

APPENDIX F: Public Comments on NMFS IHA Notice



MARINE MAMMAL COMMISSION

18 August 2014

Ms. Jolie Harrison, Chief
Permits and Conservation Division
Office of Protected Resources
National Marine Fisheries Service
1315 East-West Highway
Silver Spring, MD 20910-3225

Dear Ms. Harrison:

The Marine Mammal Commission (the Commission), in consultation with its Committee of Scientific Advisors on Marine Mammals, has reviewed the application submitted by Lamont-Doherty Earth Observatory (LDEO), in collaboration with the National Science Foundation (NSF), seeking authorization under section 101(a)(5)(D) of the Marine Mammal Protection Act (the MMPA) to take small numbers of marine mammals by harassment. The taking would be incidental to a marine geophysical survey to be conducted off North Carolina. The Commission also has reviewed the National Marine Fisheries Service's (NMFS) 31 July 2014 notice announcing receipt of the application and proposing to issue the authorization, subject to certain conditions (79 Fed. Reg. 44550).

Some issues raised in previous letters regarding geophysical surveys reflect Commission concerns that apply more broadly to incidental take authorization applications beyond LDEO's proposed application. The Commission has recommended repeatedly that NMFS adjust density estimates using some measure of uncertainty when available density data originate from different geographical areas and temporal scales and that it formulate policy or guidance shaping a consistent approach for how applicants should incorporate uncertainty in density estimates. NMFS has indicated that it is currently evaluating available density information and working on guidance that would outline a consistent approach for addressing uncertainty in specific situations where certain types of data are or are not available (78 Fed. Reg. 57354). Further, the Commission has recommended that NMFS follow a consistent approach for requiring the assessment of Level B harassment takes for specific types of sound sources (e.g., sub-bottom profilers, echosounders, side-scan sonar, and fish-finding sonar) by all applicants who propose to use them. NMFS has indicated that it is evaluating the broader use of those types of sources to determine under what specific circumstances requests for incidental taking would be advisable (or not) and also is working on guidance that would outline a consistent approach for addressing potential impacts from those types of sources (78 Fed. Reg. 57354). The Commission welcomes the opportunity to meet with NMFS to review these higher-level recommendations, as well as those specific to LDEO's application.

Background

LDEO proposes to conduct a high-energy, 2D geophysical survey primarily in the U.S. exclusive economic zone (EEZ), with some portions in international waters, off North Carolina.

The survey would occur for approximately 33 days in September and October 2014. The purpose of the proposed survey is to investigate how the continental crust stretched and separated during the opening of the Atlantic Ocean and magnetism's role during the continental breakup. The survey would be conducted in waters estimated to be 20 to 5,300 m in depth with approximately 5,185 km of tracklines. LDEO would use the R/V *Marcus G. Langseth*, owned by NSF, to operate a 36-airgun array (nominal source levels 246 to 253 dB re 1 μ Pa (peak-to-peak)) at 9 m depth and an 18-airgun array at 6 m depth. The *Langseth* also would tow one hydrophone streamer, 8,000 m in length, and would use 90 ocean-bottom seismometers (OBSs) during the survey. In addition, LDEO would operate a 10.5- to 13-kHz multibeam echosounder and a 3.5-kHz sub-bottom profiler continuously throughout the survey.

NMFS preliminarily has determined that, at most, the proposed activities would result in a temporary modification in the behavior of small numbers of up to 24 species of marine mammals and that any impact on the affected species would be negligible. NMFS does not anticipate any take of marine mammals by death or serious injury. It also believes that the potential for temporary or permanent hearing impairment will be at the least practicable level because of the proposed mitigation and monitoring measures. Those measures include monitoring exclusion and buffer zones and using power-down, shut-down, and ramp-up procedures. NMFS also would authorize the activities only until 31 October to minimize any impacts on migrating North Atlantic right whales. If, however, a right whale is sighted, LDEO would shut down the airguns immediately regardless of the distance of the whale from the *Langseth*. Ramp-up procedures would not be initiated until the right whale has not been seen at any distance for 30 minutes. In a recent USGS proposed incidental harassment authorization, NMFS proposed to require USGS to power down the array, if possible, when concentrations of humpback, sei, fin, blue, and/or sperm whales (six or more individuals that do not appear to be traveling and are feeding, socializing, etc.) are observed within the Level B harassment zone (based on 160 dB re 1 μ Pa; 79 Fed. Reg. 35642). The Commission is unsure why NMFS did not include the same mitigation measure in the currently proposed authorization, especially since the USGS and LDEO surveys both occur in waters up to more than 5,000 m in depth, in the same geographical region, and during September. Therefore, the Commission recommends that NMFS include a requirement that LDEO power down the array when concentrations of humpback, sei, fin, blue, and/or sperm whales (six or more individuals that do not appear to be traveling and are feeding, socializing, etc.) are observed within the Level B harassment zone (based on 160 dB re 1 μ Pa).

Further, NMFS would require LDEO, to the maximum extent practicable, to conduct the survey from the coast (inshore) and proceed towards the open sea (offshore) to minimize the potential for driving animals towards shore and trapping them in shallow water. The Commission agrees that this measure should be included in the incidental harassment authorization, but believes it should be an explicit requirement rather than qualified with the phrase "to the maximum extent practicable". Accordingly, the Commission recommends that NMFS require LDEO to conduct the survey from the coast (inshore) and proceed towards the sea (offshore), removing the caveat of "to the maximum extent practicable". Lastly, the Commission understands that NMFS would require that LDEO cease operation of the echosounder and sub-bottom profiler when the *Langseth* is in transit and only operate those types of equipment during the airgun survey itself. The Commission believes that requirement should be specified in the final incidental harassment authorization, if that is indeed NMFS's intent, and recommends that NMFS specify in the final authorization that LDEO is not authorized to operate the multi-beam echosounder and sub-bottom profiler during transit.

Staff members from NMFS, LDEO, NSF, U.S. Geological Survey (USGS), and the Commission met in March 2013 to discuss some of the Commission's ongoing concerns regarding the potential effects of geophysical surveys. Although a number of concerns were discussed and several resolved, the following sections highlight areas that, in the Commission's view, warrant further attention.

Justification for the use of the 36-airgun array

In its application, LDEO stated that it was decided that the scientific objectives for most of the survey could not be met using a source smaller than the 36-airgun array, because of the need to image the crust-mantle boundary at a depth of 30 km beneath the continental shelf and slope. LDEO stated that it was decided that the 18-airgun array towed at a shallower depth (6 m vs. 9 m) would be adequate to image the boundary for the remaining portion of the survey (the southern and northernmost portions of the multi-channel hydrophone streamer (MCS) tracklines; see Figure 1 in LDEO's application). However, based on the addendum to the application, it appears that LDEO has changed its plan to use the 36-airgun configuration during the MCS portion of the survey and now proposes to use only the 18-airgun configuration to survey the MCS tracklines. Apparently, LDEO still plans to use the 36-airgun configuration during the OBS portion of the survey, which would occur in water depths as shallow as 20 m.

