Port of Wilmington, NC, on May 8, 2015.

Beaked whales are difficult to locate in the ocean: *"Beaked whales are both visually and acoustically difficult to detect...Currently, none of the available detection methods has a high probability of detecting and identifying beaked whales...All beaked whale strandings associated with anthropogenic sound have been detected by chance, without dedicated search efforts."* (Barlow, J. and Gisiner R. (2006). Mitigating, monitoring and assessing the effects of anthropogenic sound on beaked whales. *J. CETACEAN RES. MANAGE.)*

Care must be given to all marine life. From July 2013 to date, the Atlantic bottlenose dolphins have suffered die-offs from cetacean morbillivirus. Adding additional stress upon these marine populations with seismic blasting could result in higher than predicted takes.

The Southport community also has concerns for the fish stocks in the surrounding waters: *"In an example from a complex, open-ocean ecosystem, the removal of cod (Gadus morhua) and other ground fishes by sustained overfishing in the northwest Atlantic during the 1980s and 1990s resulted in increases in the abundance of the prey species for these ground fishes, particularly smaller fishes and invertebrates such as the northern snow crab (Chionoecetes opilio) and northern shrimp (Pandalus borealis). The increased abundance of these prey species altered the community of zooplankton that serve as food for smaller fishes and invertebrates as an indirect effect." (Frank, K. T.; Petrie, B.; Choi, J. S.; Leggett, W. C. (2005). "Trophic Cascades in a Formerly Cod-Dominated Ecosystem". Science 308.)*

Most importantly, the predicted Level A & B takes of all the species seem low given the unknown effects on the fish stocks upon which they feed. *"Concerns about the potential effects of human-generated noise on marine species have been growing as scientific evidence indicates that certain classes of noise produced during naval exercises, geophysical exploration, and underwater construction may cause temporary or permanent auditory damage to some marine vertebrates, including marine mammals, turtles, and fishes (NRC, 1994, 2000; Popper, 2003, Popper et al., 2004a). Of equal concern is the potential for concomitant changes in normal behavior that may reduce foraging efficiency, reproductive success, or individual longevity, any of which could result in reduced populations. Negative impacts for any population will in turn negatively affect their predator or initiate a cascade of changes that alter an entire ecosystem if top predators are reduced or eliminated." (TECHNICAL REPORT 1939,* April 2006; *Evaluation of Evidence for Altered Behavior and Auditory Deficits in Fishes Due to Human-Generated*

Noise Sources, P. L. Edds-Walton and J. J. Finneran) There is no way to quantify the level of disruption seismic surveying may inflict upon this critical process of nature.

Southport and our surrounding communities are in the Atlantic migration flyway. Thousands of water birds and shore birds of several species traverse the coast within this flyway, with some choosing to stay for several consecutive months. To date, our neighbor, the Bald Head Island Conservancy has documented over 243 species of birds in our area. Many of these bird species have been designated as protected by the government since their populations are diminished, and many of these bird species rely on coastal fish for sustenance during their migration. It is estimated that the BP Horizon spill killed over one million sea and shore birds, including 32% of the brown pelican population. There is no empirical data to confirm that seismic testing will not displace the fish stocks that the birds in the flyway and all the other marine animals that frequent the survey area rely on for survival.

The TGS-NOPEC IHA application utilizes aerial and surface observations for populations in the survey area as well as the seismic survey impacts to determine take and harassment data. Many of the species spend an abundant amount of time deep in the ocean and would not be detected by ships or air surveys. This data combined with mitigation that relies on line of sight observation during daylight hours only and underwater monitoring leads to the conclusion that TGS-NOPEC Level A and B takes and harassment could be lower than the actual effects on stocks and individuals of the 39 species outlined. What consideration is given to the mammals in the firing area during darkness and how will the underwater monitoring devices pick up the sounds of the 40 dB cetaceans while the 40 arrays are firing at or above 160 dB and masking their sounds?

The TGS-NOPEC application also states: *"If a sound source displaces marine mammals from an important feeding or breeding area for a prolonged period, impacts on both individuals and the population could be important." (page 88)* This is a major concern for all the species in or migrating through the survey area. Also noted in the application: *"if a sound source repetitively interrupts important behaviors, or displaces marine mammals from important feeding or breeding habitats for a prolonged period (i.e., weeks to months), then the impacts on individuals and populations have greater potential to be biologically significant (e.g., Lusseau and Bejder 2007; Weilgart 2007)."*

Other concerns of note:

- Surface observers during the tests are able only to monitor a small percentage of the total impact. The subsurface impact remains undetected and undocumented. This concern is magnified because surveying will occur both during the daytime and nighttime hours.

- The seismic application proposes mitigation by underwater monitoring for whale songs to determine their presence. Sea turtles do not emit sound underwater, so their presence would be completely undetectable by the seismic application mitigation proposal, but for their occasional and intermittent need to surface. The 10,000+ incredibly small and vulnerable hatchling turtles leaving the Bald Head beaches (included in the 145,000 + hatchlings leaving North Carolina beaches) are at high risk by nature, and they would be completely undetectable by the seismic application mitigation proposal.

- Although mitigation steps such as exclusion zones, ramped-up sound levels, PSOs and PAMs are being promoted, how can your organization actually monitor the activities to ensure compliance with federal rules? How will your organization enforce appropriate penalties if/when the rules are violated?

- Although TGS-NOPEC mentions the exclusion area the application does not give details on their surveying avoidance process of the essential North Atlantic Right Whale critical habitat period and no mention is made for the threatened sea turtle migration season.

The Southport community respectfully requests that the National Marine Fisheries Service not allow the any seismic activity to take place in the Mid-Atlantic Planning Area at any time of year. The North Atlantic Right Whale protection period is from November 15th until April 15th from Florida to North Carolina and should be from near shore to the continental shelf. The threatened Sea Turtles are migrating from offshore to the coast from Florida to the North Carolina/Virginia border from April until November 1st. There is no safe time or place for seismic testing here that will not impact marine life that this community cares deeply about and depends on for the sustainability of its tourism based economy.

In conclusion, we call into question the TGS-NOPEC IHA application and their use of seismic airguns at the proposed intensity levels, frequency of discharge, duration and scale, the likes of which have never been done in the mid-Atlantic.

It is of vital importance that all stakeholders recognize the globally unmatched bio diversity that exists off the coast of North Carolina. That all stakeholders understand that this diverse marine life, much of which is little understood by the scientific community, has not been studied to determine the short and long term effects of the large scale seismic surveying as proposed in this permit application and the concurrent overlapping areas under consideration in all 4 permit applications. We respectfully ask that NOAA and NMFS not allow the absence of complete data to serve as de facto evidence that seismic surveying on this scale and intensity is not harmful to marine life in the Atlantic.

Please find enclosed a copy of the resolution passed by the City of Southport Aldermen as demonstration of our community's opposition of seismic surveying and oil and gas offshore exploration and drilling on the continental shelf off the coast of North Carolina.

Thank you, once again for the opportunity to comment on the TGS-NOPEC IHA application to conduct seismic surveying off the coast of North Carolina. The members of the Southport community look forward to working with NOAA and NMFS as this process unfolds.

Sincerely,

Mary Ellen Poole
City of Southport Mayor Pro Tem Mary Ellen Poole

Michele Windham
City Clerk

Enclosure

RESOLUTION IN CONTINUED OPPOSITION OF SEISMIC SURVEYING AND STATED OPPOSITION TO OIL AND GAS OFFSHORE EXPLORATION AND DRILLING ON THE CONTINENTAL SHELF OFF THE COAST OF NORTH CAROLINA

WHEREAS, the City of Southport is committed to being a sound steward of the unique coastal environment, including the rare maritime forest, estuaries, marshes, and pristine beaches on and around our regional coastal communities; and

WHEREAS, the Aldermen of the City of Southport recognize that Southport's economic survival solely depends on the sustainability of the existing environment; and

WHEREAS, on March 5, 2015, a letter was sent to President Obama signed by 75 leading marine scientists expressing their concern over the significant threat to marine life posed by the introduction of seismic oil and gas exploration along the U.S. Mid-Atlantic and South Atlantic coasts. The letter further states, "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." The scientists' letter serves as additional confirmation of the City of Southport's previous resolution in opposition of the use of seismic airguns.

WHEREAS, exploratory and commercial drilling, extraction, and transportation of offshore oil and gas resources pose a significant risk of spill; and

WHEREAS, offshore drilling requires substantial onshore infrastructure, such as pipelines and/or refineries, which will further risk the health and safety of the environment, character and natural beauty of North Carolina's coast; and

WHEREAS, it is known that the 20 counties that comprise North Carolina's coastal region generate more commercial and personal income, public revenues, and employment opportunities than the petroleum and natural gas industry is estimated to generate for the State, specifically,

1. In 2014, a record $21.3 billion in domestic visitor/tourism spending was realized in North Carolina; and
2. In 2014, North Carolina was the sixth most visited state in the nation. Out of the 100 counties in the State of North Carolina, in terms of travel expenditures, three of the top 10 counties were coastal counties; and
3. In 2014, direct tourism employment in North Carolina is approximately 204,800 persons, with direct tourism payroll of $4.9 billion; and
4. Visitors to North Carolina generated more than $3.2 billion in federal, state and local taxes in 2014; and
5. The NC Division of Marine Fisheries (NCDENR) reported 2014 commercial fish landings in North Carolina to be worth $93,843,254; and
6. Because of North Carolina's tourism industry, each North Carolina household in 2014 saved $455 in state and local taxes as a direct result of visitor spending in the state; and

WHEREAS, visitors from all over the world come to enjoy the natural beauty of our clean beaches, salt and freshwater marshes, inlets, estuaries and tributaries; and

WHEREAS, the City of Southport and her surrounding coastal communities are rich in natural areas that provide sanctuary, nesting and breeding grounds for diverse groups of migratory birds, turtles, dolphin, whales, fish and other wildlife, some of which are on the endangered species list; and

WHEREAS, North Carolina's coastal waters and natural habitats provide the world with some of the best wild-caught seafood, renowned for its freshness and exceptional quality; and

WHEREAS, the inherent risks to North Carolina's 320 miles of valued coastline from seismic surveying, offshore oil and natural gas exploration and drilling have the potential to irrevocably harm our natural environment, our economic well-being and our overall quality of life; and

NOW, THEREFORE, BE IT RESOLVED, the Aldermen of the City of Southport reaffirm the resolution passed in 2014 in opposition to seismic surveying and are opposed to the exploration and development of oil/gas resources on the continental shelf or elsewhere off the coast of North Carolina; and

BE IT FURTHER RESOLVED the Aldermen of the City of Southport stand in solidarity with North Carolina coastal communities and communities who may be affected by the onshore infrastructure supporting offshore exploration and drilling and who may suffer long-term social, economic and environmental impacts from offshore exploration and production of petroleum resources on the continental shelf off the coast of North Carolina.

BE IT FURTHER RESOLVED the Aldermen of the City of Southport call upon all North Carolina municipal and county governing bodies of North Carolina to pass similar resolutions to this one and that the League of Municipalities joins in this effort.

BE IT FURTHER RESOLVED the Aldermen of the City of Southport urge the Governor McCrory and the entire North Carolina General Assembly to oppose offshore petroleum production policies that risk the health, safety and sound environmental stewardship of North Carolina's coastline whose natural beauty attracts a proven tourism-driven economy.

On Behalf of the City of Southport Board of Aldermen:

Southport Mayor, Robert D. Howard

Attest: Michele Windham

City Clerk

CITY OF SOUTHPORT CORPORATE SEAL 1792 NORTH CAROLINA

August 24, 2015

Jolie Harrison
Chief Permits and Conservation Division
Office of Protected Resources
National Marine Fisheries Service
1315 East – West Highway
Silver Spring, MD 20910

Dear Ms. Harrison,

The National Oceanic and Atmospheric Association (NOAA) and the National Marine Fisheries Service (NMFS) are commended for their continued efforts to inform and engage the public about the ION GeoVentures IHA application for a federal permit to conduct deep-water seismic surveying in the Atlantic Ocean to better evaluate the evolution of the petroleum system at the basin level.

The members of the Bald Head Association (BHA) and the Bald Head Island Stage II Association (Stage II) submit for your consideration the following comments about this important issue.

The BHA and Stage II represent more than 2,000 properties and their owners on Bald Head Island, North Carolina (BHI). BHI is located in southeastern North Carolina where the Cape Fear River and Atlantic Ocean intersect, and these BHI property owners will be most affected by the seismic surveying and its related activities in this portion of North Carolina.

The BHI community's deeply embraced mantra for over 30 years is to 'live in harmony with nature.' BHI property owners and their visitors include many serious birders, avid fisherman and over 20,000 passionate sea turtle conservationists. BHI property owners remain overwhelmingly opposed to seismic surveying and oil/gas exploration and drilling as proposed by the Bureau of Energy Management (BOEM).

The surveying proposed by ION GeoVentures in its recent IHA application to the North Carolina Department of Energy and Natural Resources (DENR) and BOEM, will extend 24/7 summer through fall of 2016. The proposed survey grid is five widely-spaced transect lines (~20–190 km apart) roughly parallel to the coast and 14 widely-spaced transect lines in the onshore-offshore direction. Numerous prominent marine scientists have indicated that seismic surveying of shorter durations may have an impact on marine animals, sea turtles and fish stocks. Many scientists are concurring that a survey conducted with seismic air guns of 263 dB to 270 dB, over tens of thousands of acres could harass these and other species and impact behaviors, migratory patterns, food supply, safety and communication. Of the 39 species listed in the application, six are endangered. The application indicates no ESA-listed as threatened; the application makes no mention of the sea turtles that feed, mate, nest and hatch on all the barrier islands and coastline from Florida to Virginia.

BHI property owners are concerned that the noise created by seismic surveying will startle, impair and preclude sea turtles from returning to lay their nests on BHI, the island of their birth. BHI is one of two sea turtle index beaches in North Carolina. BHI is proud of its 30-year history of sea turtle conservation, and BHI property owners request assurance that seismic surveying and any anticipated oil/gas exploration and drilling will not negatively impact the turtle population. Leatherback, loggerhead and green turtles are evident offshore and in the Cape Fear River from spring until late fall. The BHI Conservancy has maintained a thirty+ year data set that determines the earliest and latest times sea turtles have nested and hatched on BHI.

The BHI property owners' concerns seem confirmed by a statement from the 2006 Draft Environmental Impact Statement on the OCS Leasing Program: 2007-2012, which acknowledged that in the Gulf of Mexico planning areas, *"Noise generated by seismic surveys may have physical and/or behavioral effects on marine mammals, such as (1) hearing loss, discomfort, and injury; (2) masking of important sound signals; and (3) behavioral responses such as fright, avoidance and changes in physical or vocal behavior."* It is further stated within the draft that *"...Sea turtles could be directly affected by seismic surveys, vessel traffic and construction of offshore and onshore facilities and removal of platforms. Sea turtles may also be exposed to a variety of waste materials, such as produced water, which have the potential to cause a variety of lethal and sub-lethal effects."*

Loggerheads are considered threatened in the United States and endangered globally. Leatherbacks are considered "vulnerable." Adult sea turtles enter the waters offshore of North Carolina in April, nesting takes place from May until September and hatching takes place at night from July until November. Only one in 1000 are expected to survive to come back and lay a nest. The ION GeoVentures IHA application does not acknowledge the endangered or threatened sea turtles in as far as proposed takes, exclusion zones or mitigation.

The ION GeoVentures IHA application was prepared by LGL Ecological Research Associates, a Texas based consulting firm. LGL's website states they have "*expertise with sensitive species in Canada, the United States and abroad of marine mammals and sea turtles*," yet the application does not have any reference to the Atlantic Seaboard migration patterns of the endangered and threatened sea turtles and fish stocks.

The application does mention the North Atlantic Right Whales, but does not include the observations much farther out to the continental shelf. Mariners are under special rules when transiting the western mid-Atlantic and south-Atlantic offshore waters from November until April. *"Large whales, such as right whales, rely on their ability to hear far more than their ability to see. Chronic noise is likely reducing their opportunities to gather and share vital information that helps them find food and mates, navigate, avoid predators and take care of their young."* Leila Hatch, Ph.D., NOAA's Stellwagen Bank National Marine Sanctuary marine ecologist. *"...noise from an individual ship could make it nearly impossible for a right whale to* *be heard by other whales,"* said Christopher Clark, Ph.D., director of Cornell's bioacoustics research program (*CONSERVATION BIOLOGIST, Underwater noise decreases whale communications in Stellwagen Bank sanctuary*, August 15, 2012). It is hard to conceive what impact adding Ultra-deep lines of 36 seismic air guns at a decibel level of 257dB-263dB, a low-level acoustic pinger system (operating between 50–100 kHz) and standard single-beam navigational echo sounders will have on the 39 species listed including the six endangered populations mentioned in the survey and the endangered and threatened sea turtle populations.

Page 34 of the ION GeoVentures IHA application states "*All anticipated takes would be 'takes by harassment' involving temporary changes in behavior. The mitigation measures to be applied (see § XI below) would minimize the possibility of injurious takes. However, as noted earlier and in Appendix C, there is no specific information demonstrating that injurious 'takes' would occur if animals were exposed to sound levels >180 dB re 1μPa SPL rms even in the absence of the planned mitigation measures."* More than 100 scientists have asked the Obama administration for survey applications not be approved until NOAA's Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammals has been reviewed and adopted.

This application is specifically for summer and fall of 2016, on page 22 the application says *"Cuvier's beaked whales have been regularly sighted during summer and fall line transect surveys in the mid-Atlantic shelf break area (Martinez and Garrison 2005, 2006; Wicker et. al 2011; Wicker and Mullin 2012; Palka 2012). DoN (2008a,b) reported eight sightings offshore from Georgia and North Carolina in the fall, most of which occurred near the shelf break. Several summer and fall strandings have also been reported along the coast from south Florida to North Carolina (DoN 2007a, 2008a,b).* According to Barlow and Gisiner, 2006, *"Beaked whales are both visually and acoustically difficult to detect"* and *"Currently, none of the available detection methods (visual search and passive acoustic monitoring) has a high probability of detecting and identifying beaked whales" "beaked whales stay silent for long periods of time."* To make matters worse, *"some mitigation methods may actually harm beaked whales since they approach the air guns they are ramping up.* (Barlow and Gisiner, 2006)*"*

No peer-reviewed studies appear to exist that inform scientists about the chronic impact of seismic surveying on marine wildlife, including sea turtles. No studies exist to prove that the surveys will not adversely impact the species beyond the accidental take or harassment. On page 40 the application admits, "*Permanent hearing impairment, in the unlikely event that it occurred, would constitute injury, but temporary threshold shift (TTS) is not considered an injury (Southall et al. 2007; Le Prell 2012). Rather, the onset of TTS has been considered an indicator that, if the animal is exposed to higher levels of that sound, physical damage is ultimately a possibility. Recent research has shown that sound exposure can cause cochlear neural degeneration, even when threshold shifts and hair cell damage are reversible (Liberman 2013). These findings have raised some doubts as to whether TTS should continue to be considered a non-injurious effect.*"

Although proven facts cannot directly relate the seismic surveying of the ocean floor that occurred this spring off Bald Head Island, a beaked whale and a dolphin were stranded and died on Bald Head Island on May 11, 2015, within days of a Geophysical Survey ship coming into the Port of Wilmington, NC, on May 8, 2015.