Neither LDEO nor NMFS provided justification regarding the need to use the full 36-airgun array during the OBS portion¹ of the survey. In the past, LDEO used the 18-airgun configuration with OBSs in water depths ranging from 3,500 to more than 5,000 m in depth off Spain (78 Fed. Reg. 34069). The Commission is unsure why the smaller 18-airgun array could not be used during the OBS portion of the proposed survey off North Carolina, especially when the water depths are as shallow as 20 m. If the water depths are not the primary factor for using the 36-airgun array during the OBS portion of the survey, then presumably the requirement for the larger array is dictated by the receiving devices. If that is the case, the Commission questions whether the MCS could be used in the shallow and intermediate water depths to obtain the needed data rather than using the OBSs. In any event, NMFS has indicated in previous proposed incidental harassment authorizations when smaller arrays could be used to achieve the same objective that the applicant would use such smaller devices, as was the case for the 18-airgun configuration used off of Spain (78 Fed. Reg. 17376). Although LDEO apparently amended its proposed method for the MCS portion of the survey, that type of information is lacking in the *Federal Register* notice² and should be included as part of the mitigation measures. Absent both the justification for the use of the 36-airgun configuration for the OBS portion of the survey and acknowledgement of the use of the 18-airgun configuration for the MCS portion and its implied mitigating effects (if such is the reason), LDEO's process is not transparent and as such may not be justifiable. Therefore, the Commission recommends that NMFS require LDEO to justify the use of the 36-airgun configuration during the OBS portion of the survey. If the same quality of data can be obtained using the smaller 18-airgun configuration with the MCS or OBSs, then the Commission recommends that NMFS require LDEO to use the smaller airgun configuration to minimize impacts on marine mammals.

¹ Based on correspondence from LDEO, the Commission understands that the OBS portion of the survey would be surveyed twice, once to acquire data with the OBSs and once with the streamer.

² This normally is found under the "Planning Phase" portion of the "Proposed Mitigation" section of the notice.

Uncertainty in estimating exclusion and buffer zones

The Commission continues to have concerns regarding the method used to estimate exclusion and buffer zones (based on Level A and B harassment, respectively) and the numbers of takes for NSF-funded geophysical research. These concerns date back to 2010 but please refer to the Commission's 12 March, 19 April, and 24 June 2013 and 31 March and 23 July 2014 letters for detailed rationale. Briefly, LDEO performs acoustic modeling for geophysical research conducted by the *Langseth*. For at least 6 years (and likely more than the last 10 years), LDEO has estimated exclusion and buffer zones using a simple ray trace–based modeling approach that assumes spherical spreading, a constant sound speed, and no bottom interactions (Diebold et al. 2010). That model does not incorporate environmental characteristics of the specific study area including sound speed profiles and refraction within the water column, bathymetry/water depth, sediment properties/bottom loss, or absorption coefficients. However, LDEO continues to believe that its model generally is conservative when compared to in-situ sound propagation measurements of the R/V *Maurice Ewing*'s arrays (i.e., 6-, 10-, 12-, and 20-airgun arrays) and the R/V *Langseth*'s 36-airgun array from the Gulf of Mexico (Tolstoy et al. 2004, Tolstoy et al. 2009, Diebold et al. 2010³). LDEO also has noted the model is most directly applicable to deep water (> 1,000 m), although it uses the model, with the inclusion of substantial correction factors, in intermediate and shallow-water environments (100–1,000 m and < 100 m, respectively) as well. Diebold et al. (2010) noted the limited applicability of LDEO's model when sound propagation is dependent on water temperature, water depth, bathymetry, and bottom-loss parameters—this is especially important for estimating zones for surveys, such as the North Carolina survey, in which the various airgun configurations would be used in waters as shallow as 20 m and as deep as 5,300 m. They further indicated that modeling could be improved by including realistic sound speed profiles within the water column. In addition, Tolstoy et al. (2009) acknowledged that sound propagation depends on water depth, bathymetry, and tow depth of the array and that sound propagation varies with environmental conditions and should be measured at multiple locations.

To estimate the proposed exclusion and buffer zones for the survey off North Carolina, LDEO apparently used in-situ measurements for the 18-airgun array in shallow water only and used LDEO's model, scaling factors⁴, correction factors⁵, and/or low-energy proxies for the other airgun configurations (36-, 18-, and single airgun array) and water depths (shallow, intermediate, and deep water; see Table 1 in LDEO's application for specific details). Presumably, Diebold et al. (2010) served as the basis for the in-situ measurements of the 18-airgun array in shallow water. However, in the case of Diebold et al. (2010), the shallow-water hydrophone was positioned in 50 m of water, which is much deeper than 20 m of water proposed for the survey. The Commission questions the validity of using the Diebold et al. (2010) measurements given that the survey will be conducted in much shallower water⁶. In previous incidental harassment authorizations, LDEO has indicated that the model underestimates the zones in shallow water⁷. The Commission is not surprised by that finding since Diebold et al. (2010) stated the acoustic field in shallow water was dominated by near-vertically traveling reflected and refracted waves, information that is not used within LDEO's

³ Diebold et al. (2010) also presented data on the 18-airgun array from the Gulf of Mexico.

⁴ Based on assumed tow depth differences from LDEO's deep-water model.

⁵ For intermediate water depths, LDEO multiplied the modeled deep-water results by a correction factor of 1.5.

⁶ And the fact that the measurements originated from a different geographical area.

⁷ When LDEO has used its model for shallow water depths, a correction factor of 14.7 has been used.

model. Accordingly, the Commission does not support use of either of the methods⁸ to determine the sizes of the exclusion or buffer zones.

For deep water, LDEO has stated that its model overestimates the received sound levels at a given distance but is still valid for defining exclusion zones at various tow depths. However, LDEO indicated in its application that the calibration data show that at greater distances (4 to 5 km) sound reflected from the sea floor and refracted from the sub-seafloor dominate, while the direct arrivals become weak and/or incoherent (Figures 11, 12, and 16 in Appendix H of the NSF/USGS programmatic environmental impact statement for geophysical surveys (PEIS)). LDEO stated that aside from local topography effects, the region around the critical distance (~5 km in Figures 11 and 12 and ~4 km in Figure 16 in Appendix H of the NSF/USGS PEIS) is where the observed sound levels rise very close to the mitigation model curve. Although the observed sound levels occur primarily below the mitigation model curve, that finding further substantiates the fact that the model is not necessarily indicative of site-specific environmental conditions, including bathymetry and sound speed profiles. The reflective/refractive arrivals are the very measurements that should be accounted for in site-specific modeling and ultimately determine underwater sound propagation. Ignoring those factors is a serious flaw of LDEO's model. In addition, LDEO apparently applied scaling factors to empirical shallow-water zones based on modeled deep-water zones to account for tow depth differences. The Commission is unsure why LDEO would assume that the ratio of modeled zones in deep water would equate to empirical zones in shallow water, as those two quantities are not comparable and LDEO itself has indicated that the model underestimates received levels in shallow water.

Furthermore, the estimated exclusion zone for the proposed survey (36-airgun array towed at 9 m in depth) is smaller⁹ than previously authorized and the buffer zone is larger¹⁰ than previously authorized (75 Fed. Reg. 44770; 76 Fed. Reg. 75525, 49737; 77 Fed. Reg. 25693, 41755). This is a bit perplexing as the Commission is unaware of any changes to LDEO's model¹¹. If the model has not changed, then perhaps the manner in which LDEO is using the model or the inputs to the model have changed. In any case, it is not clear why the zones have changed. NMFS did add a precautionary 3-dB buffer to the exclusion zones in shallow water (which, if the exclusion zones have been underestimated, may be less precautionary than originally intended). Additionally, the estimated shallow-water exclusion zone for the mitigation airgun is smaller than previously authorized or proposed to be authorized¹² (e.g., 77 Fed. Reg. 41755). Therefore, even with NMFS's added 3-dB precautionary buffer, the exclusion zone for the mitigation airgun in shallow water is smaller than previous incidental harassment authorizations. LDEO indicated in its application that the zone was based on empirically derived measurements from the Gulf of Mexico with a scaling factor applied to account for differences in tow depth. The Commission does not understand why LDEO has offered this explanation. For many years, LDEO has indicated that the zones associated

⁸ Shallow-water empirical measurements in deeper waters than proposed by the survey and LDEO's model.

⁹ 927 vs. 940 m for the 180-dB re 1 μ Pa threshold.

¹⁰ 5,780 vs. 3,850 m for the 160-dB re 1 μ Pa threshold.

¹¹ Appendix H of the PEIS has been used in support of LDEO's model since it was available for public review in 2010 and, to the Commission's knowledge, has been unchanged since that time. Those figures have included the maximum sound pressure level trajectories and have been based on sound exposure levels, with a presumed 10 dB difference for sound pressure levels.

¹² 86 m was estimated for this authorization vs. 121 m that included the 3-dB buffer vs. 296 m that was previously authorized.

with the mitigation airgun have been model-estimated and that the tow depth has minimal effect on the maximum near-field output and the shape of the frequency spectrum for the single airgun. Thus, LDEO has assumed that the predicted exclusion zones are essentially the same at different tow depths (i.e., the same values are used for the mitigation gun being towed from 6–15 m in depth; 77 Fed. Reg. 25969). Due to these shortcomings and inconsistencies, the Commission continues to have concerns regarding the estimation of exclusion and buffer zones for NSF-funded geophysical surveys and highlights the need for transparency regarding the methods by which LDEO is estimating those zones. Therefore, the Commission recommends that NMFS require LDEO to explain why the proposed exclusion and buffer zones for the survey are not consistent with those used in past surveys that involved the same airgun configurations (36-, 18-, and single airgun(s)) and tow depths (9 or 6 m) and that occurred in the same water depths (shallow, intermediate, and deep water). Until that information is provided, neither the Commission nor the public can comment meaningfully on the proposed exclusion and buffer zones. Without such information NMFS presumably would not be able to determine that the zones were based on best available science and that the additional 3-dB buffer was in fact precautionary.

Because LDEO has failed to verify the use of its model in conditions other than the Gulf of Mexico, the Commission has recommended that NMFS or the relevant entity estimate exclusion and buffer zones using either empirical measurements from the particular survey site or a model that accounts for the conditions in the proposed survey area. The model should incorporate operational parameters (e.g., tow depth, source level, number/spacing of active airguns) and site-specific environmental parameters (e.g., sound speed profiles, refraction in the water column, bathymetry/water depth, sediment properties/bottom loss, and wind speed). In March 2013, LDEO indicated that it might be able to compare its model to hydrophone data collected during previous surveys in environmental conditions other than those in the Gulf of Mexico¹³ (i.e., deep and intermediate waters in cold water environments that may have surface ducting conditions, shallow-water environments, etc.). The Commission understands that LDEO has been analyzing hydrophone data from waters off Washington State to allow comparisons of empirically derived estimates to model-estimated exclusion and buffer zones, but those results do not appear to have been published yet. The Commission is pleased to hear of this work and encourages LDEO to make such comparisons at various sites, not just in waters off Washington, if it intends to continue using a model that does not incorporate site-specific parameters. The Commission recommended in its 24 June 2013 letter that such comparisons be made prior to submitting applications for geophysical surveys to be conducted in 2014. The Commission further recommended that if LDEO and NSF either do not have enough data to compare LDEO's modeled results to other environments, or choose not to assess the accuracy of the model, then they should re-estimate the exclusion and buffer zones and associated takes of marine mammals using site-specific parameters (including sound speed profiles, bathymetry, and bottom characteristics) for all future applications that use LDEO's model. Neither approach was used for the proposed incidental harassment authorization.

NMFS has stated repeatedly that NSF, LDEO, and other relevant entities (USGS, Scripps Institution of Oceanography (Scripps)) are providing sufficient scientific justification for their take

¹³ Diebold et al. (2010) supported such an approach, stating that streamer data can provide an accurate assessment of sound exposure levels at the relevant ranges for mitigation in shallow-water environments (≤ 100 m). They further indicated it seems logical and advantageous that those data be monitored in real time to fine tune a priori mitigation zones in shallow-water environments.

estimates. The Commission disagrees with this conclusion, given that the estimates are based on LDEO's model, various scaling and correction factors, unsupported proxies, and/or empirical measurements from the Gulf of Mexico. Recent activities have occurred in areas such as the North Atlantic and the Antarctic rather than the Gulf of Mexico. Environmental conditions in waters off the East Coast include presence of surface ducts, in-water refraction, and bathymetry and sediment characteristics that reflect sound¹⁴. Although a surface duct likely is present in the proposed survey area, none of the site-specific parameters are accounted for in LDEO's model¹⁵.

In a recent sound exposure modeling workshop attended by representatives of numerous entities (including NMFS, LDEO, NSF, USGS, and the Commission), experts confirmed that sound speed profiles and bathymetry/sediment characteristics were the most important factors affecting underwater sound propagation and should be included in related modeling. While LDEO presented various aspects of its model during the workshop and indicated that the model was fast, inexpensive, and simple to use, none of those attributes support its applicability or accuracy. Further, LDEO indicated that the model is more closely related to a source model that compares airgun arrays and that it is not representative of modeling in the actual environment. Therefore, the Commission remains very concerned that the LDEO model is not based on best available science and does not support its continued use. For all of these reasons, the Commission recommends that NMFS (1) require LDEO to re-estimate the proposed exclusion and buffer zones and associated takes of marine mammals using site-specific (including sound speed profiles, bathymetry, and sediment characteristics at a minimum) and operational (including number of airguns, tow depth) parameters for the proposed incidental harassment authorization and (2) impose the same requirement for all future incidental harassment authorizations submitted by LDEO, NSF, USGS, Scripps, Antarctic Support Contract (ASC), or any other relevant entity.