Care must be given to all marine life. From July 2013 to date, the Atlantic bottlenose dolphins have suffered die-offs from cetacean morbillivirus. Adding additional stress upon these marine populations with seismic blasting could result in higher than predicted takes.

The BHI community also has concerns for the fish stocks in the surrounding waters: "*Bony fish may be particularly vulnerable to intense sound because most of them possess an air-filled swim bladder. Although marine fish typically have less acute hearing than marine mammals, many are more sensitive than odontocetes in the range 100-500 Hz where most seismic sound is produced. Effects of air gun pulses on fish range from serious injury at short ranges, to avoidance behavior, possibly at the range of many kilometers* (Turnpenny & Nedwell, 1994). *Reduced catch rates have been reported for several species of fish in areas of seismic surveying activity* (see review in McCauley, 1994*).*

Most importantly, the predicted Level A & B takes of all the species seem low given the unknown effects on the fish stocks upon which they feed. *"Concerns about the potential effects of human-generated noise on marine species have been growing as scientific evidence indicates that certain classes of noise produced during naval exercises, geophysical exploration, and underwater construction may cause temporary or permanent auditory damage to some marine vertebrates, including marine mammals, turtles, and fishes (NRC, 1994, 2000; Popper, 2003, Popper et al., 2004a). Of equal concern is the potential for concomitant changes in normal behavior that may reduce foraging efficiency, reproductive success, or individual longevity, any of which could result in reduced populations. Negative impacts for any population will in turn negatively affect their predator or initiate a cascade of changes that alter an entire ecosystem if top predators are reduced or eliminated." (TECHNICAL REPORT 1939,* April 2006*; Evaluation of Evidence for Altered Behavior and Auditory Deficits in Fishes Due to Human-Generated Noise Sources,* P. L. Edds-Walton and J. J. Finneran) There is no way to quantify the level of disruption seismic surveying may inflict upon this critical process of nature.

Bald Head Island is also in the Atlantic migration flyway. Thousands of water birds and shore birds of several species traverse the coast within this flyway, with some choosing to stay for several consecutive months. To date, the BHI Conservancy has documented over 243 species of birds on Bald Head Island. Many of these bird species have been designated as protected by the government since their populations are diminished, and many of these bird species rely on coastal fish for sustenance during their migration. It is estimated that the BP Horizon spill killed over one million sea and shore birds, including 32% of the brown pelican population. There is no empirical data to confirm that seismic testing will not displace the fish stocks that the birds in the flyway and all the other marine animals that frequent the survey area rely on for survival.

Other concerns of note:

- ION GeoVentures admits the uncertainty of the metrics put forth in their take and harassment metrics. The application states on page 151: *"The total uncertainty in the predicted exposure level is the product of all the possible sources of uncertainty in the modeling procedure. These can be grouped into three categories: acoustic propagation,* *animal behavior, and animal density. Acoustic propagation uncertainty largely results from the natural variability in sound velocity profiles, which can be precisely measured but changes rapidly. The other contribution is seafloor composition. This changes slowly, but it is difficult to measure precisely."*

- Surface observers during the tests are able only to monitor a small percentage of the total impact. The subsurface impact remains undetected and undocumented. This concern is magnified because surveying will occur both during the daytime and nighttime hours.

- The seismic application proposes mitigation by underwater monitoring for whale songs to determine their presence. Sea turtles do not emit sound underwater, so their presence would be completely undetectable by the seismic application mitigation proposal, but for their occasional and intermittent need to surface. The 10,000+ incredibly small and vulnerable hatchling turtles leaving the Bald Head beaches (included in the 145,000 + hatchlings leaving North Carolina beaches) are at high risk by nature, and they would be completely undetectable by the seismic application mitigation proposal.

- Although mitigation steps such as exclusion zones, ramped-up sound levels, PSOs and PAMs are being promoted, how can your organization actually monitor the activities to ensure compliance with federal rules? How will your organization enforce appropriate penalties if/when the rules are violated?

The ION GeoVentures IHA application makes no mention of the threatened sea turtle migration season.

The BHI community emphatically implores the NMFS not to approve duplicative seismic survey applications whose scope is over lapping geophysically and whose effects will be cumulative. All of the proposed applications, Spectrum GEO, TGS NOPEC, ION GeoVentures and TDI-Brooks, overlay each other.

The BHI community respectfully requests that the National Marine Fisheries Service not allow the any seismic activity to take place in the Mid-Atlantic Planning Area at any time of year. The North Atlantic Right Whale protection period is from November 15th until April 15th from Florida to North Carolina and should be from near shore to the continental shelf. The threatened Sea Turtles are migrating from offshore to the coast from Florida to the North Carolina/Virginia border from April until November 1st. There is no safe time or place for seismic testing here that will not impact marine life that this community cares deeply about or partially depends on for its sustainability.

Thank you, once again for the opportunity to comment on the ION GeoVentures IHA application to conduct seismic surveying off the coast of North Carolina. The members of the BHI community look forward to working with NOAA and NMFS as this process unfolds.

Sincerely,

Judy Porter

Trisha Barnard

Judy Porter
President
Bald Head Association
PO Box 3030
Bald Head Island, NC 28461
910-457-4676 x21

Trisha Barnard
President
Stage II Association
c/o CAMS
3960 Executive Park Blvd., Unit 8
Southport, NC 28461
910-454-8787

August 26, 2015

Jolie Harrison
Chief Permits and Conservation Division
Office of Protected Resources
National Marine Fisheries Service
1315 East – West Highway
Silver Spring, MD 20910

Dear Ms. Harrison,

The National Oceanic and Atmospheric Association (NOAA) and the National Marine Fisheries Service (NMFS) are commended for their continued efforts to inform and engage the public about the Spectrum Geo, Inc. application for a federal permit to conduct seismic surveying in the Atlantic Ocean.

The members of the Bald Head Association (BHA) and the Bald Head Island Stage II Association (Stage II) submit for your consideration the following comments about this important issue.

The BHA and Stage II represent more than 2,000 properties and their owners on Bald Head Island, North Carolina (BHI). BHI is located in southeastern North Carolina where the Cape Fear River and Atlantic Ocean intersect, and these BHI property owners will be most affected by the seismic surveying and its related activities in this portion of North Carolina.

The BHI community's deeply embraced mantra for over 30 years is to 'live in harmony with nature.' BHI property owners and their visitors include many serious birders, avid fisherman and over 20,000 passionate sea turtle conservationists. BHI property owners remain overwhelmingly opposed to seismic surveying and oil/gas exploration and drilling as proposed by Bureau of Energy Management (BOEM).

The surveying proposed by Spectrum Geo, Inc. in its recent IHA application to the North Carolina Department of Energy and Natural Resources (DENR) and BOEM, will extend 24/7 during an entire year. Numerous prominent marine scientists have indicated that seismic surveying of shorter durations may have an impact on marine animals, sea turtles and fish stocks. Many scientists are concurring that a survey conducted with seismic air guns over tens of thousands of acres during an entire year would harass these and other species and impact behaviors, migratory patterns, food supply, safety and communication.

BHI property owners are concerned that the noise created by seismic surveying will startle, impair and preclude sea turtles from returning to lay their nests on BHI, the island of their birth.

BHI is proud of its 30-year history of sea turtle conservation, and BHI property owners request assurance that seismic surveying and any anticipated oil/gas exploration and drilling will not negatively impact the turtle population. Loggerhead and green turtles are evident offshore and in the Cape Fear River from spring until late fall. The BHI Conservancy has maintained a thirty+ year data set that determines the earliest and latest times sea turtles have nested and hatched on BHI. This year alone 96 sea turtle nests have been laid on BHI and an estimated 12,000 hatchlings, from this season's nests, are expected to swim from BHI shores.

The BHI property owners' concerns seem confirmed by a statement from the 2006 Draft Environmental Impact Statement on the OCS Leasing Program: 2007-2012, which acknowledged that in the Gulf of Mexico planning areas, *"Noise generated by seismic surveys may have physical and/or behavioral effects on marine mammals, such as (1) hearing loss, discomfort, and injury; (2) masking of important sound signals; and (3) behavioral responses such as fright, avoidance and changes in physical or vocal behavior."* It is further stated within the draft that *"...Sea turtles could be directly affected by seismic surveys, vessel traffic and construction of offshore and onshore facilities and removal of platforms. Sea turtles may also be exposed to a variety of waste materials, such as produced water, which have the potential to cause a variety of lethal and sub-lethal effects."*

Loggerheads are considered threatened in the United States and endangered globally. Adult sea turtles swim into the waters offshore of North Carolina in April, nesting takes place from May until September and hatching takes place at night from July until November. Only one hatchling in 1000 is expected to survive to come back and lay a nest. The Spectrum Geo, Inc. IHA application does not list North Carolina as an exclusion zone for the sea turtle nesting and hatching season and the mitigation plans listed in the application do not seem to address them.

The Spectrum GEO IHA application does not recognize the proposed expansion of the designated critical habitat for endangered North Atlantic Right Whales in the northwestern Atlantic Ocean, including areas that will support calving and nursing. This critical habitat extends up to the Cape Fear River entrance and Bald Head Island. The application only acknowledges the area close to shore from Georgia to south of Jacksonville, Florida. The North Atlantic Right Whales have been observed much farther north and deep out to the continental shelf. Mariners are under special rules when transiting the western mid-Atlantic and south-Atlantic offshore waters from November until April. *"Large whales, such as right whales, rely on their ability to hear far more than their ability to see. Chronic noise is likely reducing their opportunities to gather and share vital information that helps them find food and mates, navigate, avoid predators and take care of their young." Leila Hatch, Ph.D., NOAA's Stellwagen Bank National Marine Sanctuary marine ecologist. "...noise from an individual ship could make it nearly impossible for a right whale to be heard by other whales," said Christopher Clark, Ph.D., director of Cornell's bioacoustics research program.* It is hard to conceive what impact adding 32 seismic air guns fired every 10 seconds, 24/7, for a year will have on this endangered species and the other 38 cetacean types in the proposed survey area.

A question remains among members of the recognized scientific community whether seismic surveying will harm marine animals and sea turtles. No peer-reviewed studies appear to exist that inform scientists about the chronic impact of seismic surveying on marine wildlife, including sea turtles. No studies exist to prove that the surveys will not adversely impact the species beyond the accidental take or harassment. Although proven facts cannot directly relate the seismic surveying of the ocean floor that occurred this spring off Bald Head Island, a beaked whale and a dolphin were stranded and died on Bald Head Island, on May 11, 2015, within days of a Geophysical Survey ship coming into the Port of Wilmington, NC, on May 8, 2015.

Care must be given to all marine life. From July 2013 to date the Atlantic bottlenose dolphins have suffered die-offs from cetacean morbillivirus. Adding additional stress upon these marine populations with seismic blasting could result in higher than predicted takes.

The BHI community also has concerns for the fish stocks in the surrounding waters: "*In an example from a complex, open-ocean ecosystem, the removal of cod (Gadus morhua) and other ground fishes by sustained overfishing in the northwest Atlantic during the 1980s and 1990s resulted in increases in the abundance of the prey species for these ground fishes, particularly smaller fishes and invertebrates such as the northern snow crab (Chionoecetes opilio) and northern shrimp (Pandalus borealis). The increased abundance of these prey species altered the community of zooplankton that serve as food for smaller fishes and invertebrates as an indirect effect." (Frank, K. T.; Petrie, B.; Choi, J. S.; Leggett, W. C. (2005). "Trophic Cascades in a Formerly Cod-Dominated Ecosystem". Science **308**.*

Most importantly, the predicted Level A & B takes of all the species seem low given the unknown effects on the fish stocks upon which they feed. From page 60 of the Spectrum Geo IHA application *"Temporary disruption of spawning aggregations or schools of fishes important as prey for marine mammals may occur during a seismic survey."* There is no way to quantify the level of disruption seismic surveying may inflict upon this critical process of nature. Not only does BHI have recreational fisherman and great seafood restaurants enjoyed by the local and visiting populations, the NC Division of Marine Fisheries (NCDENR) reported 2014 commercial fish landings in North Carolina to be worth $93,843,254.

Bald Head Island is in the Atlantic migration flyway. Thousands of water birds and shore birds of several species traverse the coast within this flyway, with some choosing to stay for several consecutive months. To date, the BHI Conservancy has documented over 243 species of birds on Bald Head Island. Many of these bird species have been designated as protected by the government since their populations are diminished, and many of these bird species rely on coastal fish for sustenance during their migration. It is estimated that the BP Horizon spill killed over one million sea and shore birds, including 32% of the brown pelican population. There is no empirical data to confirm that seismic testing will not displace the fish stocks that the birds in the flyway and all the other marine animals that frequent the survey area rely on for survival.

Page 32 of the Spectrum GEO IHA application states: *"Given the predominant low-frequency sound sources, limited sound production levels (SPLs) and durations, and directionality of higher frequency sound sources associated with seismic sound sources, it is not likely that the proposed survey would generate sounds loud enough to cause direct mortality (Det Norske Veritas Energy, 2007)."* This quote was provided by DNVL, an organization whose main source of income is derived from the oil and gas industry. The members of the BHI community question this conclusion. The Spectrum GEO IHA application also states on page 36: *"If a sound source displaces marine mammals from an important feeding or breeding area for a prolonged period, impacts on both individuals and the population could be important."* This is a major concern for all the species in or migrating through the survey area.

Other concerns of note:

- Surface observers during the tests are able only to monitor a small percentage of the total impact. The subsurface impact remains undetected and undocumented. This concern is magnified because surveying will occur both during the daytime and nighttime hours.

- The seismic application proposes mitigation by underwater monitoring for whale songs to determine their presence. Sea turtles do not emit sound underwater, so their presence would be completely undetectable by the seismic application mitigation proposal, but for their occasional and intermittent need to surface. The 10,000+ incredibly small and vulnerable hatchling turtles leaving the Bald Head beaches (included in the 145,000 + hatchlings leaving North Carolina beaches) are at high risk by nature, and they would be completely undetectable by the seismic application mitigation proposal.

- Although mitigation steps such as exclusion zones, ramped-up sound levels, PSOs and PAMs are being promoted, how can your organization actually monitor the activities to ensure compliance with federal rules? How will your organization enforce appropriate penalties if/when the rules are violated?

- Spectrum GEO's plan proposes arriving at the center of the seismic testing survey area by simultaneously starting one boat at the south end of the survey area and one at the north end. This proposed process does not consider and/or allow for the essential North Atlantic Right Whale critical habitat period or the threatened sea turtle migration season.

The BHI community respectfully requests that the National Marine Fisheries Service not allow any seismic activity to take place in the Mid-Atlantic Planning Area at any time of year. The North Atlantic Right Whale protection period is from November 15th until April 15th from Florida to North Carolina and should be from near shore to the continental shelf. The threatened Sea Turtles are migrating from offshore to the coast (and back) from Florida to the North Carolina/Virginia border from April until November 1st. There is no safe time or place for seismic testing here that will not impact marine life that this community cares deeply about or partially depends on for its sustainability.

Thank you once again for the opportunity to comment on the Spectrum GEO IHA application to conduct seismic surveying off the coast of North Carolina. The members of the BHI community look forward to working with NOAA and NMFS as this process unfolds.

Sincerely,

Judy Porter

Judy Porter
President
Bald Head Association
PO Box 3030
Bald Head Island, NC 28461
910-457-4676 x21

Trisha Barnard

Trisha Barnard
President
Stage II Association
c/o CAMS
3960 Executive Park Blvd., Unit 8
Southport, NC 28461
910-454-8787

August 24, 2015

Jolie Harrison
Chief Permits and Conservation Division
Office of Protected Resources
National Marine Fisheries Service
1315 East – West Highway
Silver Spring, MD 20910

Dear Ms. Harrison,

The National Oceanic and Atmospheric Association (NOAA) and the National Marine Fisheries Service (NMFS) are commended for their continued efforts to inform and engage the public about the TDI-Brooks IHA application for a federal permit to utilize a regional multibeam (bathymetry, backscatter, water column) and sub-bottom profiler to survey an area of approximately 90,434 square miles stretching from the east coast of Florida to North Carolina.

The members of the Bald Head Association (BHA) and the Bald Head Island Stage II Association (Stage II) submit for your consideration the following comments about this important issue.

The BHA and Stage II represent more than 2,000 properties and their owners on Bald Head Island, North Carolina (BHI). BHI is located in southeastern North Carolina where the Cape Fear River and Atlantic Ocean intersect, and these BHI property owners will be most affected by the multibeam echo sounder (MBES) activity, seismic surveying and the related activities in this portion of North Carolina.

The BHI community's deeply embraced mantra for over 30 years is to 'live in harmony with nature.' BHI property owners and their visitors include many serious birders, avid fisherman and over 20,000 passionate sea turtle conservationists. BHI property owners remain overwhelmingly opposed to seismic surveying and oil/gas exploration and drilling as proposed by the Bureau of Energy Management (BOEM).

The surveying proposed by TDI-Brooks in its recent IHA application to the North Carolina Department of Energy and Natural Resources (DENR) and BOEM, will extend 24/7 for 30-day periods but does not specify the duration of the survey permit being requested. The application does state "*that approximately 40-45,000 square kilometers of seafloor will be surveyed in each 30 day leg.*" Numerous prominent marine scientists have indicated that seismic surveying of shorter durations may have an impact on marine animals, sea turtles, and fish stocks. Many scientists are concurring that a survey conducted with a MBES, sub-bottom profiler that emits a beam where sound intensity reaches at least 180dB, over tens of thousands of acres could harass these and other species and impact behaviors, migratory patterns, food supply, safety and communication.

BHI property owners are concerned that the noise created by MBES could impair and preclude sea turtles from returning to lay their nests on BHI, the island of their birth. BHI is one of two sea turtle index beaches in North Carolina. BHI is proud of its 30-year history of sea turtle conservation, and BHI property owners request assurance that MBES and any anticipated oil/gas exploration and drilling will not negatively impact the turtle population. The BHI Conservancy has maintained a thirty+ year data set that determines the earliest and latest times sea turtles have nested and hatched on BHI.

The BHI property owners' concerns seem justified by a statement from the 2006 Draft Environmental Impact Statement on the OCS Leasing Program: 2007-2012, which acknowledged that in the Gulf of Mexico planning areas, *"Noise generated by seismic surveys may have physical and/or behavioral effects on marine mammals, such as (1) hearing loss, discomfort, and injury; (2) masking of important sound signals; and (3) behavioral responses such as fright, avoidance and changes in physical or vocal behavior."* It is further stated within the draft that *"...Sea turtles could be directly affected by seismic surveys, vessel traffic and construction of offshore and onshore facilities and removal of platforms. Sea turtles may also be exposed to a variety of waste materials, such as produced water, which have the potential to cause a variety of lethal and sub-lethal effects."*

Leatherback (not mentioned in application), hawksbill, Kemp's Ridley, loggerhead and green turtles are evident offshore in the proposed survey area year round. The females come ashore and nest in North Carolina from May until September and the hatchlings emerge from their nests and swim out to the Sargasso Sea from July until November. Hatchlings and juveniles, swimming underwater or floating year round within algal mats, would be undetectable to (mitigation) spotters and sound monitoring devices day or night. Loggerheads are considered threatened in the United States and endangered globally. Only one in 1000 hatchlings are expected to survive to come back and lay a nest. The TDI-Brooks application does not acknowledge any sea turtle takes, exclusion zones or mitigation.

The application does mention the North Atlantic Right Whales, but does not include the observations much farther out to the continental shelf. Mariners are under special rules when transiting the western mid-Atlantic and south-Atlantic offshore waters from November until April. *"Large whales, such as right whales, rely on their ability to hear far more than their ability to see. Chronic noise is likely reducing their opportunities to gather and share vital information that helps them find food and mates, navigate, avoid predators and take care of their young."* Leila Hatch, Ph.D., NOAA's Stellwagen Bank National Marine Sanctuary marine ecologist. *"...noise from an individual ship could make it nearly impossible for a right whale to be heard by other whales,"* said Christopher Clark, Ph.D., director of Cornell's bioacoustics research program (*CONSERVATION BIOLOGIST, Underwater noise decreases whale communications in Stellwagen Bank sanctuary*, August 15, 2012). It is hard to conceive what impact will occur when adding a MBES, sub-bottom profiler that emits two beams whose sound intensity reaches at least 180dB up to 245 dB each.

Page 24 of the TDI-Brooks IHA application states "*Au and Hastings (2008) found that sound from echosounders used during regular hydrographic survey operations could lead to behavioral changes in marine mammals that might affect migration, feeding, breeding, and the ability to avoid predators.*" Over 100 scientists have asked the Obama administration not to approve survey applications until NOAA's Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammals has been reviewed and adopted.

The BHI community is interested in the conservation of the beaked whale populations. Page 16 of the application quotes: *"Cuvier's beaked whale sightings occur primarily along the continental shelf edge in the Mid-Atlantic region off the northeast U.S. coast (CETAP 1982; Waring et al. 1992; Waring et al.2001; Hamazaki 2002; Palka 2006)* TDI-Brooks IHA, October, 2014. According to Barlow and Gisiner, 2006, *"Beaked whales are both visually and acoustically difficult to detect"* and *"Currently, none of the available detection methods (visual search and passive acoustic monitoring) has a high probability of detecting and identifying beaked whales" "beaked whales stay silent for long periods of time."* To make matters worse, *"some mitigation methods may actually harm beaked whales since they approach the air guns they are ramping up.* (Barlow and Gisiner, 2006)*"*

No peer-reviewed studies appear to exist that inform scientists about the chronic impact of seismic surveying or MBES on marine wildlife, including sea turtles. No studies exist to prove that the surveys will not adversely impact the species beyond the accidental take or harassment. The BHI community is seriously concerned that TDI-Brooks outlines using sound levels that exceed permanent threshold shift (PTS) also known as permanent hearing loss.

Although proven facts cannot directly relate the seismic surveying of the ocean floor that occurred this spring off Bald Head Island, a beaked whale and a dolphin were stranded and died on Bald Head Island on May 11, 2015, within days of a Geophysical Survey ship coming into the Port of Wilmington, NC, on May 8, 2015.

Care must be given to all marine life. From July 2013 to date, the Atlantic bottlenose dolphins have suffered die-offs from cetacean morbillivirus. Adding additional stress upon these marine populations with MBES and/or seismic blasting could result in higher than predicted takes.

The BHI community also has concerns for the fish stocks in the surrounding waters: "*Bony fish may be particularly vulnerable to intense sound because most of them possess an air-filled swim bladder. Although marine fish typically have less acute hearing than marine mammals, many are more sensitive than odontocetes in the range 100-500 Hz where most seismic sound is produced. Effects of air gun pulses on fish range from serious injury at short ranges, to avoidance behavior, possibly at the range of many kilometers (*Turnpenny & Nedwell, 1994*). Reduced catch rates have been reported for several species of fish in areas of seismic surveying activity* (see review in McCauley, 1994).

Most importantly, the predicted Level A & B takes of all the species seem low given the unknown effects on the fish stocks upon which they feed. *"Concerns about the potential effects of human-generated noise on marine species have been growing as scientific evidence indicates that certain classes of noise produced during naval exercises, geophysical exploration, and underwater construction may cause temporary or permanent auditory damage to some marine vertebrates, including marine mammals, turtles, and fishes (NRC, 1994, 2000; Popper, 2003, Popper et al., 2004a). Of equal concern is the potential for concomitant changes in normal behavior that may reduce foraging efficiency, reproductive success, or individual longevity, any of which could result in reduced populations. Negative impacts for any population will in turn negatively affect their predator or initiate a cascade of changes that alter an entire ecosystem if top predators are reduced or eliminated." (TECHNICAL REPORT 1939,* April 2006*; Evaluation of Evidence for Altered Behavior and Auditory Deficits in Fishes Due to Human-Generated Noise Sources,* P. L. Edds-Walton and J. J. Finneran) There is no way to quantify the level of disruption MBES surveying may inflict upon this critical process of nature.

Bald Head Island is also in the Atlantic migration flyway. Thousands of water birds and shore birds of several species traverse the coast within this flyway, with some choosing to stay for several consecutive months. To date, the BHI Conservancy has documented over 243 species of birds on Bald Head Island. Many of these bird species have been designated as protected by the government since their populations are diminished, and many of these bird species rely on coastal fish for sustenance during their migration. It is estimated that the BP Horizon spill killed over one million sea and shore birds, including 32% of the brown pelican population. There is no empirical data to confirm that MBES surveying will not displace the fish stocks that the birds in the flyway and all the other marine animals that frequent the survey area rely on for survival.

Other concerns of note:

- Surface observers during the tests are able only to monitor a small percentage of the total impact. The subsurface impact remains undetected and undocumented. This concern is magnified because surveying will occur both during the daytime and nighttime hours.

- The seismic application proposes mitigation by underwater monitoring for whale songs to determine their presence. Sea turtles do not emit sound underwater, so their presence would be completely undetectable by the seismic application mitigation proposal, but for their occasional and intermittent need to surface. The 10,000+ incredibly small and vulnerable hatchling turtles leaving the Bald Head beaches (included in the 145,000 + hatchlings leaving North Carolina beaches) are at high risk by nature, and they would be completely undetectable by the seismic application mitigation proposal.

- Although mitigation steps such as exclusion zones, ramped-up sound levels, PSOs and PAMs are being promoted, how can your organization actually monitor the activities to ensure compliance with federal rules? How will your organization enforce appropriate penalties if/when the rules are violated?

The BHI community emphatically implores the NMFS not to approve duplicative MBES and seismic survey applications whose scope is over lapping geophysically and whose effects will be cumulative. All of the proposed applications, Spectrum GEO, TGS NOPEC, ION GeoVentures and TDI-Brooks, overlay each other.

The BHI community respectfully requests that the National Marine Fisheries Service not allow the any seismic or multibeam echo sounder activity to take place in the Mid-Atlantic Planning Area at any time of year. The North Atlantic Right Whale protection period is from November 15th until April 15th from Florida to North Carolina and should be from near shore to the continental shelf. The threatened sea turtles are migrating from offshore to the coast from Florida to the North Carolina/Virginia border from April until November 1st. They are floating around well offshore year round. There is no safe time or place for seismic multibeam echo sounder activity here that will not impact marine life that this community cares deeply about or partially depends on for its sustainability.

Thank you, once again, for the opportunity to comment on the TDI-Brooks IHA application to conduct multibeam echo sounder surveying off the coast of North Carolina. The members of the BHI community look forward to working with NOAA and NMFS as this process unfolds.

Sincerely,

Judy Porter

Judy Porter
President
Bald Head Association
PO Box 3030
Bald Head Island, NC 28461
910-457-4676 x21

Trisha Barnard

Trisha Barnard
President
Stage II Association
c/o CAMS
3960 Executive Park Blvd., Unit 8
Southport, NC 28461
910-454-8787

August 24, 2015

Jolie Harrison
Chief Permits and Conservation Division
Office of Protected Resources
National Marine Fisheries Service
1315 East – West Highway
Silver Spring, MD 20910

Dear Ms. Harrison,

The National Oceanic and Atmospheric Association (NOAA) and the National Marine Fisheries Service (NMFS) are commended for their continued efforts to inform and engage the public about the TGS-NOPEC IHA application for a federal permit to conduct seismic surveying in the Atlantic Ocean.

The members of the Bald Head Association (BHA) and the Bald Head Island Stage II Association (Stage II) submit for your consideration the following comments about this important issue.

The BHA and Stage II represent more than 2,000 properties and their owners on Bald Head Island, North Carolina (BHI). BHI is located in southeastern North Carolina where the Cape Fear River and Atlantic Ocean intersect, and these BHI property owners will be most affected by the seismic surveying and its related activities in this portion of North Carolina.

The BHI community's deeply embraced mantra for over 30 years is to 'live in harmony with nature.' BHI property owners and their visitors include many serious birders, avid fisherman and over 20,000 passionate sea turtle conservationists. BHI property owners remain overwhelmingly opposed to seismic surveying and oil/gas exploration and drilling as proposed by Bureau of Energy Management (BOEM).

The surveying proposed by TGS-NOPEC in its recent IHA application to the North Carolina Department of Energy and Natural Resources (DENR) and BOEM, will extend 24/7 during an entire year. Numerous prominent marine scientists have indicated that seismic surveying of shorter durations may have an impact on marine animals, sea turtles and fish stocks. Many scientists are concurring that a survey conducted with seismic air guns over tens of thousands of acres during an entire year would harass these and other species and impact behaviors, migratory patterns, food supply, safety and communication. Of the 39 species listed in the application, six are endangered. The application indicates no ESA-listed as threatened and the application makes no mention of the sea turtles that feed, mate, nest and hatch off the coastline from Florida to Virginia.

BHI property owners are concerned that the noise created by seismic surveying will startle, impair and preclude sea turtles from returning to lay their nests on BHI, the island of their birth. BHI is proud of its 30-year history of sea turtle conservation, and BHI property owners request assurance that seismic surveying and any anticipated oil/gas exploration and drilling will not negatively impact the turtle population. Leatherback, loggerhead and green turtles are evident offshore and in the Cape Fear River from spring until late fall. The BHI Conservancy has maintained a thirty+ year data set that determines the earliest and latest times sea turtles have nested and hatched on BHI.

The BHI property owners' concerns seem confirmed by a statement from the 2006 Draft Environmental Impact Statement on the OCS Leasing Program: 2007-2012, which acknowledged that in the Gulf of Mexico planning areas, *"Noise generated by seismic surveys may have physical and/or behavioral effects on marine mammals, such as (1) hearing loss, discomfort, and injury; (2) masking of important sound signals; and (3) behavioral responses such as fright, avoidance and changes in physical or vocal behavior."* It is further stated within the draft that *"...Sea turtles could be directly affected by seismic surveys, vessel traffic and construction of offshore and onshore facilities and removal of platforms. Sea turtles may also be exposed to a variety of waste materials, such as produced water, which have the potential to cause a variety of lethal and sub-lethal effects."*

Loggerheads are considered threatened in the United States and endangered globally. Leatherbacks are considered "vulnerable." Adult sea turtles enter the waters offshore of North Carolina in April, nesting takes place from May until September and hatching takes place at night from July until November. Only one hatchling in 1000 is expected to survive to come back and lay a nest. The TGS-NOPEC application does not acknowledge the endangered or threatened sea turtles in as far as proposed takes, exclusion zones or mitigation (except off of Brevard County in Florida). Additionally, the mitigation plans listed in the application do not seem to address them.

The TGS-NOPEC application was prepared by Smultea Sciences, a California-based consulting firm. The Atlantic Seaboard migration patterns of the endangered and threatened marine mammals are reflected in the application but not the endangered and threatened sea turtles and fish stocks. There is concern from the residents of Bald Head Island as to the prevalence of current data on the migration patterns and the effects of seismic testing referenced in the application. We encourage NMFS to suspend the application until more recent migration data sets and the NOAA's Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammals can be compared to TGS-NOPEC assumptions.

The North Atlantic Right Whales have been observed much farther north and deep out to the continental shelf. Mariners are under special rules when transiting the western mid-Atlantic and south-Atlantic offshore waters from November until April. *"Large whales, such as right whales, rely on their ability to hear far more than their ability to see. Chronic noise is likely reducing their opportunities to gather and share vital information that helps them find food and mates, navigate, avoid predators and take care of their young." Leila Hatch, Ph.D., NOAA's Stellwagen*

Bank National Marine Sanctuary marine ecologist. "...noise from an individual ship could make it nearly impossible for a right whale to be heard by other whales," said Christopher Clark, Ph.D., director of Cornell's bioacoustics research program. It is hard to conceive what impact adding 40 seismic air guns going off every 10 seconds and two echo sounders emitting up to 200 dB at 750 pings per minute, 24/7, for a year will have on this endangered species.

A question remains among members of the recognized scientific community whether seismic surveying will harm marine animals and sea turtles. No peer-reviewed studies appear to exist that inform scientists about the chronic impact of seismic surveying on marine wildlife, including sea turtles. No studies exist to prove that the surveys will not adversely impact the species beyond the accidental take or harassment. Although proven facts cannot directly relate the seismic surveying of the ocean floor that occurred this spring off Bald Head Island, a beaked whale and a dolphin were stranded and died on Bald Head Island on May 11, 2015, within days of a Geophysical Survey ship coming into the Port of Wilmington, NC, on May 8, 2015.

Care must be given to all marine life. From July 2013 to date, the Atlantic bottlenose dolphins have suffered die-offs from cetacean morbillivirus. Adding additional stress upon these marine populations with seismic blasting could result in higher than predicted takes.

The BHI community also has concerns for the fish stocks in the surrounding waters: "*In an example from a complex, open-ocean ecosystem, the removal of cod (Gadus morhua) and other ground fishes by sustained overfishing in the northwest Atlantic during the 1980s and 1990s resulted in increases in the abundance of the prey species for these ground fishes, particularly smaller fishes and invertebrates such as the northern snow crab (Chionoecetes opilio) and northern shrimp (Pandalus borealis). The increased abundance of these prey species altered the community of zooplankton that serve as food for smaller fishes and invertebrates as an indirect effect." (Frank, K. T.; Petrie, B.; Choi, J. S.; Leggett, W. C. (2005). "Trophic Cascades in a Formerly Cod-Dominated Ecosystem". Science **308**.*

Most importantly, the predicted Level A & B takes of all the species seem low given the unknown effects on the fish stocks upon which they feed. *"Concerns about the potential effects of human-generated noise on marine species have been growing as scientific evidence indicates that certain classes of noise produced during naval exercises, geophysical exploration, and underwater construction may cause temporary or permanent auditory damage to some marine vertebrates, including marine mammals, turtles, and fishes (NRC, 1994, 2000; Popper, 2003, Popper et al., 2004a). Of equal concern is the potential for concomitant changes in normal behavior that may reduce foraging efficiency, reproductive success, or individual longevity, any of which could result in reduced populations. Negative impacts for any population will in turn negatively affect their predator or initiate a cascade of changes that alter an entire ecosystem if top predators are reduced or eliminated." (TECHNICAL REPORT 1939,* April 2006*; Evaluation of Evidence for Altered Behavior and Auditory Deficits in Fishes Due to Human-Generated Noise Sources,* P. L. Edds-Walton and J. J. Finneran) There is no way to quantify the level of disruption seismic surveying may inflict upon this critical process of nature.

Bald Head Island is also in the Atlantic migration flyway. Thousands of water birds and shore birds of several species traverse the coast within this flyway, with some choosing to stay for several consecutive months. To date, the BHI Conservancy has documented over 243 species of birds on Bald Head Island. Many of these bird species have been designated as protected by the government since their populations are diminished, and many of these bird species rely on coastal fish for sustenance during their migration. It is estimated that the BP Horizon spill killed over one million sea and shore birds, including 32% of the brown pelican population. There is no empirical data to confirm that seismic testing will not displace the fish stocks that the birds in the flyway and all the other marine animals that frequent the survey area rely on for survival.

The TGS-NOPEC IHA application utilizes aerial and surface observations for populations in the survey area as well as the seismic survey impacts to determine take and harassment data. Many of the species spend an abundant amount of time deep in the ocean and would not be detected by ships or air surveys. This data combined with mitigation that relies on line of sight observation during daylight hours only and underwater monitoring leads to the conclusion that TGS-NOPEC Level A and B takes and harassment could be lower than the actual effects on stocks and individuals of the 39 species outlined. What consideration is given to the mammals in the firing area during darkness and how will the underwater monitoring devices pick up the sounds of the 40 dB cetaceans while the 40 arrays are firing at or above 160 dB and masking their sounds?

The TGS-NOPEC application also states: *"If a sound source displaces marine mammals from an important feeding or breeding area for a prolonged period, impacts on both individuals and the population could be important." (page 88)* This is a major concern for all the species in or migrating through the survey area. Also noted in the application: "*if a sound source repetitively interrupts important behaviors, or displaces marine mammals from important feeding or breeding habitats for a prolonged period (i.e., weeks to months), then the impacts on individuals and populations have greater potential to be biologically significant (e.g., Lusseau and Bejder 2007; Weilgart 2007).*"

Other concerns of note:

- Surface observers during the tests are able only to monitor a small percentage of the total impact. The subsurface impact remains undetected and undocumented. This concern is magnified because surveying will occur both during the daytime and nighttime hours.