In 2011¹⁶, NSF and USGS modeled sound propagation under various environmental conditions in their PEIS. LDEO and NSF (in cooperation with Pacific Gas and Electric Company) also used a similar modeling approach in the recent incidental harassment authorization application and associated environmental assessment for a geophysical survey of Diablo Canyon in California (77 Fed. Reg. 58256). These recent examples indicate that LDEO, NSF, and related entities are capable of implementing the recommended modeling approach, if required to do so by NMFS. The Commission understands the constraints imposed by the current budgetary environment, but notes that other agencies that contend with similar funding constraints incorporate modeling based on site-specific parameters. LDEO, NSF, and related entities (USGS, Scripps, ASC) should be held to that same standard. NMFS recently indicated that it does not prescribe the use of any particular modeling package and does not believe it is appropriate to do so (79 Fed. Reg. 38499). The Commission agrees that NMFS should not instruct applicants to use specific contractors or modeling packages, but it should hold applicants to the same standard, primarily one in which site- and operation-specific environmental parameters are incorporated into the models.

¹⁴ Although not accounted for by LDEO's model.

¹⁵ NMFS has acknowledged that although the acoustic energy within the third and fourth lobes (330–667 Hz) of the impulsive waveform would be trapped in the surface duct and propagated to greater distances, those lobes represent only a fraction of the total acoustic energy (specifically for the LDEO New Jersey survey; 79 Fed. Reg. 38500). The Commission notes that the impulsive waveform includes sound energy in frequencies even greater than 667 Hz, including contributions from mid- and high-frequency sound that may be trapped in the surface duct and propagated further than sound below 330 Hz.

¹⁶ The record of decision was signed in 2012.

NMFS further indicated that based on empirical data (which illustrate the LDEO model's conservative exposure estimates for the Gulf of Mexico and preliminarily for waters off Washington), it found that LDEO's model effectively estimates sound exposures or number of takes and represents the best available information for NMFS to reach its determinations for the authorization. However, for the recent survey off New Jersey (79 Fed. Reg. 38499) and the proposed survey off North Carolina, NMFS increased the exclusion zone in shallow water by 3-dB. The Commission questions why, if NMFS believes the LDEO model is based on best available science, it then extended the exclusion zones to be precautionary. Further, the Commission is unsure why NMFS did not extend the buffer zones and the re-estimate the numbers of takes of marine mammals as well.

Group size and take estimates

In estimating the numbers of potential takes for the proposed incidental harassment authorization, LDEO used the Strategic Environmental Research and Development Program's (SERDP) spatial decision support system (SDSS) Marine Animal Model Mapper tool based on the U.S. Navy's OPAREA Density Estimates (NODE) model¹⁷ to estimate marine mammal densities. NMFS increased the estimated takes for some species (primarily large whales) to average group sizes based on correspondence with various experts. However, NMFS did not apply the same method for other species for which the potential for taking exists but density data were lacking. In addition to the large whale species, the SERDP model did not include data for spinner dolphins¹⁸, Fraser's dolphins, melon-headed whales, pygmy killer whales, false killer whales, or killer whales that have the potential to occur in the waters off North Carolina. Interestingly, USGS requested, and NMFS proposed to authorize, takes of those species for its survey that would precede LDEO's survey in the same general geographical area and at nearly the same time of year. For those species, USGS had estimated the numbers of takes based on average group size.

LDEO and NMFS also proposed to authorize the taking of only one bottlenose dolphin from both the Northern and Southern North Carolina Estuarine Systems (NNCE and SNCE) based on the calculated number of takes rather than accounting for average group size and thereby increasing the number of bottlenose dolphin takes for those two stocks. Bottlenose dolphins generally do not occur as single individuals and taking should not be authorized as such. Because the potential exists to take those species or stocks in numbers greater than what NMFS has proposed, the Commission recommends that NMFS authorize the taking of spinner dolphins, Fraser's dolphins, melon-headed whales, pygmy killer whales, false killer whales, killer whales, NNCE bottlenose dolphins, and SNCE bottlenose dolphins based on at least the average group size.

LDEO did not request the incidental taking of harbor seals based on the low likelihood of occurrence in the survey area in September and October, and NMFS concurred. However, NMFS's 2012 stock assessment report indicated that, although harbor seals are known to occur seasonally along the southern New England to New Jersey coasts from September through late May and scattered sightings and strandings have been reported as far south as Florida, a recently established

¹⁷ Those data originated from the waters within the U.S. EEZ only.

¹⁸ Based on NMFS's 2013 Stock Assessment Report, spinner dolphins were observed within the proposed survey area off North Carolina in 2011.

seasonal haul-out site was documented in 2011 at Oregon Inlet, North Carolina (Todd Pusser, pers. comm.). Oregon Inlet is within the proposed survey area and if harbor seals are not only occurring in the area but hauling out at an established site, NMFS should include their incidental taking in the authorization. Therefore, the Commission recommends that NMFS consult with Mr. Pusser, the appropriate NMFS Science Center, and other researchers in the region (i.e., at University of North Carolina Wilmington and Duke University) to determine the number of harbor seals that could be harassed incidental to the proposed survey and authorize that number in the final authorization.

The Commission understands the LDEO would actually survey the OBS tracklines twice, once for acquiring OBS data and once for recording source shots with the MCS¹⁹. This has not been made clear in either the application or the *Federal Register* notice. However, it does not appear that LDEO, or subsequently NMFS, estimated the ensonified area based on repeating the OBS tracklines, which would likely occur on different days as the streamer would have to be deployed and lines re-surveyed. The Commission also is unsure whether LDEO would deploy the streamer after each OBS trackline to acquire the data concurrently or it would conduct the survey using the OBSs and then deploy the streamer to survey the OBS tracklines again and followed by the MCS tracklines. In either instance, the Commission cannot envision how the full extent of each OBS trackline could be surveyed twice within any given day. Accordingly, the Commission recommends that NMFS require LDEO to re-estimate the total numbers of takes based on the OBS portion of the survey being surveyed twice, which may be as simple as multiplying the takes estimated for the OBS portion of the survey by two.

The *Federal Register* notice indicated that LDEO did not include its normal 25 percent contingency for repeating some of the tracklines, accommodating the turning of the vessel, addressing equipment malfunctions, or conducting equipment testing to complete the survey²⁰. That 25 percent contingency is applied to the line-kilometers of tracklines, inevitably increasing the numbers of takes. The Commission is skeptical that those activities would not be needed as contingency for the proposed survey, especially since the 25 percent contingency was included in LDEO's application. However, since such an increase has not been included in the proposed take estimation analysis in the *Federal Register* notice, the Commission recommends that NMFS specify explicitly in the final incidental harassment authorization that LDEO is not authorized to repeat tracklines, accommodate the turning radius of the vessel, address equipment malfunctions, or conduct equipment testing prior to commencing or during the survey. If a possibility exists that those activities would occur during the survey, then the Commission recommends that NMFS require LDEO to re-estimate the numbers of marine mammals that could be taken during the proposed survey and base its "small numbers" and "negligible impact" determinations on those revised take estimates.

¹⁹ Although the source repetition rate would be different for those two methods (approximately 65 and 22 s, respectively), the source level would be the same with the full 36-airgun array.