- The seismic application proposes mitigation by underwater monitoring for whale songs to determine their presence. Sea turtles do not emit sound underwater, so their presence would be completely undetectable by the seismic application mitigation proposal, but for their occasional and intermittent need to surface. The 10,000+ incredibly small and vulnerable hatchling turtles leaving the Bald Head beaches (included in the 145,000 + hatchlings leaving North Carolina beaches) are at high risk by nature, and they would be completely undetectable by the seismic application mitigation proposal.

- Although mitigation steps such as exclusion zones, ramped-up sound levels, PSOs and PAMs are being promoted, how can your organization actually monitor the activities to ensure compliance with federal rules? How will your organization enforce appropriate penalties if/when the rules are violated?

- Although TGS-NOPEC mentions the exclusion area the application does not give details on their surveying avoidance process of the essential North Atlantic Right Whale critical habitat period and no mention is made for the threatened sea turtle migration season.

The BHI community emphatically implores the NMFS not to approve duplicative seismic survey applications whose scope is over lapping geophysically and whose effects will be cumulative. All of the proposed applications, Spectrum GEO, TGS NOPEC, ION GeoVentures and TDI-Brooks, overlay each other.

The BHI community respectfully requests that the National Marine Fisheries Service not allow the any seismic activity to take place in the Mid-Atlantic Planning Area at any time of year. The North Atlantic Right Whale protection period is from November 15th until April 15th from Florida to North Carolina and should be from near shore to the continental shelf. The threatened Sea Turtles are migrating from offshore to the coast from Florida to the North Carolina/Virginia border from April until November 1st. There is no safe time or place for seismic testing here that will not impact marine life that this community cares deeply about or partially depends on for its sustainability.

Thank you, once again for the opportunity to comment on the TGS-NOPEC IHA application to conduct seismic surveying off the coast of North Carolina. The members of the BHI community look forward to working with NOAA and NMFS as this process unfolds.

Sincerely,

Judy Porter

Judy Porter
President
Bald Head Association
PO Box 3030
Bald Head Island, NC 28461
910-457-4676 x21

Trisha Barnard

Trisha Barnard
President
Stage II Association
c/o CAMS
3960 Executive Park Blvd., Unit 8
Southport, NC 28461
910-454-8787

Charlie/Ilona

Resolution

City Council
City of Wilmington
North Carolina

Introduced By: Sterling B. Cheatham, City Manager

Date: 6/16/2015

Resolution in Opposition to Seismic Testing and Offshore Drilling Activities off of the North Carolina Coast

LEGISLATIVE INTENT/PURPOSE:

WHEREAS, the U.S. Department of the Interior has proposed the inclusion of the North Carolina coast in their proposed exploration and development of offshore oil and gas off of the Atlantic Coast. Such exploration and development would include such methods as seismic blasting; and

WHEREAS, seismic air-guns fire intense blasts of compressed air, said to be one of the loudest man made sounds in the ocean. These blasts can occur as frequently as every ten seconds, for days to weeks at a time and are loud enough to harm marine and aquatic life; and

WHEREAS, the full impacts of seismic testing and offshore drilling in the Atlantic are not yet fully understood by scientists, the oil and gas industry, the Bureau of Ocean Energy Management, or the Federal Government, and lower-impact alternative technologies may be available for exploration in the near future; and

WHEREAS, exploratory and commercial drilling, extraction, and the transportation of offshore oil and gas resources pose an possible economic and environmental risk; and

WHEREAS, offshore drilling activities pose specific threats for the coastal and river wetlands areas of Wilmington, which are of intrinsic ecological value for numerous migratory bird species, serve as essential nursery habitats for recreational and commercially important fisheries, and act as natural buffers from storm surge and hurricanes; and

WHEREAS, the appreciation of our natural coastal and historical environment, including commercial and recreational fishing are critical economic drivers and quality of life drivers for our region; and

WHEREAS, the City of Wilmington endeavors to be a good steward of it's coastal environment and its resources; and

WHEREAS, it has been requested by area residents and advocacy organization such as Oceana that the City of Wilmington lend it's voice to this critical issue facing our coast; and

CERTIFIED TO BE A TRUE COPY.
Penelope Spicer-Sidbury
CITY CLERK

WHEREAS, the City of Wilmington stands with numerous other coastal North Carolina municipalities in their pursuit of shoreline protection and preservation.

THEREFORE, BE IT RESOLVED:

THAT, the City Council of the City of Wilmington, North Carolina, is opposed to seismic testing and offshore oil and gas development off of the North Carolina coast.

Adopted at a regular meeting on July 21, 2015

Bill Saffo, Mayor

ATTEST:

Penelope Spicer-Sidbury, City Clerk

APPROVED AS TO FORM:

William E. Wolak | MTE

City Attorney

ITP Laws - NOAA Service Account <itp.laws@noaa.gov>

Fwd: comment to NMFS - clean up and send to

1 message

Maureen Hayes <mchayes720@gmail.com> Thu, Aug 27, 2015 at 11:57 AM
To: ITP.Laws@noaa.gov

Jolie Harrison
Permits and Conservation Division
Office of Protected Resources
NMFS

Dear Ms. Harrison,

I have not had an opportunity to synthesize the information that I found in a 1 hour search this evening, but there is clearly scientific data available to demonstrate the impact of acoustic testing on marine mammals.

Here are scientific results from research done in last decade:

Stone, Carolyn J. and Mark L. Tasker. The effects of seismic airguns on cetaceans in UK waters. 2006.

Bain, David E. and Rob Williams. Long-range effects of airgun noise on marine mammals: responses as a function of received sound level and distance. 2006.

Gailey, Glenn, Bernd Wursig and Trent L. McDonald. Abundance, behavior, and movement patterns of western gray whales in relation to a 3-D seismic survey, Northeast Sakhalin Island, Russia. 2007.

Iorio, Lucia Di and Christopher W. Clark. Exposure to seismic survey alters blue whale acoustic communication. 2010.

Here is an interesting report:

Joint Interim Report of NOAA and NMFS to the U.S. Navy. Bahamas Marine Mammal Stranding. Event of 15-16 March 2000. Submitted December 2001.

Here are articles discussing mitigation needs:

Barlow, Jay and Robert Gisiner. Mitigating, monitoring and assessing the effects of anthropogenic sound on beaked whales. 2006.

Cox, T.M. etal. Understanding the impacts of anthropogenic sound on beaked whales. 2006.

Weir, Caroline R. and Sarah J. Dolman. Comparative Review of the Regional Marine Mammal Mitigation Guidelines Implemented During Industrial Seismic Surveys, and Guidance Towards a Worldwide Standard. 2007.

E.C.M. Parson, Sarah J. Dolman, Michael Jasny, Naomi A. Rose, Mark P. Simmonds, Andrew J. Wright. A critique of the UK's JNCC seismic survey guidelines for minimising acoustic disturbance to marine mammals: Best practise? 2008.

I hope these will help inform the decision makers.

Kind regards,

Maureen C. Hayes
131 Circadian Way
Chapel Hill, NC 27516
(919) 933-3140

ITP Laws - NOAA Service Account <itp.laws@noaa.gov>

Comment on shock waves in the marine environment and effects on fish

1 message

John Jeffrey Govoni <jjgovoni@gmail.com> Tue, Aug 25, 2015 at 5:14 PM

To: ITP.Laws@noaa.gov

Shock waves and injury to marine aquatic life:

Shock waves generated by underwater explosions used in engineering projects or seismic surveying of ocean bottom and substrata, pile driving operations, or air guns cause trauma to marine mammals and fishes. Shock waves from air-guns have largely superseded submarine detonations in oil and gas seismic surveying in recent decades.

Injury inflicted on mammals and fishes is well documented when the shock wave is intense as is typical for underwater explosions; the literature, as well as our understanding of injury that results from shock waves of lesser intensity or power, as for shock waves emanating from pile driving activities or from seismic surveying of the submarine geology, is more diffuse; consequently so is our understanding.

Further, the energy of all shock waves attenuates with distance for the source. Most of the scientific literature deals with short range effects. Nevertheless, long range effects of shock waves are real and are better documented, and understood, for mammals (whales, porpoises, and dolphins) than for fishes. Injury to mammals typically involves trauma to the organs of sound reception, hearing.

Adding difficulty to the scientific resolution of the effects of shock waves is the scaling of the energy of the wave impulse itself. Shock wave are frequently scaled and reported in decibels (dB), a relative index–the ratio of two values with one being a physical reference–that is difficult to interpret and to convert. The absolute intensity or power of a shock wave are better measures, because they are physical measures that directly reflect the interaction of a shock wave with biological tissue. Also highly relevant is the form (wave form) of the shock wave itself. Decibel levels are often used and reported in environmental impact statements for convenience and because they can be made relevant to human physiological reaction typically hearing.

At short range (< a kilometer measured in meters or statute mile measured in yards) shock waves of 180dB (or roughly 1 Pascal (Pa, a physical measure of wave energy in the form of pressure)) and above cause injury to larval, juvenile, and adult fishes that include damage to the sensory systems (the inner ear, the acoustical-lateralis system, and eye), external hemorrhaging, and swim bladder rupture of fishes. Shock waves generated from air guns are typically in the range of 241 to 265 dB.

Injury to mammals and fishes is thus physical and behavioral. For fishes, physical, anatomical, and physiological injury is categorized as lethal or sub-lethal, while sub-lethal trauma often results simply in delayed mortality. Behavioral changes owing to impairment of hearing in mammals or vibration sensibility in fishes (fish inner ears and the lateral line system). Behavioral changes in both mammals and fishes are documented for both short-, and long range exposure.

Physical injury to the internal organs of fishes owe chiefly to the rapid expansion and contraction of the swim bladder with the passage of the shock wave through the water. Most fishes have a gas-filled swim bladder and consequently these fishes are more susceptible to injury owing to the passage of shock waves than are fishes that lack a swim bladder. Trauma inflicted by the passage of shock waves within the 1 to 10 Pa per second range on juvenile fishes in particular, are both lethal and sub-lethal and include rupture of the pancreas, an unusual amount of blood (hyperemia) in the swim bladder and liver, blood in the urine (hematuria), and aggregations of dead cells (hepatocytes) in the liver (coagulative necrosis).

Continental shelf and Blake Plateau south of Cape Hatteras and in the southeastern Atlantic bight are both exceptional and unique in the Western North Atlantic Ocean. This area constitutes important wintering habitat for whales and dolphins, a mixing zone of northern and southern biogeographical provinces and the fishes that inhabit these provinces, and deep-water reef habitats that are habitat for deep-water corals and reef fishes. High species diversity of fishes is evident in Raleigh and Onslow Bay off North Carolina, owing to the mixing zone of fishes from northern and southern areas, and to the contributions of warm-water reef fish assemblages. The southeastern Atlantic bight is the principal spawning area of commercially and recreationally exploited fishes (e.g., Atlantic Menhaden, spot, and an assemblage of reef fishes). The fishery for Atlantic menhaden is industrial (for reduction of fish products (oil and fish meal), and for the provision of bait for recreational fishing. Further, Atlantic menhaden is an important forage fish for fishes of the entire east coast of the United States. Many of the reef fishes upon which fisheries are prosecuted register as populations of concern for fisheries management. Whales, dolphins, and porpoises are protected species.

Shock waves emanating from air guns employed in seismic surveys injure fishes. The overall impact at a population level is difficult to determine. Yet, for populations that are currently threatened, or of concern, additional mortality beyond natural and fishing mortality is ill-advised.

Sound exposure guidelines for fishes, based on relative likelihood of effects occurring, are found in: Popper, A.N., A.D. Hawkins, R.R. Fay, D,A, Mann, S. Bartol, T.J. Carlson, S. Coombs, W. T. Ellison, R.L. Gentry, M. B. Halvorsen, S. Løkkeborg, P.H. Rogers, B.L. Southall, D. G. Zeddies, and W.N.Tavolga. 2014. Sound exposure guidelines for fishes and seaturtles: a technical Report prepared by the Accredited Standards Committee, S3/SC1, Springer Briefs in Oceanography. This report is preliminary because exposure levels in the literature are often reported in decibels only and are consequently difficult to interpret. The authors emphasize that more research is clearly warranted.

Other useful, and available, references:

Dalen, J. and Knutsen, G.M. (1987) Scaring effects in fish and harmful effects on eggs, larvae and fry by offshore seismic explorations. In: Merklinger, H.M. ed. *Progress in Underwater Acoustics*. Plenum Press, NY, pp. 93–102.Govoni, J.J., L.R. Settle, and M.A. West. 2003. Trauma to juvenile pinfish and spot inflicted by submarine detonations. **Journal of Aquatic Animal Health**. 15:111-119.

Hirst A.G., and P. G. Rodhouse. 2000. Impacts of geophysical seismic surveying on fishing success. **Reviews in Fish Biology and Fisheries**. 10:113-118.

Linton, T.L., Landry, A.M. Jr., Buckner, J.E. Jr. and Berry, R.L. (1985) Effects upon selected marine organisms of explosives used for sound production in geophysical exploration. **The Texas Journal of Science 37**, 341–353.

McCauley, R.D. (1994) Environmental implications of offshore oil and gas developemnt in Australia-seismic surveys. In: Swan, J.M., Neff, J.M. and Young, P.C. eds. *Environmental Implications of Offshore Oil and Gas Development in Australia*. The Findings of an Independent Scientific Review, pp. 19–122.

Wiley, M. L., J. B. Gaspin, and J. F. Goertner. 1981. Effects of underwater explosions on fish with a dynamicalmodel to predict fishkill. **Ocean Science and Engineering** 6:223–284.

Wright, D.G. (1982) *A Discussion Paper on the Effects of Explosions Fish and Marine Mammals in the Waters of the Northwest Territories*. **Canadian Technical Report of Fisheries and Aquatic Sciences** 1052. 16 pp.

Yelverton, J. T., D. R. Richmond,W. Hicks, K. Saunders, and E. R. Fletcher. 1975. The relationship between fish size and their response to underwater blast. Defense Nuclear Agency, Washington, D.C.

John J. Govoni, Ph.D.
Member: Board of Directors - Carteret County Cross Roads

ITP Laws - NOAA Service Account <itp.laws@noaa.gov>

comments on seismic testing

1 message

CHRIS <seamason1@msn.com> Tue, Aug 4, 2015 at 2:14 PM
To: "ITP.Laws@noaa.gov" <itp.laws@noaa.gov>

Please review the attached scientific document regarding seismic testing per the 30 day public comment period. Articles such a these are a small representation of countless studies and papers published on the topic. Conclusion, Do not allow this to be conducted off the East coast of the united states.

Thank you for your consideration.

Chris Mason
356 Live oak road
Newport, NC 28570

effects of seismic surveys on marine life.pdf
587K

To:

Jolie Harrison, Chief, Permits and Conservation Division,

Office of Protected Resources, National Marine Fisheries Service,

1315 East-West Highway, Silver Spring, MD 20910

ITP.Laws@noaa.gov

From: Edward Johnson

Cannon Beach, OR. 97110

Having been involved in submitting comments on this issue for a number of years this one again is of significance because of the permits eventual impact on whales particularly the deep diving variety. A major policy shift should be undertaken by NOAA & it's Marine Fisheries Service as their responsibility being responsible for the enforcement of the Marine Mammal Protection Act & issuing of species impacting permits such as this particular request are total dichotomies. Further as new research establishes testing that identify whether or not the cause of death, when they occur, have resulted from sonar/seismic waves those tests should be performed. The work found in the following report clearly identifies those tests http://jeb.biologists.org/content/215/21/3856.full In fact those protocols established in the above have found their way into specific procedures when necropsies are performed on the Southern Resident Pod Orca Population as can be found in the following Killer Whale Necropsy Protocol (2014) http://www.seadocsociety.org/killer-whale-necropsy-protocol-2014/

Revised May 15, 2014 Killer Whale Necropsy Protocol 2014 Page 54

APPENDIX XVI Barotrauma considerations and sampling protocol for gas bubbles

These instructions are a summary of the "protocol for gas sampling and analysis in marine mammals". For further information please visit the link to this article:

http://www.nature.com/protocolexchange/protocols/2299

The

Nitrogen solubility in odontocete blubber and mandibular fats in relation to lipid composition http://jeb.biologists.org/content/218/16/2620.abstract?sid=741a5956-f991-41db-a223-c8fb5b8e602e

What follows is the document submitted by Stranded No More an organization that has & is tracking the tragedy occurring in our oceans. I have read the following document and subscribe to its tenants.

From:

StrandedNoMore

strandednomore.org

August 23, 2015

We strongly encourage you to deny the request for seismic exploration off of the Atlantic East Coast, based on available scientific evidence that both seismic surveys involving air guns and sonar used in the process could not only harm marine life physically and behaviorally, but could also lead to lethal outcomes involving stranding.

Despite the Oil and Gas industry saying that seismic surveys are harmless, we have scientific evidence pointing out a potential link between seismic surveys and stranding. Below are some cases that have been documented:

1. Galapagos 2000, beaked whales, Gentry, 2002.

2. Gulf of California, 2002, beaked whales, Malakoff, 2002

3. Madagascar, 2008, melon-headed whales, IWC, 2008

We encourage NMFS to recognize that seismic surveys could affect whales and dolphins in numerous ways, both directly and indirectly. A recent study by Tal et al. (2015) demonstrated, via experimental protocol that exposure to underwater sound can result in "Induction of neurologic damage by intense underwater sound during immersion, with a further deleterious effect when this was combined with decompression stress." Apart from a direct impact, sudden sound exposure could lead to modification of the typical ascending behavior of deep diving whales, resulting in developing bends from a fast ascent. Panic responses (with or without decompression sickness) could lead to live stranding, where whales and dolphins could die from stress induced conditions, drowning, or euthanasia.

Whales and dolphins could be affected even at low levels of underwater noise. A study by Lyamin et al. (2011) indicated that the beluga whale started showing an extremely troubling physiological response at significantly lower levels. "Our data indicates that severe tachycardia developed in the beluga at lower noise intensities (as low as 140 dB); at higher intensities, the HR could reach a twofold excess over the control values and last for no less than 4 min" (p. 278).

The industry often argues that Marine Mammal Observers have good enough mitigation measures, even though cetaceans not only spend more than 80% of their time underwater, but also tend to go silent when exposed to stimuli they perceive as threatening or unusual. Hence, neither visual observation nor using PAM (passive acoustic monitoring) could be effective enough to make sure that there are no cetaceans in the area.

Most importantly, we would like to point out that the absence of evidence is not the evidence of absence. In the Appendix below, you can see the worldwide stranding numbers we recorded this year alone, in the vicinity of seismic surveys. None of these stranding's were systematically investigated in regard to potential connection to seismic surveys. Given that the US's Stranding network (and other international networks as well) rarely engages in comprehensive and detailed investigation of stranding events occurring in the vicinity of seismic surveys or Naval exercises, it could be argued that the connection between the anthropogenic noise and stranding is seriously underestimated.

It is also important to recognize that the same area that is being considered for seismic exploration has also been included as a range for military exercises, leading to overlapping areas where marine life will be exposed to both military anthropogenic noise and seismic exploration noise.

The US's Stranding network is poorly equipped to deal with any increase in live stranding, because even now, euthanasia of stranded whales and dolphins is widespread, dolphins and whales are denied medical attention and rescue, and rehabilitation efforts with consequent release are next to none. Any increase in stranding will put an even larger strain on a network which has very poor performance as it is.

In summation, seismic surveys can affect marine mammals in several ways (that could act separately or in conjunction), including:

Directly:

1. " Neurologic damage by intense underwater sound during immersion, with a further deleterious effect when this was combined with decompression stress."

2. Decompression sickness from modified ascent

3. Panic responses leading to live stranding (baleen and toothed whales, dolphins)

4. Pulmonary edema

Indirectly:

1. Avoidance response forcing cetaceans to abandon feeding grounds

2. Sleep interruption

3. Avoidance response forcing cetaceans to go to areas they are not familiar with, i.e. whales entering rivers and bays

4. Separation of mothers and calves

5. Loss of key individuals in mass stranding (i.e. matriarch pilot whales, etc.) that could affect larger population survival abilities, as they carry important knowledge (Wade et al., 2012)

6. Impact on cetacean's prey: fish, squid.

We strongly oppose opening the entire East Coast up for seismic exploration and encourage NMFS to deny this permit.

Appendix 1.

1. April 2015, Cape Verde, pilot whales Map (not included)

2. August, 2015, Canada, mass stranding pilot whales Map (not included)

3. February 2015, Namibia, pygmy right whale Map (not included)

4. February 2015, New Zealand, mass stranding pilot whales Map (not included)

5. January, 2015, Australia, Beaked whale Map (not included)

6. January, 2015, Australia, Beaked whales Map (not included)

7. July, 2015, USA, beaked whale Map (not included)

8. June, 2015, UK, a large stranding cluster involving several species Map (not included)

9. March, 2015, Australia, mass stranding pilot whales Map (not included)

References:

Gentry, R. (2002), Mass Stranding of Beaked Whales in the Galapagos Islands, April 2000, Reports for NMFS, Available athttp://www.nmfs.noaa.gov/pr/pdfs/health/galapagos_stranding.pdf

Lyamin O.I., Korneva, S.M., Rozhnov, V.V., Mukhametov, L.M. (2011), Cardiorespiratory Changes in Beluga in Response to Acoustic Noise, Doklady Biological Sciences, Vol. 440, pp. 275–278, 704-707. Available at http://beluga.sevin-expedition.ru/netcat_files/106/57/11_Lyamin_ECG_acoustic_noise_beluga_DAN_E.pdf

Malakoff, D. (2002), Suit Ties Whale Deaths to Research Cruise, Science,

Vol. 298 no. 5594 pp. 722-723, Available athttp://www.sciencemag.org/content/298/5594/722.citation

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Paul R. Wade, Randall R. Reeves, and Sarah L. Mesnick, “Social and Behavioural Factors in Cetacean Responses to Overexploitation: Are Odontocetes Less “Resilient” Than Mysticetes?,” Journal of Marine Biology, vol. 2012, Article ID 567276, 15 pages, 2012. doi:10.1155/2012/567276

ITP Laws - NOAA Service Account <itp.laws@noaa.gov>

(no subject)

1 message

Jennifer Hartrich <jnhartrich@gmail.com>
Tue, Aug 25, 2015 at 9:29 PM
To: ITP.Laws@noaa.gov

I don't want companies surveying for oil and natural off the East Coast harassing and hurting marine life.

Jennifer Schriver

ITP Laws - NOAA Service Account <itp.laws@noaa.gov>

(no subject)

1 message

joan klemic <jekak@hotmail.com> Wed, Aug 19, 2015 at 11:20 AM
To: "ITP.Laws@noaa.gov" <ITP.Laws@noaa.gov>

Our oceans are being assaulted in so many ways and the impacts on marine life is epidemic. Please turn down the requests from IHA for seismic surveys as the damage is already well documented.

Sincerely
Jim and Joan Klemic
244 Oakleaf Drive, Pine Knoll Shores, nc 28512

ITP Laws - NOAA Service Account <itp.laws@noaa.gov>

(no subject)

1 message

edith kurie <ekurie@gmail.com>
To: ITP.Laws@noaa.gov

Sun, Aug 16, 2015 at 3:40 PM

To Jolie Harrison, chief, Permits and Conservation Division, Office of Protected Resources, National Marine Fisheries Service:

Hello,

As you may know, most of our North Carolina coastal communities, despite the governor's being in favor, oppose seismic testing and offshore drilling along our coast. Even the "air guns" which will determine whether or not our coast even contains any oil worth drilling we are against. There are migratory and local fish, crustaceans, whales, porpoises, dolphins, turtles-- all manner of sea life here. Science has proven they are capable of hearing, using sonar to communicate and find food. This blasting would seriously disorient, harm and potentially kill in its inherent intensity.

Simply because there exists little or no peer-reviewed support to this does not negate the fact that it is dangerous. Our fragile environment is already in serious peril. Please do not add to it by destroying or even slightly harming our coastline and its sea life here in North Carolina.

Thank you for your kind attention.

Sincerely,

Edith Kurie
Wilmington, North Carolina

--

Everyone you meet is fighting a battle you know nothing about. Be kind. Always.

ITP Laws - NOAA Service Account <itp.laws@noaa.gov>

"A deaf whale is a dead whale"

1 message

Susan Harman-Scott <sharmanscott@gmail.com> Mon, Aug 24, 2015 at 7:00 PM
To: itp.laws@noaa.gov

RE: Your own studies and information: RE: Your own agency's information.
http://gu.com/p/49mpx/sbl

ITP Laws - NOAA Service Account <itp.laws@noaa.gov>

Acoustics Testing off NC coast

1 message

Googi <oceanlady12004@yahoo.com> Fri, Aug 14, 2015 at 6:03 PM
To: "ITP.Laws@noaa.gov" <ITP.Laws@noaa.gov>

I would like to oppose any acoustic testing off our beautiful coast. I see that marine life may be taken incidentally during this testing and that's just not wrong. I would prefer our beautiful state to take action towards more sustainable, green energies . I understand that the studies show no real harm is done, however, I don't believe that. Even a goldfish can be harmed by tapping on its bowl.

Thank you,

Julia Bishop
Southport NC

ITP Laws - NOAA Service Account <itp.laws@noaa.gov>

against seismic testing

1 message

Pam Valente <yachtingtime@gmail.com> Mon, Aug 3, 2015 at 7:45 AM
To: ITP.Laws@noaa.gov

To Whom It Concerns: I live in Carteret County, North Carolina and I am against seismic testing in our waters because of the proven effect this kind of testing has had on marine life. We have a responsibility to protect all marine life especially endangered life and I believe there is enough evidence to prove that testing causes harm. It is my wish that these operations are not allowed. Regards, Pam Valente, 896 Sea Gate Drive, Newport, NC.

ITP Laws - NOAA Service Account <itp.laws@noaa.gov>

Ban Seismic Testing

1 message

aocchuizzo@gmail.com <aocchuizzo@gmail.com> Wed, Aug 26, 2015 at 2:58 PM
To: "ITP.Laws@noaa.gov" <ITP.Laws@noaa.gov>

Please say no to seismic testing!

· Energy resources are already in abundance
· Wildlife is being harmed by it on a mass scale – any scale is too much

Those not involved in the energy business understand that the detriments of seismic testing far outweigh any benefit of finding resources. So why is this even being considered? Stand with citizens instead of corporations and say no to allowing this type of research.

Anna Occhuizzo

Sent from my iPad

ITP Laws - NOAA Service Account <itp.laws@noaa.gov>

Coastal Review Article: Seismic Permits

1 message

Richard Rodewald <rodewalr@verizon.net> Mon, Aug 3, 2015 at 11:13 AM
To: markh@nccoast.org
Cc: ITP.Laws@noaa.gov

http://www.coastalreview.org/2015/08/agency-seeks-comments-on-seismic-permits/

I appreciate this very important article and alert. However, informed public comment should be based on additional information not provided in the article. Most importantly, the permit seekers must address directly the items of importance listed by NMSF and referenced in the article. Have the already? Public comments should carefully critique this information. In the absence of but in addition to any comments from the permit seekers, appropriate links should be provided for the permit applications as they are currently formulated and being submitted for regulatory approval. I suspect there are hyperlinks buried somewhere in the article.

Richard Rodewald
112 Soundside Lane
Manteo, NC 27954

4609 6th Street S
Arlington, VA 22204

ITP Laws - NOAA Service Account <itp.laws@noaa.gov>

Comment on Seismic Surveys

1 message

Terry Munson <tmunson@sc.rr.com> Mon, Aug 3, 2015 at 11:14 AM
To: ITP.Laws@noaa.gov

The agency may authorize the incidental taking of "small numbers" of marine mammals if the taking will have no more than a negligible impact on the species or stock. If accurate, this sentence from the article I read requesting comments invalidates BOEM's approach to permitting seismic surveys. Their goal, in their own words, is "population sustainability." That implies, first, that by their rules they are allowed to "take" an *unlimited* number of fish and marine mammals as long as they have concluded, by their own methods, that those numbers will not affect "population sustainability." Can that strange interpretation possibly be what the regulation intended?

Second, the science on population sustainability is weak. It fails to account for how seismic blasting affects the hearing of marine mammals and may play an important role in adversely affecting "sustainability." It seems irrational to me to allow BOEM, an agency charged with overseeing and managing the processes leading to seismic surveys and drilling in the Atlantic, to be seen as neutral in the relevant decision-making processes. If they disallow the blasting, they will, in effect, have failed at carrying out their presidential mandate. This does not, to me, seem to serve the goal of objectivity for which the rules were formed in the first place.

BOEM's insufficient level of seriousness about their responsibilities is reflected in their assertion that, as a "mitigation" factor, they will place a human on each survey boat to visually observe whether there are marine mammals in the area and will refrain from blasting when that is the case. Given the plan for 24/7 blasting schedules, how is this meaningful? In the daytime such visual observations accomplish very little. At night, the concept would border on comical if it were not so counter to the protection of marine mammals and fish.

Finally, BOEM's concept of "Optimum Sustainable Population (OSP)" seems to say that since natural processes have erred in the numbers of marine mammals currently in the Atlantic, we (BOEM) will impose our own, wiser conclusions on that natural process.

Terry Munson
108 Greenbriar Ave.
Pawleys Island SC 29585
843 461-6411
tmunson@sc.rr.com

ITP Laws - NOAA Service Account <itp.laws@noaa.gov>

COMMENT: permits for seismic testing off the NC coast

1 message

Janil Miller <janil.miller@duke.edu> Tue, Aug 11, 2015 at 9:46 AM
To: "ITP.Laws@noaa.gov" <ITP.Laws@noaa.gov>

The waters off of the NC coast are a particularly productive ocean environment, supporting many marine mammals as they transit to breeding and feeding habitats. The numbers of oceanic creatures affected by seismic activity, when listed, are significant. The area of exploration is also significantly larger than any previous efforts, possibly having significant deleterious effects at an exponential rate.

There are so few numbers remaining of the regal right whale; one species that has already suffered decimation by man's careless and zealous activities in previous centuries. Aren't we smarter than that in this early 21st century?

Thank you for your consideration.

Respectfully,

Janil Miller

Janil Miller, MLIS | Pearse Memorial Library | Duke University Marine Laboratory

135 Duke Marine Lab Road | Beaufort, NC 28516

(o) 252.504.7510 | (f) 252.504.7648

"All truths are easy to understand once they are discovered; the point is to discover them." –Galileo

ITP Laws - NOAA Service Account <itp.laws@noaa.gov>

Deny the request for seismic exploration off of the Atlantic East Coast

1 message

deverest.4ads@yahoo.com <deverest.4ads@yahoo.com> Mon, Aug 24, 2015 at 8:43 PM
Reply-To: deverest.4ads@yahoo.com
To: "ITP.Laws@noaa.gov" <ITP.Laws@noaa.gov>

To:
Jolie Harrison, Chief, Permits and Conservation Division,
Office of Protected Resources, National Marine Fisheries Service,
1315 East-West Highway, Silver Spring, MD 20910
ITP.Laws@noaa.gov

From:
Dan Everest
NCSU '79
Duke Univ '91
San Francisco, CA - present

August 24, 2015
We strongly encourage you to deny the request for seismic exploration off of the Atlantic East Coast, based on available scientific evidence that both seismic surveys involving air guns and sonar used in the process could not only harm marine life physically and behaviorally, but could also lead to lethal outcomes involving stranding.
Despite the Oil and Gas industry saying that seismic surveys are harmless, we have scientific evidence pointing out a potential link between seismic surveys and stranding. Below are some cases that have been documented:
1. Galapagos 2000, beaked whales, Gentry, 2002.
2. Gulf of California, 2002, beaked whales, Malakoff, 2002
3. Madagascar, 2008, melon-headed whales, IWC, 2008
We encourage NMFS to recognize that seismic surveys could affect whales and dolphins in numerous ways, both directly and indirectly. A recent study by Tal et al. (2015) demonstrated, via experimental protocol, that exposure to underwater sound can result in “Induction of neurologic damage by intense underwater sound during immersion, with a further deleterious effect when this was combined with decompression stress.” Apart from a direct impact, sudden sound exposure could lead to modification of the typical ascending behavior of deep diving whales, resulting in developing bends from a fast ascent. Panic responses (with or without decompression sickness) could lead to live stranding, where whales and dolphins could die from stress induced conditions, drowning, or euthanasia.
Whales and dolphins could be affected even at low levels of underwater noise. A study by Lyamin et al. (2011) indicated that the beluga whale started showing an extremely troubling physiological response at significantly lower levels. “Our data indicates that severe tachycardia developed in the beluga at lower noise intensities (as low as 140 dB); at higher intensities, the HR could reach a twofold excess over the control values and last for no less than 4 min” (p. 278).
The industry often argues that Marine Mammal Observers have good enough mitigation measures, even though cetaceans not only spend more than 80% of their time underwater, but also tend to go silent when exposed to stimuli they perceive as threatening or unusual. Hence, neither visual observation nor using PAM (passive acoustic monitoring) could be effective enough to make sure that there are no

cetaceans in the area.

Most importantly, we would like to point out that the absence of evidence is not the evidence of absence. In the Appendix below, you can see the worldwide stranding numbers we recorded this year alone, in the vicinity of seismic surveys. None of these stranding's were systematically investigated in regard to potential connection to seismic surveys. Given that the US's Stranding network (and other international networks as well) rarely engages in comprehensive and detailed investigation of stranding events occurring in the vicinity of seismic surveys or Naval exercises, it could be argued that the connection between the anthropogenic noise and stranding is seriously underestimated.

It is also important to recognize that the same area that is being considered for seismic exploration has also been included as a range for military exercises, leading to overlapping areas where marine life will be exposed to both military anthropogenic noise and seismic exploration noise.

The US's Stranding network is poorly equipped to deal with any increase in live stranding, because even now, euthanasia of stranded whales and dolphins is widespread, dolphins and whales are denied medical attention and rescue, and rehabilitation efforts with consequent release are next to none. Any increase in stranding will put an even larger strain on a network which has very poor performance as it is.

In summation, seismic surveys can affect marine mammals in several ways (that could act separately or in conjunction), including:

Directly:

1. " Neurologic damage by intense underwater sound during immersion, with a further deleterious effect when this was combined with decompression stress."
2. Decompression sickness from modified ascent
3. Panic responses leading to live stranding (baleen and toothed whales, dolphins)
4. Pulmonary edema

Indirectly:

1. Avoidance response forcing cetaceans to abandon feeding grounds
2. Sleep interruption
3. Avoidance response forcing cetaceans to go to areas they are not familiar with, i.e. whales entering rivers and bays
4. Separation of mothers and calves
5. Loss of key individuals in mass stranding (i.e. matriarch pilot whales, etc.) that could affect larger population survival abilities, as they carry important knowledge (Wade et al., 2012)
6. Impact on cetacean's prey: fish, squid.

We strongly oppose opening the entire East Coast up for seismic exploration and encourage NMFS to deny this permit.

Appendix 1.

1. **April 2015, Cape Verde, pilot whales**
2. **August, 2015, Canada, mass stranding pilot whales**
3. **February 2015, Namibia, pygmy right whale**
4. **February 2015, New Zealand, mass stranding pilot whales**
5. **January, 2015, Australia, Beaked whale**
6. **January, 2015, Australia, Beaked whales**
7. **July, 2015, USA, beaked whale**
8. **June, 2015, UK, a large stranding cluster involving several species**
9. **March, 2015, Australia, mass stranding pilot whales**

References:

Gentry, R. (2002), Mass Stranding of Beaked Whales in the Galapagos Islands, April 2000, Reports for NMFS, Available athttp://www.nmfs.noaa.gov/pr/pdfs/health/galapagos_stranding.pdf

Lyamin O.I., Korneva, S.M., Rozhnov, V.V., Mukhametov, L.M. (2011), Cardiorespiratory Changes in Beluga in Response to Acoustic Noise, Doklady Biological Sciences, Vol. 440, pp. 275–278, 704-707. Available at http://beluga.sevin-expedition.ru/netcat_files/106/57/11_Lyamin_ECG_acoustic_

noise_beluga_DAN_E.pdf
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Vol. 298 no. 5594 pp. 722-723, Available athttp://www.sciencemag.org/content/298/5594/722.citation
Tal, D., Shachar-Bener, H., Hershkovitz, D., Arieli, Y., & Shupak, A. (2015). Evidence for the initiation of decompression sickness by exposure to intense underwater sound. *Journal of neurophysiology*, jn-00466.
Paul R. Wade, Randall R. Reeves, and Sarah L. Mesnick, “Social and Behavioural Factors in Cetacean Responses to Overexploitation: Are Odontocetes Less “Resilient” Than Mysticetes?,” Journal of Marine Biology, vol. 2012, Article ID 567276, 15 pages, 2012. doi:10.1155/2012/567276

ITP Laws - NOAA Service Account <itp.laws@noaa.gov>

I oppose Seismic Testing and Oil Drilling off NC Coast

1 message

M Susan <susankiwi15@gmail.com> Mon, Aug 17, 2015 at 10:16 AM
To: ITP.Laws@noaa.gov

Dear Jolie Harrison,

I oppose seismic testing and oil drillingoff the NC coast..