²⁰ However, LDEO did include the 25 percent contingency in its application. The Commission is unsure why the contingency was removed for the proposed authorization as published in the *Federal Register* notice. Regardless, it is difficult for the Commission and public to review and comment on any proposed action when the information in the application and *Federal Register* notice is not consistent. In the future, NMFS should address and clarify the reason for those inconsistencies in its *Federal Register* notice or require the applicant to amend its application accordingly. Otherwise, the authorization process includes a level of unnecessary confusion, which constitutes a lack of transparency.

NMFS has yet to develop a clear policy setting forth more explicit criteria and/or thresholds for making small numbers and negligible impact determinations, as recommended by the Commission. Such guidance would be particularly useful in a case like this, in which up to 22 percent of the pantropical spotted dolphin stock in the area could be taken incidentally during the proposed survey activities. In the addendum to LDEO's application, that percentage of the pantropical spotted dolphins was considered an overestimate because the stock assessment report estimates are based on surveys only in U.S. waters rather than the entire range. The Commission is unsure why that percentage would be considered an overestimation because the density estimates upon which the takes were based originated only from U.S. waters as well. In any event, the Commission understands that NMFS is in the process of developing both a clearer policy to outline the criteria for determining what constitutes "small numbers" and an improved analytical framework for determining whether an activity will have a "negligible impact" for the purpose of authorizing takes of marine mammals and that NMFS plans to engage the Commission in that process at the appropriate time (79 Fed. Reg. 13626). The Commission encourages NMFS to complete its policy development as quickly as possible and awaits a meeting to engage in that policy development process.

Mitigation and monitoring measures

NMFS would require LDEO to monitor the area near the survey vessel for at least 30 minutes before, during, and 30 minutes after airgun operations. NMFS also would require that when airguns have been powered or shut down because a marine mammal has been detected near or within a proposed exclusion zone, airgun activity will not resume until the marine mammal is outside the exclusion zone (i.e., the animal is observed to have left the exclusion zone or has not been seen or otherwise detected within the exclusion zone for 15 minutes in the case of small odontocetes and pinnipeds and 30 minutes in the case of baleen whales and large odontocetes, including sperm, pygmy sperm, dwarf sperm, killer, and beaked whales). Those clearance times may be adequate for some species, but not all species. For small cetaceans, the Commission has recommended a clearance time of at least 15 minutes because their dive times are shorter and generally fall within that limit. For some large cetaceans, the proposed 30-minute clearance time may be inadequate, sometimes markedly so. Beaked and sperm whales, in particular, can remain submerged for periods far exceeding 30 minutes. Blainville's and Cuvier's beaked whales have been known to dive to considerable depths (> 1,400 m) and to remain submerged for more than 80 minutes (Baird et al. 2008). The grand mean dive duration for those species of beaked whales during foraging dives has been estimated at approximately 60 minutes (51.3 and 64.5 minutes for Blainville's and Cuvier's beaked whales, respectively; Baird pers. comm.). However, recent data on Cuvier's beaked whales revealed a maximum dive duration of more than 137 minutes and dive depths of more than 2,990 m, both of which set new mammalian dive records. Consistent with previous findings, Schorr et al. (2014) indicated a mean dive duration of 67.4 minutes. Sperm whales also dive to great depths and can remain submerged for up to 55 minutes (Drouot et al. 2004), with a grand mean dive time of approximately 45 minutes (Watwood et al. 2006).

In addition, observers may not detect marine mammals each time they return to the surface, especially cryptic species such as beaked whales, which are difficult to detect even under ideal conditions. Barlow (1999) found that "[a]ccounting for both submerged animals and animals that are otherwise missed by the observers in excellent survey conditions, only 23 percent of Cuvier's beaked

whales and 45 percent of *Mesoplodon* beaked whales are estimated to be seen on ship surveys if they are located directly on the survey trackline.” Moreover, Miller et al. (2009) determined that sperm whales continued on their course of travel during exposure to airgun sounds. None of those sperm whales diverted to avoid seismic activity at distances of 1–13 km from the vessel, and most whales traveled on a parallel course. Therefore, after either a power down or shutdown, the Marine Mammal Commission recommends that the National Marine Fisheries Service require a clearance time of 60 minutes for deep-diving species (i.e., beaked and sperm whales), if the animal is not observed to have left the exclusion zone.

In previous letters, the Commission has indicated that monitoring and reporting requirements should be sufficient to provide a reasonably accurate assessment of the manner of taking and the numbers of animals taken by the proposed activity, specifically to verify that only small numbers of marine mammals are being taken and that the impacts are negligible. The Commission continues to believe those assessments need to account for animals at the surface but not detected and for animals present but underwater and not available for sighting, which are accounted for by $g(0)$ and $f(0)$ values. NMFS’s most recent response to the Commission’s comments indicated that the MMPA implementing regulations require that applicants include monitoring that will result in “an increased knowledge of the species, the level of taking or impacts on populations of marine mammals that are expected to be present while conducting activities . . .” This increased knowledge of the level of taking could be qualitative or relative in nature, or it could be more directly quantitative (79 Fed. Reg. 38503). The Commission believes that NMFS misinterpreted its implementing regulations in its response. Those regulations state that applicants are to specify—

The suggested means of accomplishing the necessary monitoring and reporting that will result in increased knowledge of the species, the level of taking or impacts on populations of marine mammals that are expected to be present while conducting activities, and suggested means of minimizing burdens by coordinating such reporting requirements with other schemes already applicable to persons conducting such activity.

Although this portion of the regulations²¹ is not particularly clear, it appears that the phrase “increased knowledge” is intended to modify the clause “of the species” and not “the level of taking or impacts on the populations of marine mammals that are expected to be present while conducting activities”. If the phrase “increased knowledge of” is intended to apply throughout the remainder of the provision, as NMFS suggests, then the portion requiring the applicant to provide “suggested means of minimizing burdens...” makes no sense. A better interpretation of the provision is that the applicant is to suggest monitoring and reporting measures that will (1) increase the knowledge regarding the species and (2) provide the necessary information regarding the level of incidental taking that occurs and the impacts of such taking on the affected marine mammal populations. Such an interpretation is consistent with the statutory structure, which under section 101(a)(5)(D)(iv) requires that NMFS “modify, suspend, or revoke an authorization” if it finds, among other things, that the authorized taking is having more than a negligible impact or that more than small numbers

²¹ The Commission also questions whether the cited regulation is even the relevant one upon which NMFS should be relying. It merely specifies what applicants should be suggesting when applying for an incidental take authorization. NMFS has an independent responsibility under the MMPA to specify monitoring and reporting requirements that are sufficient for it determine that the statutory requirements are being met.

of marine mammals are being taken. It is through the prescribed monitoring and reporting requirements that NMFS collects the information necessary to make those determinations. As such, those requirements need to be sufficient to provide accurate information on the numbers of marine mammals being taken and the manner in which they are taken, not merely better information on the qualitative nature of the impacts. Accordingly, the Commission continues to believe that appropriate $g(0)$ and $f(0)$ values are essential for making accurate estimates of the numbers of marine mammals taken during surveys. To be applicable for the proposed survey, the corrections should be based on the ability of the protected species observers to detect marine mammals rather than a hypothetical optimum derived from scientific studies (e.g., from NMFS's shipboard surveys).