I have lived in Beaufort since 1979, more than half my life, and I come
from the Chesapeake Bay.

Offshore NC, the fisheries are the most diverse and abundant in the world.
Oil would ruin commercial and recreational fishing— i.e., the coastal
economy. As well as natural systems.

Seismic testing is many times louder than an aircraft taking off--Continuously
for months, by 4 companies. The noise would drive away whales, and
damage their sonar. Whales can hear the seismic noise for 2,000 miles.
Seismic would damage all fish.

After the BP spill, scientists along the NC coast were worried that oil would get
entrained in the Gulf Stream and reach NC shores. Just off our county, spills are
inevitable and LEAKS happen daily. Len Pietrafesa's modelling at 30, 40, and 50
miles offshore shows that oil would hit our beaches and enter our estuaries.

When the drilling stops, the rigs still offer huge risk to our coast— for decades, forever.
After the Santa Barbara oil spill in 1969, the oil-drilling rig was capped and
abandoned.
http://response.restoration.noaa.gov/about/media/45-years-after-santa-barbara-oil-spill-looking-historic-disaster-through-technology.htmlThis year
Yet, this year, Santa Barbara had another oil spill when an old pipeline broke.
http://www.huffingtonpost.com/2015/05/22/santa-barbara-oil-spill_n_7418010.html

Offshore NC, the fisheries are the most diverse and abundant in the world.
Oil would ruin commercial and recreational fishing— i.e., the Carteret
County economy. As well as natural systems.

Seismic testing is 20 times louder than an aircraft taking off. Continuously
for months, by 4 companies. The noise would drive away whales, and
damage their sonar. Whales can hear the seismic noise for 2,000 miles.
Seismic would damage all fish.

Economically, the NC Coast bears all the risks for none of the benefits.
After *Deepwater Horizon* spill BP paid $18 billion in damages, the maximum
the entire NC Coast would receive is capped at $75 million.
There is NO REVENUE SHARING.
The amount of oil offshore would supply no more than 3 percent of the national
daily need. and would last only about 3 years.

Currently, the US has an oil surplus, so >30,000 oil workers are laid off.
What can happen in NC is that all those oil-industry workers from Louisiana
and Texas will take the jobs in NC. When they are laid off again, inevitably,
they will like it here and stay in NC, and we will have to pay their unemployment.

When I worked as Environmental Scientist for NC Coastal Management 1980-82,
I participated in an Oil Spill Response study. This study is more than 30 years old.

Rooney-Char, Ann Hayward, Virginia Institute of Marine Science, and NOAA Hazardous Materials Response Project (U.S.). 1983.
ESI atlas of North Carolina: an atlas illustrating the sensitivity of the coastal environment to spilled oil. [Columbia, S.C.]: Research Planning Institute, Inc. GE155.N8 E75 1983

We are not prepared for a spill— neither government or industry.
One of our Carteret County scientists was part of the Oil Spill Response after the BP Spill.
Because of lack of preparation, no ships, paperwork, infrastructure delays,
it took THREE MONTHS before any scientists actually arrived to assess the damage.

thank you for protecting us: Carteret County citizens, business, and
the beautiful fish, birds, marine mammals who are our neighbors

VOTE AGAINST SEISMIC TESTING AND OIL DRILLING

Susan Schmidt, PhD
Beaufort Writing Group Developmental Editor
1527 Ann St
Beaufort, NC 28516
susankiwi15@gmail.com
(252)269-0032
www.susanschmidt.net

ITP Laws - NOAA Service Account <itp.laws@noaa.gov>

I oppose seismic testing off NC coast ATT Julie Harrison

1 message

Keely Wood <keely@bionaturae.com> Tue, Aug 4, 2015 at 1:12 PM
To: "ITP.Laws@NOAA.gov" <ITP.Laws@noaa.gov>

Ms Harrison,

I am writing to you as a resident of NC, that pays NC taxes.

DO not allow seismic testing off the NC Coast. It will impact the marine species & populations. The manatee is making a comeback in NC.

The hump back whale and the blue whale are both endangered species and need to be protected. Seismic testing will hurt & kill the marine life, and effect tourism.

NC residents don't want off shore drilling.

Keely Wood

Euro USATrading Co.Inc/bionaturae & **Jovial**

Eastern & Central Sales Manager

919-708-5221

www.jovialfoods.com

www.bionaturae.com

ITP Laws - NOAA Service Account <itp.laws@noaa.gov>

INCIDENTAL HARASSMENT AUTHORIZATION, REQUEST FOR COMMENTS AND INFORMATION

1 message

Anita Francis <francianita@gmail.com> Mon, Aug 3, 2015 at 3:41 PM
To: ITP.Laws@noaa.gov

HELLO,

AS A COASTAL RESIDENT OF BEAUFORT, NC, I DO NOT AGREE WITH THE GEOGRAPHICAL AND GEOPHYSICAL SURVEY ACTIVITIES IN THE ATLANTIC OCEAN,

WHICH ARE IN SUPPORT OF OIL AND GAS EXPLORATION AND DEVELOPMENT, AS ARE PROPOSED IN THE MMPA APPLICATIONS BEFORE NMFS.

IT IS MY OPINION THAT GEOGRAPHICAL AND GEOPHYSICAL SURVEYING, SEISMIC TESTING, AND OFFSHORE DRILLING ARE ACTIVITIES THAT RUN COUNTER

TO THE HEALTH AND SAFETY OF OUR COMMUNITY AND OF FUTURE GENERATIONS.

SINCERELY,

ANITA FRANCIS

667 WEST BEAUFORT ROAD

BEAUFORT, NC 28516

ITP Laws - NOAA Service Account <itp.laws@noaa.gov>

My two cents worth

1 message

Richard <richardaugustson@gmail.com> Wed, Aug 5, 2015 at 8:54 PM
To: "ITP.Laws@noaa.gov" <ITP.Laws@noaa.gov>

I am opposed to any seismic testing off of the NC coast. I am a life long resident of Hatteras Island as were my decedents going way back. At this point, the majority of residents don't want anything to do with oil or gas drilling here. There is too much of a risk to our eco-system and our tourism economy. Personally I am more concerned for any effects it might have on marine mammals. Any more stress to the balance of life already threatened is in my opinion backwards.
There's plenty of oil still in the Middle East and Texas. Better yet, there's more potential energy coming from the sun so maybe it would be money better spent investing in that or wind.
Thank you for the opportunity to comment.

Richard Augustson

Sent from my iPad

ITP Laws - NOAA Service Account <itp.laws@noaa.gov>

NO NO NO NO NO to Seismic Airgun Testing in the Atlantic Ocean

1 message

Brenda Owens <bjbowens@gmail.com> Wed, Aug 26, 2015 at 11:19 AM
To: ITP.Laws@noaa.gov

August 26, 2015

Jolie Harrison, Chief
Permits and Conservation Division
Office of Protected Resources,
National Marine Fisheries Service.

RE: Federal regulators have provided a 30-day public review and comment period before acting on applications related to proposed seismic surveys for oil and natural gas off the Atlantic coast. A decision on whether to issue the permits could come by the end of the year.
The National Marine Fisheries Service, or NMFS, has filed notice on four requests for permits from companies which are planning seismic surveys of the Atlantic Ocean for oil and natural gas. If permitted, they incidentally harass animals protected by the federal Marine Mammal Protection Act.

Top 5 Reasons to DENY Permits for Seismic Airgun Testing
1. We have to stop destroying the ecosystems for all life on Earth by continuing the destructive and deadly means of fossil fuel & natural gas extraction.
2. Violation of Marine Mammal Protection Act.
3. Violation of Common Sense & Humane Ethics.
4. Egregious disregard for lessons learned from the Deepwater Horizon tap blowout & massive uncontrollable oil spill that continues to kill marine life in the Gulf of Mexico.
5. We can no longer allow the pursuit and use of petroleum products to take precedence over the immediate & desperate need to build clean sustainable energy sources that will provide much-needed jobs and boost the economy in ways that take the future of Life on Earth into consideration.

Climate science has proven that Global Warming is real and we much take action to prevent and lessen our human contribution to reverse the decline to our future demise. “SAVE the WHALES!”. Consider the undermining of Protection of Endangered Sea Turtles. Are we to kill off everything on planet Earth in pursuit of profits for oil and gas companies? Could we have a look as responsible stewardship of our only currently inhabitable planet? Can we stop the madness before it's too late? Like NOW?

Please do not grant these or future permits for seismic or other testing that would sacrifice ocean life. We need to conserve life, not destroy what is left of our oceans and atmosphere. You have the ability to prevent this mayhem of degradation, destruction and death.

Thank you very much.
Brenda Owens
EcoLuxe Travels
Fernandina Beach, FL

Brenda Owens
Certified *Romance Travel* Consultant

EcoLuxe Travels
Sustainable Adventure Travel Specialist
ecoluxetravels@gmail.com
(678)768-6926

ITP Laws - NOAA Service Account <itp.laws@noaa.gov>

NO seismic testing

1 message

Chris Occhuizzo <chrisocc1946@gmail.com> Wed, Aug 26, 2015 at 12:07 PM
To: ITP.Laws@noaa.gov

Please say no to seismic testing!

- Energy resources are already in abundance
- Wildlife will be harmed on a mass scale – any scale is too much
- Many, many cities and states along the eastern seaboard have already adopted resolutions against seismic testing

Why is this even being considered ??!! Make a stand. Say NO !

Best regards,

Chris

Chris Occhuizzo, Financial Planner

1585 Canopy Dr.

Fernandina Beach, FL 32034

(904) 432-7720

ITP Laws - NOAA Service Account <itp.laws@noaa.gov>

NO to Offshore Drilling in NC

1 message

Christian Nophsker <chris@gcp.com>
To: ITP.Laws@noaa.gov

Fri, Aug 28, 2015 at 5:21 PM

To: Jolie Harrison, Chief, Permits and Conservation Division,

Office of Protected Resources, National Marine Fisheries Service,

1315 East-West Highway, Silver Spring, MD 20910

August 28, 2015

We strongly encourage you to deny the request for seismic exploration off of the Atlantic East Coast, based on available scientific evidence that both seismic surveys involving air guns and sonar used in the process could not only harm marine life physically and behaviorally, but could also lead to lethal outcomes involving stranding.

Despite the Oil and Gas industry saying that seismic surveys are harmless, we have scientific evidence pointing out a potential link between seismic surveys and stranding. Below are some cases that have been documented:

1. Galapagos 2000, beaked whales, Gentry, 2002.

2. Gulf of California, 2002, beaked whales, Malakoff, 2002

3. Madagascar, 2008, melon-headed whales, IWC, 2008

We encourage NMFS to recognize that seismic surveys could affect whales and dolphins in numerous ways, both directly and indirectly. A recent study by Tal et al. (2015) demonstrated, via experimental protocol, that exposure to underwater sound can result in "Induction of neurologic damage by intense underwater sound during immersion, with a further deleterious effect when this was combined with decompression stress." Apart from a direct impact, sudden sound exposure could lead to modification of the typical ascending behavior of deep diving whales, resulting in developing bends from a fast ascent. Panic responses (with or without decompression sickness) could lead to live stranding, where whales and dolphins could die from stress induced conditions, drowning, or euthanasia.

Whales and dolphins could be affected even at low levels of underwater noise. A study by Lyamin et al. (2011) indicated that the beluga whale started showing an extremely troubling physiological response at significantly lower levels. "Our data indicates that severe tachycardia developed in the beluga at lower noise intensities (as low as 140 dB); at higher intensities, the HR could reach a twofold excess over the control values and last for no less than 4 min" (p. 278).

The industry often argues that Marine Mammal Observers have good enough mitigation measures, even though cetaceans not only spend more than 80% of their time underwater, but also tend to go silent when exposed to stimuli they perceive as threatening or unusual. Hence, neither visual observation nor using PAM (passive acoustic monitoring) could be effective enough to make sure that there are no cetaceans in the area.

Most importantly, we would like to point out that the absence of evidence is not the evidence of absence. In the Appendix below, you can see the worldwide stranding numbers we recorded this year alone, in the vicinity of seismic surveys. None of these stranding's were systematically investigated in regard to potential connection to seismic surveys. Given that the US's Stranding network (and other international networks as well) rarely engages in comprehensive and detailed investigation of stranding events occurring in the vicinity of seismic surveys or Naval exercises, it could be argued that the connection between the anthropogenic noise and stranding is seriously underestimated.

It is also important to recognize that the same area that is being considered for seismic exploration has also been included as a range for military exercises, leading to overlapping areas where marine life will be exposed to both military anthropogenic noise and seismic exploration noise.

The US's Stranding network is poorly equipped to deal with any increase in live stranding, because even now, euthanasia of stranded whales and dolphins is widespread, dolphins and whales are denied medical attention and rescue, and rehabilitation efforts with consequent release are next to none. Any increase in stranding will put an even larger strain on a network which has very poor performance as it is.

In summation, seismic surveys can affect marine mammals in several ways (that could act separately or in conjunction), including:

Directly:

1. ” Neurologic damage by intense underwater sound during immersion, with a further deleterious effect when this was combined with decompression stress.”

2. Decompression sickness from modified ascent

3. Panic responses leading to live stranding (baleen and toothed whales, dolphins)

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Indirectly:

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6. Impact on cetacean’s prey: fish, squid.

We strongly oppose opening the entire East Coast up for seismic exploration and encourage NMFS to deny this permit.

Appendix 1.

1. April 2015, Cape Verde, pilot whales

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5. January, 2015, Australia, Beaked whale

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8. June, 2015, UK, a large stranding cluster involving several species

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References:

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all the best,
Christian

Christian Nophsker

252 -256-1372 mobile | gcp.com

ITP Laws - NOAA Service Account <itp.laws@noaa.gov>

No to seismic testing

1 message

Diane Lea <diane.lea@me.com>
Thu, Aug 6, 2015 at 7:24 AM

To: "ITP.Laws@noaa.gov" <ITP.Laws@noaa.gov>

Too much damage to fish & wildlife. Can further disrupt the natural environment & state economy that depends on it. Diane Lea

Sent from my iPhone

ITP Laws - NOAA Service Account <itp.laws@noaa.gov>

No to Seismic testing-please

1 message

Gina Young <gyoung55@hotmail.com> Mon, Aug 24, 2015 at 10:14 AM
To: "ITP.Laws@noaa.gov" <ITP.Laws@noaa.gov>

I strongly encourage you to deny the request for seismic exploration off of the Atlantic East Coast, based on available scientific evidence that both seismic surveys involving air guns and sonar used in the process could not only harm marine life physically and behaviorally, but could also lead to lethal outcomes involving stranding.
Despite the Oil and Gas industry saying that seismic surveys are harmless, we have scientific evidence pointing out a potential link between seismic surveys and stranding. Below are some cases that have been documented:

1. Galapagos 2000, beaked whales, Gentry, 2002.

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We encourage NMFS to recognize that seismic surveys could affect whales and dolphins in numerous ways, both directly and indirectly. A recent study by Tal et al. (2015) demonstrated, via experimental protocol, that exposure to underwater sound can result in “Induction of neurologic damage by intense underwater sound during immersion, with a further deleterious effect when this was combined with decompression stress.” Apart from a direct impact, sudden sound exposure could lead to modification of the typical ascending behavior of deep diving whales, resulting in developing bends from a fast ascent. Panic responses (with or without decompression sickness) could lead to live stranding, where whales and dolphins could die from stress induced conditions, drowning, or euthanasia.

Whales and dolphins could be affected even at low levels of underwater noise. A study by Lyamin et al. (2011) indicated that the beluga whale started showing an extremely troubling physiological response at significantly lower levels. “Our data indicates that severe tachycardia developed in the beluga at lower noise intensities (as low as 140 dB); at higher intensities, the HR could reach a twofold excess over the control values and last for no less than 4 min” (p. 278).

The industry often argues that Marine Mammal Observers have good enough mitigation measures, even though cetaceans not only spend more than 80% of their time underwater, but also tend to go silent when exposed to stimuli they perceive as threatening or unusual. Hence, neither visual observation nor using PAM (passive acoustic monitoring) could be effective enough to make sure that there are no cetaceans in the area.

Most importantly, we would like to point out that the absence of evidence is not the evidence of absence. In the Appendix below, you can see the worldwide stranding numbers we recorded this year alone, in the vicinity of seismic surveys. None of these stranding’s were systematically investigated in regard to potential connection to seismic surveys. Given that the US’s Stranding network (and other international networks as well) rarely engages in comprehensive and detailed investigation of stranding events occurring in the vicinity of seismic surveys or Naval exercises, it could be argued that the connection between the anthropogenic noise and stranding is seriously underestimated.

It is also important to recognize that the same area that is being considered for seismic exploration has also been included as a range for military exercises, leading to overlapping areas where marine life will be exposed to both military anthropogenic noise and seismic exploration noise.

The US’s Stranding network is poorly equipped to deal with any increase in live stranding, because even now, euthanasia of stranded whales and dolphins is widespread, dolphins and whales are denied medical attention and rescue, and rehabilitation efforts with consequent release are next to none. Any increase in stranding will put an even larger strain on a network which has very poor performance as it is.

In summation, seismic surveys can affect marine mammals in several ways (that could act separately or in conjunction), including:

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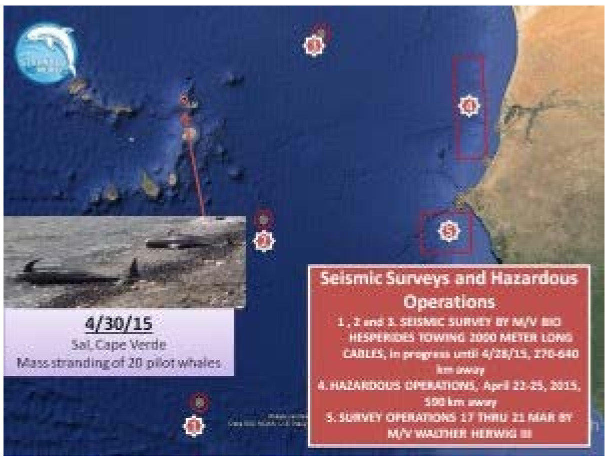

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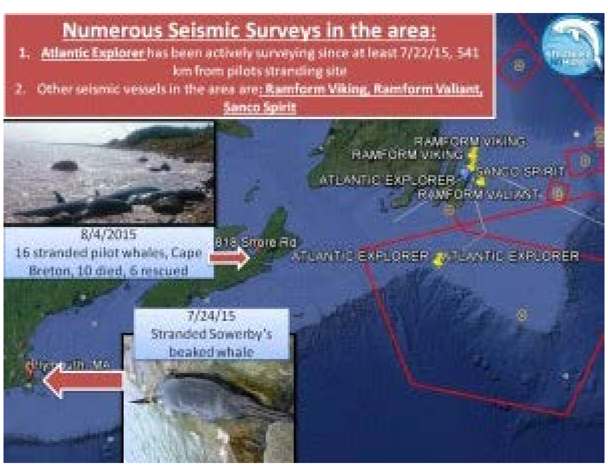

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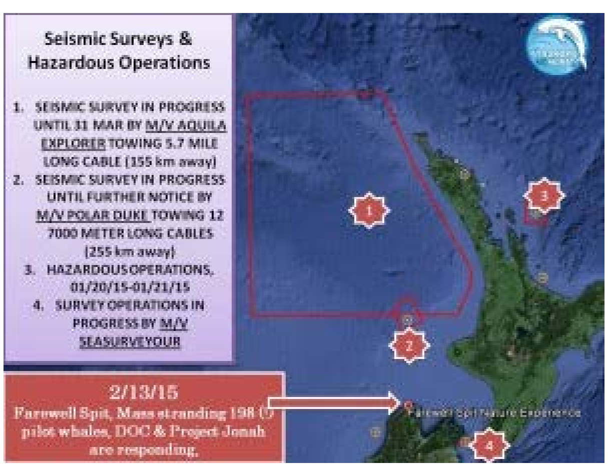

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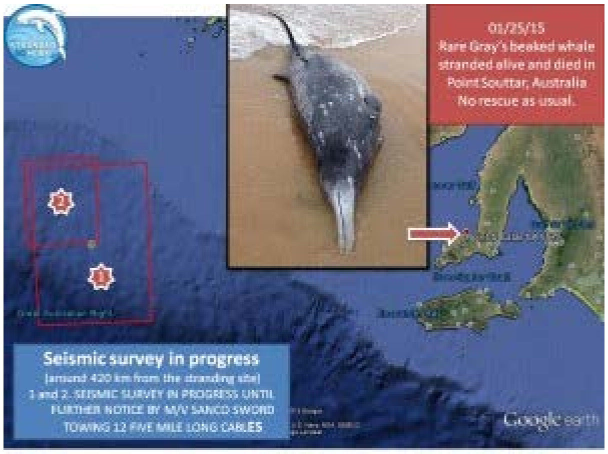

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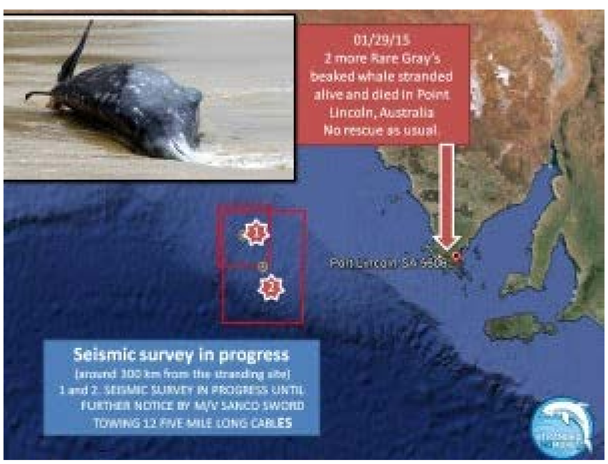

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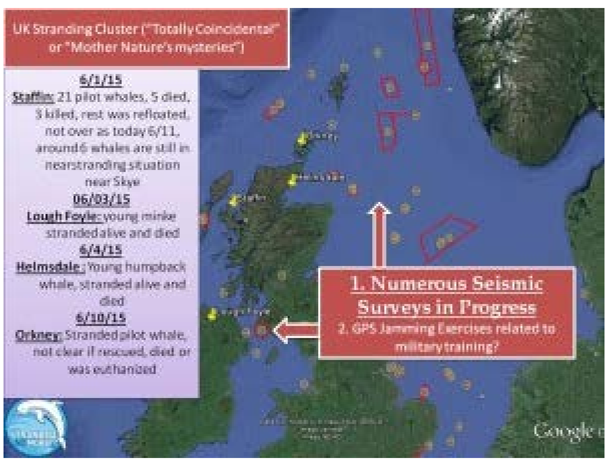

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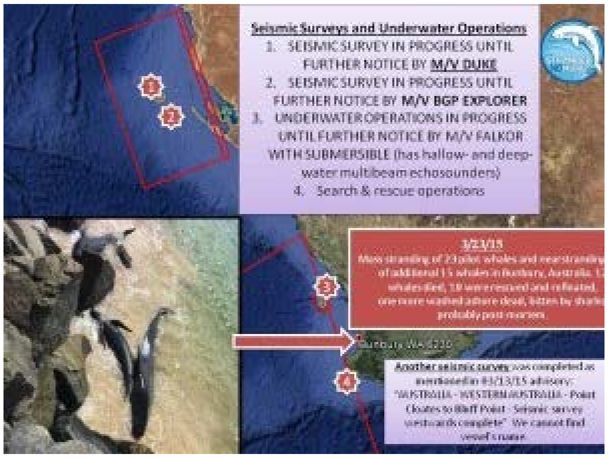

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Sent from my iPhone

ITP Laws - NOAA Service Account <itp.laws@noaa.gov>

No! dont do it!

1 message

Ashlesha Modi <ashleshamodi@gmail.com> Fri, Aug 28, 2015 at 11:51 AM
To: ITP.Laws@noaa.gov

Greed and wealth are a massive motivation. I do not care to line the already FAT pockets of these companies interested in destroying my shoreline. Oops is not a sufficient response, and large advertising budgets, such as BP's, to make the "masses" think everything is A OK, does not take away my reality. Im not an activists, Im not a political m9ver and shaker, and Im not employed by PETA or any other animal rights or environmental rights group. I am a simple person with enough sense to know that I will be beyond outraged at an apology for any, almost certain, mistakes that will occur. Time and time we have seen the damage and destruction of this type of work. Id rather bike an hour to work than have fat cats destroy my beautiful shoreline.
I cant be more clear. I have watched the death of endangered species, so we can expand the shore to please tourist, now we will destroy many more intelligent and endangered animals so the rich can get richer?
Do not permit this activity. We have enough places in the world that have been raped by humans. This tragedy of the commons can be stopped before it starts.
Make a difference. Make a choice that is not just in the interest of a few humans, but in the interest of the world we live in.
Sincerely,
A very distressed costal resident.

ITP Laws - NOAA Service Account <itp.laws@noaa.gov>

Please do not grant permits

1 message

Cheryl Duttweiler <cbdutt@comcast.net>
Wed, Aug 26, 2015 at 6:16 AM
To: ITP.laws@noaa.gov, ITP.Laws@noaa.gov

Do not grant the four requests for permits from companies which are planning seismic surveys of the Atlantic Ocean for oil and natural gas. They incidentally harass animals protected by the federal Marine Mammal Protection Act. Please do not let this happen in the Florida waters. Thank you.

Cheryl Brodie Duttweiler, MS, LPC
706-495-5968 Cell Phone
904-277-8070 Home Phone

ITP Laws - NOAA Service Account <itp.laws@noaa.gov>

Re: seismic testing in the Atlantic

1 message

Chris Howard <chrisfhoward@hotmail.com>
To: "ITP.Laws@noaa.gov" <itp.laws@noaa.gov>

Tue, Aug 25, 2015 at 1:43 PM

To: Jolie Harrison,

I understand that you are taking public comments pertaining to proposed seismic testing. It is my belief that we are called to be compassionate and responsible stewards of this planet. Everything I have read on the subject of this testing suggest to me that the harm it is likely to cause far outweighs any possible gain, and that the possible gain is much more negligible.

Please take this option off the table!

Sincerely,

Chris Howard

ITP Laws - NOAA Service Account <itp.laws@noaa.gov>

Reasons to deny seismic testing permits

1 message

LInda Mcgowen <eimcgowen@gmail.com> Wed, Aug 5, 2015 at 9:31 PM
To: "ITP.Laws@noaa.gov" <ITP.Laws@noaa.gov>

Even the EIS conducted by BOEM concludes that there would be “minor to negligible” impact to most wildlife, with the exception of marine mammals and turtles, for which impact could be “moderate.” The review estimates that about 138,000 marine animals could be injured in some way, and perhaps 13.6 million could have their migration, feeding, or other behavioral patterns disrupted by the seismic surveys. Is this really what we want happening off our pristine coast?

The air guns operate in broadband, producing a large range of frequencies, both high and low.The higher pitched sounds don’t provide useful information to the surveyors, but they can damage dolphins’ hearing and disrupt their behavior. BOEM proposes spacing air-gun surveys at least 25 miles (40 kilometers) apart to reduce their cumulative impact, but sounds in the ocean can travel much greater distances. The sound of air guns can disturb marine mammal behavior over 100 miles away.

Seismic surveying off the southwest coast of Africa in recent years has been linked to the disruption of migrating tuna and consequently a dramatic decline in catches off the coast of Namibia. Many species fished in the mid- and south Atlantic—including wahoo, swordfish, and billfishes—embark on long-distance migrations. This means that any impacts of air-gun surveys are likely to spread beyond the survey area itself. Fish eggs and larvae can be killed by intense sound, and the the growth of young scallops is also affected.

Please deny these seismic testing permits to protect sea life and our coastal habitat!

Linda McGowen

Emerald Isle, NC

ITP Laws - NOAA Service Account <itp.laws@noaa.gov>

seismec testing North Carolina

1 message

don pierce <captaindp@bellsouth.net>
Reply-To: don pierce <captaindp@bellsouth.net>
Thu, Aug 13, 2015 at 3:21 PM
To: "ITP.LAWS@noaa.gov" <ITP.LAWS@noaa.gov>

My name is Don Pierce and I am a life long resident of coastal North Carolina. Please, please do not let any seismic testing begin or allowed off of our coast. I have a masters captains license and have spent much of my life in the ocean. This would be a terrible mistake for North Carolina and for the whole east coast to do the testing and then start drilling for oil. We are a tourist based economy and one spill is all it would take to put a huge blow in all our livelyhoods. The risks are not worth the supposed rewards. I don't think the oil companies have our best interest in mind.

Don Pierce

ITP Laws - NOAA Service Account <itp.laws@noaa.gov>

Seismic blasting Atlantic

1 message

Sherry Carter <sherrygarbarini@gmail.com> Tue, Aug 25, 2015 at 11:00 AM
To: "ITP.Laws@noaa.gov" <ITP.Laws@noaa.gov>

Very concerned for the stress that will reverberate to all of life including humans that seismic blasting will initiate. It seems the message we are sending lately is no respect for life. This disrespect for life has taken over the earth in all societies. It shows in all arenas.
To continue this behavior will most definitely be the end for human beings. The earth will recover but we will no longer be here.
High profile murder, rape, road rage and slaughter is in every headline across the globe. The stress we put on our quality of life is already showing its intentions.
STOP THIS MADNESS NOW!
NO TO SEISMIC BLASTING!

Sent from my iPad Sherry Roberteen

ITP Laws - NOAA Service Account <itp.laws@noaa.gov>

Seismic Blasting in NC

1 message

Susan Harman-Scott <sharmanscott@gmail.com> Mon, Aug 24, 2015 at 6:46 PM
To: ITP.Laws@noaa.gov

To:

Jolie Harrison, Chief, Permits and Conservation Division,

Office of Protected Resources, National Marine Fisheries Service,

1315 East-West Highway, Silver Spring, MD 20910

ITP.Laws@noaa.gov

From: Susan H. Scott

August 28, 2015

As a year-round resident, business person, taxpayer, and property owner living in Nags Head, Dare County, North Carolina, I would ask that you deny the seismic blasting permits requested by these global businesses. The permitting will result in immediate and future permanent damage to our property values, coastal economy, and personal safety. Those of you who vacation here on the Outer Banks will find them much less appealing once this testing reaches its logical conclusion.

We strongly encourage you to deny the request for seismic exploration off of the Atlantic East Coast, based on available scientific evidence that both seismic surveys involving air guns and sonar used in the process could not only harm marine life physically and behaviorally, but could also lead to lethal outcomes involving stranding.

Despite the Oil and Gas industry saying that seismic surveys are harmless, we have scientific evidence pointing out a potential link between seismic surveys and stranding. Below are some cases that have been documented:

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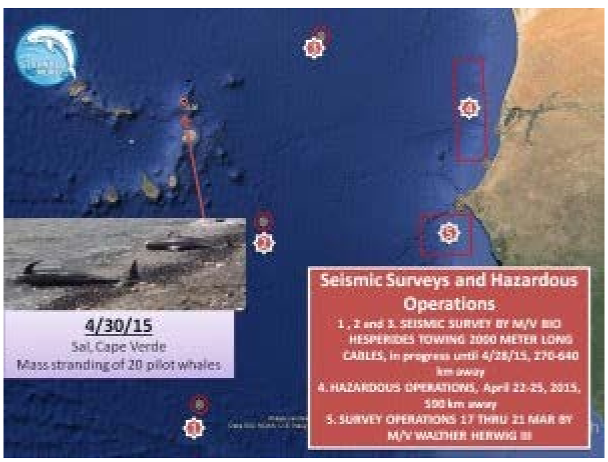

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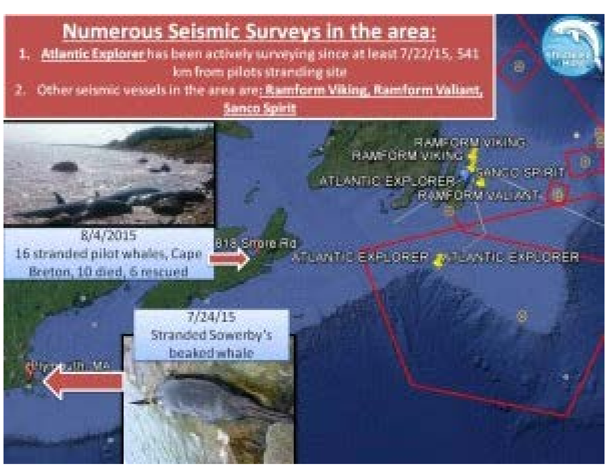

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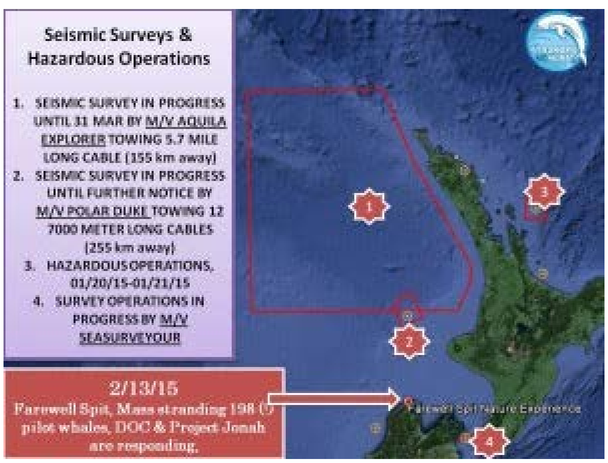

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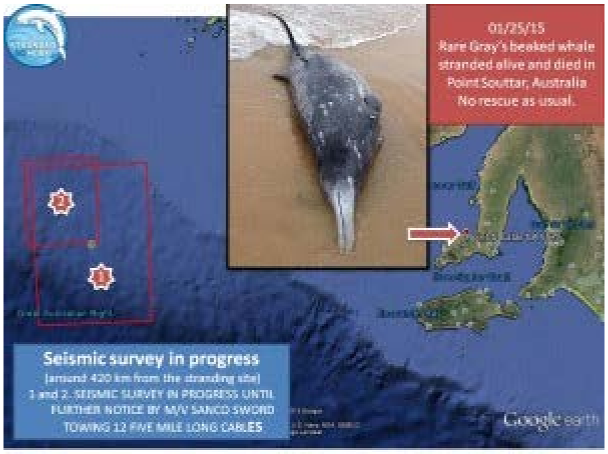

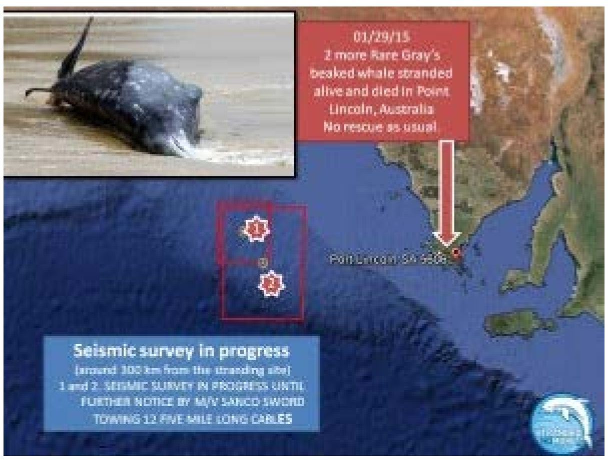

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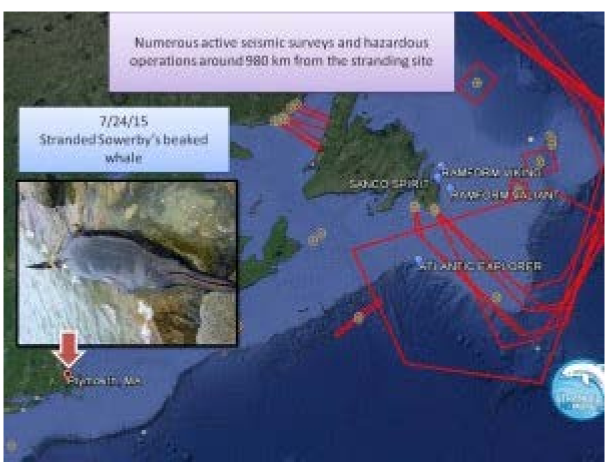

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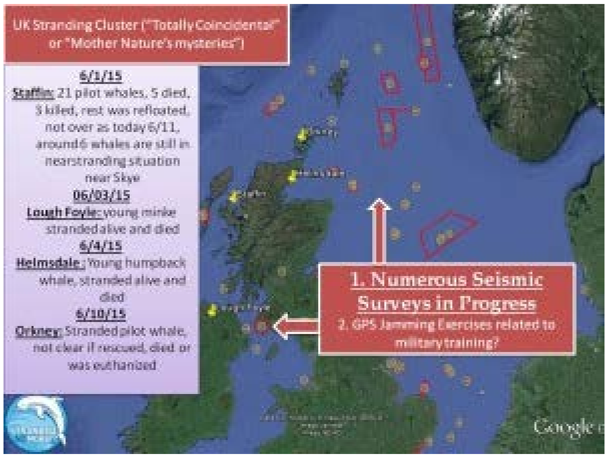

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ITP Laws - NOAA Service Account <itp.laws@noaa.gov>

seismic exploration off of the Atlantic East Coast

1 message

Alice Armstrong <aarmstrong4@nc.rr.com>
To: "ITP.Laws@noaa.gov" <ITP.Laws@noaa.gov>

Mon, Aug 24, 2015 at 7:19 PM

To:

Jolie Harrison, Chief, Permits and Conservation Division,Office of Protected Resources, National Marine Fisheries Service

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Whales and dolphins could be affected even at low levels of underwater noise. A study by Lyamin et al. (2011) indicated that the beluga whale started showing an extremely troubling physiological response at significantly lower levels. “Our data indicates that severe tachycardia developed in the beluga at lower noise intensities (as low as 140 dB); at higher intensities, the HR could reach a twofold excess over the control values and last for no less than 4 min” (p. 278).