Therefore, the Commission again recommends that NMFS consult with LDEO, NSF, and other relevant entities (e.g., USGS, Scripps, ASC) to develop, validate, and implement a monitoring program that provides a scientifically sound, reasonably accurate assessment of the types of marine mammal takes and the actual numbers of marine mammals taken by incorporating applicable $g(0)$ and $f(0)$ values. NMFS recently stated that although it does not generally believe that post-activity take estimates using $f(0)$ and $g(0)$ are *required* to meet the monitoring requirement of the MMPA, in the context of the NSF and LDEO's monitoring plan, NMFS agreed that developing and incorporating a way to better interpret the results of their monitoring (perhaps a simplified or generalized version of $g(0)$ and $f(0)$) is a good idea. NMFS further stated it would consult with the Commission and NMFS scientists prior to finalizing the recommendations (79 Fed. Reg. 38503). The Commission welcomes such a meeting.

The Commission looks forward to collaborating with NMFS on the various guidance documents and issues raised in this letter. Please contact me if you have questions concerning the Commission's recommendations.

Sincerely,



Rebecca J. Lent, Ph.D.
Executive Director

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0648-XD394

Sat, Aug 30, 2014 at 1:05 PM

A great big "NO" to allowing the NSF in collaboration with Lamont-Doherty to "take" marine animals that have been affected by the airgun blasts. We are against permits being granted for this "so called" scientific research. They obviously know that marine life will be affected due to the 800 hours of explosions since they want to "take" the creatures affected. So, NO to all of these proposals.

Allen and Kathy Fitz
Nags Head, NC



Fw: public comment on federal register the seismic massive storm that will hemorrhage all whales and dolphins in the atlantic ocean

Sat, Aug 2, 2014 at 1:27 PM

Reply-To: Jean Public <jeanpublic1@yahoo.com>

To: "itp.cody@noaa.gov" <itp.cody@noaa.gov>, "vicepresident@whitehouse.gov" <vicepresident@whitehouse.gov>, "americanvoices@mail.house.gov" <americanvoices@mail.house.gov>, "info@pewtrusts.org" <info@pewtrusts.org>, "info@oceana.org" <info@oceana.org>, "info@opsociety.org" <info@opsociety.org>, "info@wdc.greenpeace.org" <info@wdc.greenpeace.org>, "info@sweashepherd.org" <info@sweashepherd.org>, "contact@harpseals.org" <contact@harpseals.org>, "info@peta.org" <info@peta.org>

Cc: "humanelines@hsus.org" <humanelines@hsus.org>, "info@idausa.org" <info@idausa.org>, "info@lohv.org" <info@lohv.org>, "info@cok.net" <info@cok.net>, "info@godscreaturesministry.org" <info@godscreaturesministry.org>

deny any permit to lamont which has done seismic surveys in this area before so there is no necessity to do them now. no matter what they say on their permit all of these surveys are for the help of oil and gas profiteers. whales, dolphins, all marine life are harmed and killed by seismic waves, which bring on brain hemorrhages to kill these poor animals, which are under assault by the greedy of this world. we do not need to study our oceans off the atlantic ocean coast. there is no need for this destructive survey. deny the permit. save the taxpayers dollars from being spent in this destructive endeavor. this comment is for the public record please receipt. jean public

:

they will wash up dead on the beaches

[Federal Register Volume 79, Number 147 (Thursday, July 31, 2014)]

[Notices]

[Pages 44549-44578]

From the Federal Register Online via the Government Printing Office [www.gpo.gov]

[FR Doc No: 2014-17998]

[[Page 44549]]

Vol. 79

Thursday,

No. 147



(no subject)

Wed, Aug 20, 2014 at 1:44 AM

0648-xd394

As a resident of N.C. that has and oceanfront motel on Hatteras Island, as well as being a commercial fisherman that has served on three Take Reduction Teams on marine mammals (bottlenose, harbor porpoise and presently the PLTRT) there is probably no one more upset with this proposed endeavor than myself. After all, this so called scientific research into continental drift might fool a few, but certainly not many, and doubtfully no one that is aware that the Obama administration has already opened the door for leasing offshore areas to oil exploration.

Furthermore, as and involved commercial fisherman that has spent 10 hours in a room fighting over one half of one PBRi find it extremely incredible that and agency that professes to have such concern for marine mammals would allow this potentially catastrophic intrusion into a so called special research area (CHSRSA)and area which i have to call into every time i go fishing because of the agencies supposed concern for both short fin and long fin pilot whales. Interestingly enough, the impact analysis on these two species which are probably the most numerous and likely to be the most impacted overall are given little if any review on the EIS.

While much ado is made of the fact that and observer will be on the vessel at all times, no mention is made of the fact that this operation will 24/7....and how much does anyone expect and observer to actually observe in the dark of night?

One does not need a crystal ball to see our future....they need only look towards the Gulf of Mexico after the Deepwater Horizon disaster. The implications there include greatly reduced abundance of oysters which in itself is probably the greatest barometer to the health of the marine ecosystem. From there you can include dolphin deaths, a greatly impacted shrimp fishery, probable implications to the health of and important spawning ground for Western bluefin tuna etc. etc.. But of course this agency always has a trump card for any such disaster....they can always look to commercial and recreational fisheries to save the day with increased restrictions in such a case to show their professional concern.

This all really is becoming clearer now. The biggest obstacle to industry access in fisheries is the many Pew funded NGO's (not to mention Pew itself) which is represented on every fisheries council in the nation in some form. Obviously Pew (Sun Oil) has figured out that the best defense is a good offense, not to mention that the single greatest potential liability in the case of another Deepwater disaster are the many commercial and recreational fisheries that dot our coast.

I could go on for hours but quite obviously since the permit has already been issued it is wasted effort. One other thing won't likely change after this...or the distrust of a agency that speaks out of both sides of it's mouth.

jeff oden
Hatteras N.C.



TOWN OF KILL DEVIL HILLS

Post Office Box 1719, 102 Town Hall Drive

Kill Devil Hills, North Carolina 27948

252-449-5300

www.kdhnc.com

Mayor

SHEILA F. DAVIES

Mayor Pro Tem

MIKE HOGAN

Commissioners

TRAVIS APPLEMAN

MICHAEL MIDGETTE

BRANDI H. RHEUBOTTOM

Town Manager

DEBORA P. DIÁZ

Assistant Town Manager

SHAWN R. MURPHY

Town Clerk

MARY E. QUIDLEY

Town Attorney

STEVE MICHAEL

August 29, 2014

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: 0648-XD394, Takes of Marine Mammals Incidental to Specified Activities; Marine Geophysical Survey in the Northwest Atlantic Ocean Offshore North Carolina, September to October 2014

Dear Ms. Harrison:

On behalf of the Town of Kill Devil Hills Board of Commissioners, I am writing to comment on the application from the Lamont-Doherty Earth Observatory (Lamont-Doherty) in collaboration with the National Science Foundation, for an Incidental Harassment Authorization to take marine mammals, by harassment incidental to conducting a marine geophysical (seismic) survey in the northwest Atlantic Ocean off the North Carolina coast from September through October, 2014. According to the NOAA July 31, 2014 notice, the seismic survey will take place in the Atlantic Ocean, approximately 17 to 422 kilometers (km) (10 to 262 miles [mi]) off the coast of Cape Hatteras, North Carolina.