The industry often argues that Marine Mammal Observers have good enough mitigation measures, even though cetaceans not only spend more than 80% of their time underwater, but also tend to go silent when exposed to stimuli they perceive as threatening or unusual. Hence, neither visual observation nor using PAM (passive acoustic monitoring) could be effective enough to make sure that there are no cetaceans in the area.

Most importantly, i would like to point out that the absence of evidence is not the evidence of absence. In the Appendix below, you can see the worldwide stranding numbers we recorded this year alone, in the vicinity of seismic surveys. None of these stranding’s were systematically investigated in regard to potential connection to seismic surveys. Given that the US’s Stranding network (and other international networks as well) rarely engages in comprehensive and detailed investigation of stranding events occurring in the vicinity of seismic surveys or Naval exercises, it could be argued that the connection between the anthropogenic noise and stranding is seriously underestimated.

It is also important to recognize that the same area that is being considered for seismic exploration has also been included as a range for military exercises, leading to overlapping areas where marine life will be exposed to both military anthropogenic noise and seismic exploration noise.

The US’s Stranding network is poorly equipped to deal with any increase in live stranding, because even now, euthanasia of stranded whales and dolphins is widespread, dolphins and whales are denied medical attention and rescue, and rehabilitation efforts with consequent release are next to none. Any increase in stranding will put an even larger strain on a network which has very poor performance as it is.

In summation, seismic surveys can affect marine mammals in several ways (that could act separately or in conjunction), including:

Directly:

1. " Neurologic damage by intense underwater sound during immersion, with a further deleterious effect when this was combined with decompression stress."

2. Decompression sickness from modified ascent

3. Panic responses leading to live stranding (baleen and toothed whales, dolphins)

4. Pulmonary edema

Indirectly:

1. Avoidance response forcing cetaceans to abandon feeding grounds

2. Sleep interruption

3. Avoidance response forcing cetaceans to go to areas they are not familiar with, i.e. whales entering rivers and bays

4. Separation of mothers and calves

5. Loss of key individuals in mass stranding (i.e. matriarch pilot whales, etc.) that could affect larger population survival abilities, as they carry important knowledge (Wade et al., 2012)

6. Impact on cetacean's prey: fish, squid.

I strongly oppose opening the entire East Coast up for seismic exploration and encourage NMFS to deny this permit.

Thank you

Alice Armstrong

2708 Forest Creek Road

Chapel Hill, NC

ITP Laws - NOAA Service Account <itp.laws@noaa.gov>

Seismic Surveys along the Atlantic

1 message

Henry Croom <henrycroom192@gmail.com> Tue, Aug 25, 2015 at 10:51 AM

To: ITP.Laws@noaa.gov

I urge you to not approve what Cornell University's bioaccoustic lab has called the most intrusive harmful sound known to marine animals and habitat. I have listened to proponents, opponents, done my own research and based on my current understanding, I have come to the following conclusions:

1. We are not dependent on troublesome Middle Eastern countries for domestic supplies of fossil fuel.
2. There is strong evidence that recovering all the fossil fuel reserves from the Atlantic will have very little impact on domestic consumer prices.
3. There is widely differing estimates of job creation, depending on where the ports are, where the infrastructure is, how low long production will last.
4. There will be damaging contamination of the Atlantic Coast.
5. This is about the fossil fuel industry's race to get what's left for EXPORT.

The only people I have heard advocating for opening up the Atlantic are members of the oil industry or politicians funded by them.

The Manteo Project area in particular is one of the most sensitive marine environments on the planet. This area is where many diverse and some endangered species live year round.

I refer you to The Precautionary Principle, which states that "if there is risk of harm, the burden of proof that it is not harmful falls on those proposing the action. If we fail to follow this principle, it leads to hazards, unforeseen negative occurrences, even disasters."

For me, API has not adequately satisfied this principle.

For the good of the Atlantic Coast, do not approve this activity.

ITP Laws - NOAA Service Account <itp.laws@noaa.gov>

Seismic Surveys in the Atlantic

1 message

naf1313 <naf1313@yahoo.com>
Reply-To: naf1313 <naf1313@yahoo.com>
To: "ITP.Laws@noaa.gov" <ITP.Laws@noaa.gov>

Tue, Aug 25, 2015 at 3:05 PM

To:
Jolie Harrison
Permits and Conservation Division
Office of Protected Resources
National Marine Fisheries Service

Please do not allow seismic surveys in the Atlantic Ocean. The marine life does not have a voice, so we have to be their voice. I feel certain this testing would do irreparable harm to these animals and affect humans in ways we may not have even considered!

Thank you so much for accepting concerns from the public about this very important issue.

Nancy Fishburn

ITP Laws - NOAA Service Account <itp.laws@noaa.gov>

Seismic surveys

1 message

Stan Fishburn <stanfishburn@yahoo.com> Thu, Aug 27, 2015 at 8:43 AM

To: itp.laws@noaa.gov

Jolie Harrison

Permits and Conservation Division

Office of Protected Resources

National Marine Fisheries Service

I urge you to do all you can to not allow seismic surveys in the Atlantic Ocean. If the marine life could talk, they would plead with us to respect their living space. I feel certain this testing would do irreparable harm to these animals and affect humans in ways we may not have even considered. Would oil company executives be willing to scuba dive near the testing without major ear protection. Our emphasis should be on alternate sources of energy.

Thank you for your consideration
Stanley W. Fishburn
Resident of coastal Florida

ITP Laws - NOAA Service Account <itp.laws@noaa.gov>

Seismic testing off the NC Coast

1 message

Heather Payne <helsimon@yahoo.com> Sun, Aug 23, 2015 at 4:41 PM
Reply-To: Heather Payne <helsimon@yahoo.com>
To: "ITP.Laws@noaa.gov" <ITP.Laws@noaa.gov>

Jolie Harrison
Chief, Permits and Conservation Division
Office of Protected Resources
National Marines Fisheries Service
1315 East-West Highway
Silver Spring, MD 20910

Chief Harrison:

I oppose all applications for seismic survey permits for oil and natural gas exploration off the Atlantic coast. No mitigation measures are sufficient to address the long-term low-frequency noise which seismic surveying requires. The level of harm is simply too great for this to be allowed off the North Carolina coast, or anywhere in the Atlantic. We have an incredible diversity of marine life. all of which would be impacted by this activity, including ten threatened or endangered species. There is no plausible reason to allow a single "take" of any of these, or of the other marine life off our coast. It simply isn't worth it.

Instead, I encourage you to permanently protect the Point and the rest of the ocean off the Atlantic. This is all critical habitat for threatened and endangered species and should be permanently protected from seismic surveys.

Regards,
Heather Payne
Chapel Hill, NC

ITP Laws - NOAA Service Account <itp.laws@noaa.gov>

Seismic Testing, NOAA

1 message

erich sheluga <shelooga@gmail.com> Tue, Aug 18, 2015 at 11:11 AM
To: ITP.Laws@noaa.gov
Cc: neel@obsentinel.com, wrccomments@ncwildlife.org

Dear Jolie Harrison, Chief for Permits and conservation Division:

I have become of aware of the request for public comment on the anticipated surveying and drilling which will commence off the shores of our east coast around North Carolina. While I am a resident of Pennsylvania, I have had the privilege to call the Outer Banks my vacation spot 29 times in my 30 year life. 11 more days and I'll be 30 for 30. This area is my sanctuary, and I've been hard pressed to find a comparable environment. Without elaborating on the whole "this country and the world is supposed to be moving away from fossil fuels" argument, I would like to respectfully voice my objections to granting these permits to start seismic surveying. I dare say my intentions are less political and more personal, selfish as it is. I expect many locals, frequents and random guests would be able to substantiate most of my feelings below.

This coast is paradise. The allure is the serenity, the ocean and wildlife, the pristine land; it's this wonderful balance of nature at it's cleanest. I feel the immediate and long term issues that will arise from surveying and drilling will be catastrophic. To my vacation/retirement plans, and the area in general. Starting with the immediate and possibly most damaging part of this plan, is the seismic surveying. I pride myself on a basic knowledge of science, physics, biology and common sense. I've also stood in front of really big speakers. A candle to surveying's Sun. The physical reverberations are cool for a few minutes, until you realize your body is being forcibly shaken, not to mention the audible pain you experience after that 'on stage' high fades. Putting any living creature under those circumstances could be considered torture. Putting them under that for extended periods of time with no way to defend against or avoid it altogether requires a harsher word for torture that has not been created.

Some of my fondest memories of my time in OBX are discovering wildlife on the beaches. Sadly to say most were deceased, but the beauty of them nonetheless is inspiring. How many more will be washing up once this commences? To think in the future I will have to consider these creatures may have been vibrated or stressed to death breaks my heart. Their broken bodies often wash ashore because of the strong currents surrounding the area. What else will the current bring from these prolonged surveys at sea? Or when the surveying is done, someone strikes it 30s oil tycoon rich and starts drilling, where will the residual oil (since they all leak to some extent) go? And I can rant about a significant accident or spill that may or may not happen, but it seems it doesn't need to get to that point. I cannot fathom finding a washed up shark or puffer fish or manta ray covered in black oil. It's like a scene from a bad movie playing in my mind, or what you'd expect from a trip to the Jersey shore.

So I beg of anyone who will listen: please don't commence this project. These funds could be well distributed in other much needed areas. If you will not listen to my pleas for the future, the environment, or the wildlife, please listen for the sanctity of my vacation spot.

Thank you.

ITP Laws - NOAA Service Account <itp.laws@noaa.gov>

seismic testing

1 message

cindy <ciwibunch@hotmail.com> Thu, Aug 13, 2015 at 12:28 PM
To: itp.laws@noaa.gov

Mr. Harrison, I join the quickly growing mass of folks who have informed themselves of the science and the politics behind seismic testing and adamantly vote to NOT ALLOW it in the Atlantic Ocean off our eastern coast. I speak as a lifetime resident of coastal NC who cherishes our white, sandy beaches, the coastal life and the sea life in our ocean and who wants to see them all protected from the ramifications of seismic testing and oil drilling. The short term benefits projected by representatives of the oil industry pale in comparison to those inherent in the pursuit of clean energy renewables which can benefit our country, leaving our beaches and marine life intact. Please say "NO" to seismic surveying...seismic air guns...seismic interruption of any sort in our Atlantic Ocean! Thanks.

Cindy W. Bunch
Marshallberg, NC

ITP Laws - NOAA Service Account <itp.laws@noaa.gov>

Seismic testing

1 message

Veronica Moschetti Reich <pastaroni@aol.com> Wed, Aug 5, 2015 at 10:46 PM
To: "ITP.Laws@noaa.gov" <ITP.Laws@noaa.gov>

Totally against it,, we have too much to lose

Sent from my iPad

ITP Laws - NOAA Service Account <itp.laws@noaa.gov>

Seismic Testing

1 message

Beverly Bull <bfbull@rocketmail.com> Mon, Aug 3, 2015 at 8:21 PM
Reply-To: Beverly Bull <bfbull@rocketmail.com>
To: "ITP.Laws@noaa.gov" <ITP.Laws@noaa.gov>

Having lived on Hatteras Island for over forty years, I have seen so many errors in judgement resulting in the degradation of habitat, marshlands, the ocean and the lives that reside therein, that the seismic permits are a frightening prospect. Having spotters is not the answer. Anyone who goes into the ocean can tell you that 'IT WAS RIGHT BESIDE ME AND I DIDN'T EVEN SEE IT!' Please reconsider for the Ocean, Ocean Life and those of us who live nearby and cherish both.

Thank you.

Beverly Bull

ITP Laws - NOAA Service Account <itp.laws@noaa.gov>

Sonic Testing

1 message

Sam & Linda <msskeeter56@charter.net> Fri, Aug 14, 2015 at 7:40 AM
To: ITP.Laws@noaa.gov

As a resident of the Outer Banks I am opposed to sonic testing.

There have been many projects for bridges proposed on the Outer Banks. All have been fiercely fought by environmental groups, both governmental and private, due to the impacts on the wildlife on the Outer Banks. The beaches are often cordoned off due to Plover nesting and turtle nests. The area is a migratory stop over for thousands of birds.

The people of the Outer Banks are also opposed to off-shore drilling due to impacts on this environment.

It does not make sense, therefore, to do sonic testing for oil, if in fact this never comes to pass and would be contrary to all the protections provided to wildlife, both oceanic, tidal, air, and land based the government provides.

Either we are custodians of wildlife or we are not. I would hope that the responsibility to live harmoniously with these gentle creatures would kill this misguided proposal.

Linda Gillette
Southern Shores, NC

ITP Laws - NOAA Service Account <itp.laws@noaa.gov>

Testing for oil off the coast of North Carolina

1 message

Bailey Stearns <blstearn@gmail.com> Wed, Aug 12, 2015 at 10:13 AM
To: ITP.Laws@noaa.gov

As a citizen of coastal North Carolina, I do not support the decision to open North Carolina's waters to testing for oil deposits. It would be more beneficial to North Carolina to support others types of energy off the coast, such as offshore wind turbines or tidal/wave energy. It is not worth it for the state to endanger its coastal resources by testing for and harvesting oil offshore. The risks, while seemingly understated by DENR, BOEM, and NOAA thus far, are too great. Do not conduct geological and geophysical testing for oil offshore and do not conduct drill operations.

I appreciate the opportunity to comment on these actions. I hope the opinions of the coastal regions are taken into account. Thank you.

--
Bailey Stearns
UNC-Wilmington, M.S. Coastal and Ocean Policy 2015
UNC-Chapel Hill, B.A. Environmental Studies 2012
blstearn@gmail.com

We are opposed to seismic testing and drilling for oil and gas off of the N.C. coast. These barrier islands are pristine and rich in natural resources & beauty. Protecting tourism and fishing are in our best interest economically currently and in the future. This state should harness the abundance of sunlight and wind, and lead with investments in wind and solar farms that are clean, progressive and compatible with the islands. Oil and gas are filthy industries that pollute and sicken, cause earthquakes and are accident ridden. The local jobs produced are in cleanup and truck driving which are low paying. These islands are a national treasure, not to be destroyed by greed and corrupt politicians.

Debra & Henry Schlueter

PR1 ? | PR5

... 10 2015

Deede Miller
415 Wildwood Rd.
Newport, NC 28570 deedemiller@gmail.com

Cheef Jolie Harrison:

Aug. 2 2015;

Dear Chief Harrison:

I am writing to you to ask that your agency NOT PERMIT seismic testing off our coast. I have attended alot of meetings and heard scientists speak about the effects of seismic testing on marine mammals and fish and I do not believe it to be a harmless activity.

As I understand it, this testing would go on around the clock for weeks and then would be done again at later times.

We do not want oil exploration off of our coast. There is nothing good to come of it for us. We have beautiful beaches and do not want them spoiled.

Thank you for taking my comments.

Deede Miller

Ms. Jolie Harrison
Chief Permits and Conservation Division
Office of Protected Resources
National Marine Fisheries Service
1315 East-West Highway
Silver Spring, MD 20910

August 18, 2015

Dear Ms. Harrison,

Like so many others, I strongly oppose exploration for oil off of the coast of North Carolina. Among my objections I would like to ask you to consider whether the research hasn't already been completed and if the proposed tests are truly necessary.

According to the publication **Review of the Seismic Reflection Data from the North Carolina Coastal Plain and Adjacent Coastal Shelf by Larry Zarra, 1990: Open-file report 90-1 for the Geological Survey Section, Division of Land Resources, Department of Environment, Health and Natural Resources:**

"No attempt has been made to tie the North Carolina Geological Survey's seismic-reflection data with adjacent sets of single- or multi-channel seismic –reflection data. However renewed interest in local offshore petroleum exploration underscores the need for a comprehensive interpretation integrating the Survey's nearshore seismic reflection data with other sets of multi-channel seismic reflection data located offshore from North Carolina. In addition, a combined interpretation of the Survey's seismic-reflection data and adjacent single-channel seismic-reflection data sets could be used to resolve fine details of the Tertiary depositional systems. Detailed stratigraphic interpretations of this type may also have environmental applications." P. 6

I can't help but wonder if previous research hasn't already given the answer to whether or not there is enough oil to warrant exploration. In my cynical hours, I feel the answer is no, it isn't worth it, but stubborn forces insist if they just look one more time, they can get new answers. They have been looking for oil in this area for more than 40 years.

If it was here, they would have found it by now.

Although I understand the risk I am running by pointing out additional sources of information, if it can help to prevent the unnecessary impact of 24 hour seismic assault on Sei and Right whales and the myriad of other cetaceans that migrate along this coast, I'm willing to take the risk.

Therefore, I am asking that until all previous work has been reviewed and compared, seismic testing along the North Carolina coast should be delayed, or better yet, denied.

Thank you for your consideration.
Sincerely,

Tama N. Creef

Tama N. Creef
116 North End Court
Manteo, NC 27954