We were stunned and disappointed to hear about this application to use air guns to relentlessly blast the marine life off Dare County's coast in the name of science. With little public notice and a comment period only open until September 2, we consider ourselves lucky to know about this application at all. It appears to us that this application has been accelerated, without full disclosure to the public.

As a municipality located on a barrier island, we must be a good steward of our fragile and pristine environment. Whether it is monitoring Kill Devil Hills' water quality or protecting the turtles that nest on our

Ms. Jolie Harrison
August 29, 2014
Page two

beautiful beach, we take great pride in doing everything we can to ensure that future generations will also be able to experience the magnificence of the Outer Banks.

Our area is home to many wildlife species, including the endangered right whale. Are these surveys so important that your organization is willing to ignore the major impacts to our ecosystem that will occur? Though the application states that the testing is not related to oil and natural gas exploration, we have a hard time believing that.

We strongly believe that more research should be completed to understand fully the impacts of seismic testing and how we can mitigate those impacts. Further information about the impacts of manmade sound on the underwater environment and its inhabitants and the nature and effects of seismic testing is needed before blasting should be conducted. How do we know if the impacts are immediate and dramatic or subtle and delayed?

We understand that alternative technologies to seismic airgun testing exist, which may be more costly, but less harmful to marine life. We would like to see these alternatives be given more consideration during the application process.

In closing, please deny this application. Seismic airgun testing causes catastrophic impacts to the marine ecosystem, including injury or death whales and dolphins. This, in turn, will set the stage for even more negative impacts to our area.

Thank you for your consideration.

Sincerely,

A handwritten signature in cursive script that reads "Sheila F. Davies".

Sheila F. Davies
Mayor

cc: Dare County Board of Commissioners
Director, NC Department of Environment and Natural Resources, Division of
Coastal Management
File



TOWN OF KILL DEVIL HILLS

Post Office Box 1719, 102 Town Hall Drive
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SHEILA F. DAVIES

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Town Manager
DEBORA P. DÍAZ

Assistant Town Manager
SHAWN R. MURPHY

Town Clerk
MARY E. QUIDLEY

Town Attorney
STEVE MICHAEL

August 29, 2014

Mr. Braxton Davis
Director
NC Department of Environment and Natural Resources
Division of Coastal Management
400 Commerce Avenue
Morehead City, NC 28557

RE: 0648-XD394, Takes of Marine Mammals Incidental to Specified
Activities; Marine Geophysical Survey in the Northwest Atlantic
Ocean Offshore North Carolina, September to October 2014

Dear Director Davis:

On behalf of the Town of Kill Devil Hills Board of Commissioners, I am writing to comment on the application from the Lamont-Doherty Earth Observatory (Lamont-Doherty) in collaboration with the National Science Foundation, for an Incidental Harassment Authorization to take marine mammals, by harassment incidental to conducting a marine geophysical (seismic) survey in the northwest Atlantic Ocean off the North Carolina coast from September through October, 2014.

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Mr. Braxton Davis
August 29, 2014
Page two

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Thank you for your consideration.

Sincerely,

A handwritten signature in cursive script, reading "Sheila F. Davies".

Sheila F. Davies
Mayor

cc: Dare County local governments
Permits and Conservation Division, Office of Protected Resources, National
Marine Fisheries Service
File

Marcus Langseth Science Oversight Committee (MLSOC)
Dr. Dale Sawyer, Chair
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Rice University MS-126
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Jolie Harrison, Supervisor
Incidental Take Program
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1315 East-West Highway
Silver Spring, MD 20910
ITP.Cody@noaa.gov

August 31, 2014

Subject: *0648-XD394 Comment on Takes of Marine Mammals Incidental to Specified Activities; Marine Geophysical Survey in the Northwest Atlantic Ocean Offshore North Carolina, September to October, 2014.*

Dear Ms. Harrison:

The members of the Marcus Langseth Science Oversight Committee (MLSOC) are pleased to submit the following comments to the National Marine Fisheries Service about the application for an Incidental Harassment Authorization for the proposed seismic program on the Atlantic Continental margin offshore North Carolina. This 2D program uses the *R/V Marcus G Langseth* (*R/V Langseth*), a unique asset of the National Academic Fleet with its specially designed capabilities to conduct the proposed seismic program, to achieve its primary objective of investigating how this part of the continental margin separated from Africa. *R/V Langseth* is owned by the National Science Foundation (NSF) and operated by Lamont Doherty Earth Observatory (LDEO). MLSOC supports the NMFS commitment to science-based decisions in its regulatory process.

The MLSOC is a committee within the University National Oceanographic Laboratories System (UNOLS) and consists of a diverse group of professionals, including geophysicists, geologists, oceanographers, and marine engineers, who provide advice on the scientific operations of *R/V Langseth*. The committee's members have extensive experience in seismic operations around the world aboard *R/V Langseth*, and other seismic vessels, as well as knowledge and experience in mitigation and monitoring identified and/or required under the National Environmental Policy Act (NEPA), the Marine Mammal Protection Act (MMPA) and the Endangered Species Act (ESA). One role of the Committee is to advise both the National Science Foundation (NSF) and the ship operator Lamont Doherty Earth Observatory (LDEO) on safe, efficient, cost-effective, and scientifically compelling operations of *R/V Langseth*.

The proposed *R/V Langseth* survey is part of an onshore-offshore coordinated experiment that has been planned for more than 5 years, through a series of workshops, proposals, and working groups. The offshore GeoPRISMS program, to study the processes that form and modify continental margins, identified the Eastern North American Margin (ENAM) as its primary site for studying rift initiation and evolution. The onshore component, the *Earthscope* program, consists of 400 portable seismometers deployed on a uniform grid that is systematically covering the U.S., entering eastern North America in 2012, and moving to Alaska in 2015. The purpose of *Earthscope* is to study the crust and lithospheric foundation of North America. The synergy of combining these two large programs is to promote cross-disciplinary learning and approaches to scientific collaboration that are not possible with single Principal-Investigator driven proposals and research. Both of these programs are community driven science, in that the workshops and planning are open to participation from all geoscientists and involve immediate release of the data. Immediate release of the data enables the broadest possible benefit to accrue from the experiment and maximizes the science and education derived from them.

Planning for the proposed *R/V Langseth* survey began in 2010. The GeoPRISMS program, which began in October, 2010, held a workshop in November, 2010 to develop an implementation plan for the rift initiation component. A year later, in October, 2011, geoscientists from *Earthscope* and ENAM met to identify and optimize common scientific interests. The implementation plan for GeoPRISMS identified three corridors across the North American margin to study, and the final proposal submitted for funding (in late 2012) focused on one corridor off North Carolina. Review of the proposal led to modifications that are incorporated into the current plan. Additional planning has occurred since 2012 to coordinate the logistics and permitting for the onshore and offshore components of the experiment. In addition to *R/V Langseth*, a second ship, *R/V Endeavor* is utilized to deploy and recover Ocean Bottom Seismographs (OBS) for the experiment. The OBS were deployed, in spring, 2014, to passively record seismic information prior to and during the ENAM experiment.

As a U.S. research vessel, *R/V Langseth* operates entirely within the U.S. regulatory process, and, when appropriate, international laws, required for understanding and mitigating the potential impacts of sound in the environment. NEPA requires proposed agency actions (in this case, NSF, which is proposing a seismic survey) to make the best effort to avoid adverse effects, minimize them, and mitigate them as part of assessing the environmental consequences of the project. The Environmental Assessment (EA), and the associated application for an Incidental Harassment Authorization (IHA) for this seismic experiment on the southeastern U.S. Atlantic margin, lay out the program, its potential consequences, possible alternatives, the rationale for why the proposed action is the most efficient and safe program, and mitigation measures that would minimize any potential adverse impacts. Among the factors considered in developing the research plan are:

- a. Minimum energy source size to accomplish scientific objectives
- b. Mitigation and shut down procedures specific to species
- c. Protected Species Visual Observers (PSVO) observations for a standard amount of time, generally 30 minutes prior to the start of the survey to clear a specified area around the vessel, and to monitor marine animal occurrence during seismic operations.

- d. Startup of the energy source includes ramp-up procedures over a standard amount of time (generally 30 min.) that serves to alert animals of the activities and allows them to vacate the area if disturbed.
- e. No start-up of the seismic source during poor visibility or at night unless at least one airgun has been operating.
- f. PSVOs, independent biologists, have authority to shut down the seismic source when marine mammals or sea turtles are detected in or about to enter designated exclusion zones.
- g. Passive Acoustic Monitoring (PAM) and infrared sensors during day and night to complement visual monitoring.
- h. Additionally, the airguns would be shut down if a North Atlantic right whale were seen at any distance from the vessel.

For the ENAM survey, the proponents propose to use two sizes of airgun arrays, an 18-airgun array with volume of 3300 in³ for work on the continental shelf, and a 36-airgun array with volume of 6600 in³ for the deep-water portions on the continental slope and rise. *Use of the smaller airgun array in shallow water on the continental shelf represents a compromise in achieving scientific objectives and reducing the impacts on marine animals.* Sound propagation in shallow water is more complicated to predict than in deep water, and the use of the smaller airgun array in shallow water recognizes this difficulty by being a more conservative source system than would be used in deep water. However, the smaller array diminishes the ability to record seismic signals across the entire onshore-offshore instrumentation array.

Marine seismic data are an essential and irreplaceable tool for scientific research in the oceans. Seismic images provide an unparalleled view of structures in the sediments, crust, and upper mantle beneath the seafloor. Data from the ENAM experiment will advance our understanding of fundamental geologic processes such as rifting, plate tectonics, volcanism, faulting, sediment deposition, and submarine landslides. ENAM researchers will also use these data to map dynamic features in the Earth, such as ground water flow, seafloor fluid and gas seeps, chemical and physical alteration of rocks, and the movement of water masses in the ocean.

If seismic surveys for basic research such as that proposed for ENAM using *R/V Langseth* are not permitted, the future of this unique national asset and the innovative research that it enables will be lost. If basic research seismic studies are halted, the U.S. will have lost a vital tool for studying the Earth. Marine seismic surveys are critical to our understanding of coastal geohazards, such as earthquakes, tsunamis, and submarine landslides. They enable government officials to make informed policy decisions that protect the safety of citizens and resilience of infrastructure.

NSF and LDEO have followed the appropriate IHA process and have conformed with the associated requirements. Based on the information and analysis provided by NSF and LDEO, the proposed activities meet the criteria established for issuance of an IHA. Therefore, the MLSOC urges NMFS to approve this application for an IHA.

R/V Langseth, and its predecessor, *R/V Ewing*, completed more than a decade's worth of academic/government seismic programs with the highest standards of mitigation and monitoring

and without the dire, unfounded results purported by opponents of the activities (e.g., no marine mammal mass strandings). As a consequence of past activities, academic scientists have provided significant contributions to society through results which have enhanced our understanding of the Earth, Earth processes, and geohazards. Additionally, observations made by the PSVOs aboard seismic expeditions are contributing to better understanding of the distribution and behavior of marine mammals and sea turtles. We encourage NMFS – as a science based agency – to use science to make informed decisions, perform its regulatory duties, and issue IHAs in an appropriate and timely manner.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Dale Sawyer", with a long horizontal flourish extending to the right.

Dr. Dale Sawyer, Chair MLSOC
Rice University

Members:

Paul Baker, Duke University
Nathan Bangs, University of Texas at Austin
Deborah Hutchinson, U.S. Geological Survey
William Lang, Resource Access International
David Scholl, University of Alaska
Alexander Shor, University of Hawaii
Maurice Tivey, Woods Hole Oceanographic Institution

Ex-officio:

Maya Tolstoy, Lamont-Doherty Earth Observatory
Suzanne Carbotte, Lamont-Doherty Earth Observatory



0648-XD394

BONNIE MONTELEONE

Tue, Sep 2, 2014 at 7:15 PM

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

Dear Chief Harrison,

Below are the grounds by which seismic testing should not occur off of the Outer Banks/Cape Hatteras region. Though the Federal Register and the Lamont-Doherty reports attempt to quell concerns, they do not address the unique characteristics that makes Cape Hatteras an important foraging habitat for a multitude of marine life especially endangered species. Seismic testing at any degree induces unnecessary stress on the already declining whale population.

1. The Federal Register's Revised Take Table as of July 25, 2014 is not completely accurate. According to their list, North Atlantic right and fin whales have a 0% take risk (both of which are endangered species). Fin whales are reportedly seen year round off of Hatteras. Right whales migrate in the fall from Bay of Fundy to Florida to calve. Though aerial surveys report rare sightings, they are RARE as a species. We cannot assume because we don't see them, they are not in the Cape Hatteras vicinity. Right whales have been seen off the coast of Fort Fisher, NC in early November making it possible that they could be feeding in the nutrient rich water off of Cape Hatteras in October. (<http://www.starnewsonline.com/article/20091112/articles/911129985?p=1&tc=pg&tc=ar>) But regardless, seismic testing has been reported to travel 100,000 miles which spans the distance from the Bay of Fundy to Florida. (Boom, Baby, Boom: The Environmental Impacts of Seismic Surveys, pg. 3.)
2. Due to the steep slope off of Cape Hatteras that causes nutrient rich upwelling, the cold waters of the Labrador Current, and the warm waters of the Gulf Stream, this location is an unusually dynamic area for foraging unlike any other region on the entire east coast. "In the pelagic and mid-water depths there is high diversity of vertebrates, migratory birds, mammals, and turtles as well as fish. On the bottom there is also diversity of invertebrates." (Blake, J. A et al., Gooday, A. J. et al, Hecker, B, Milliman, J. D. and Rhodas, D. C, et al) This is a foraging hotbed for an unusually high density of species. The seismic testing that will occur there will create enough noise to disrupt eating, mating, and navigation for 33 days straight, "792 hours of continuous airgun operations" according to the Lamont-Doherty report. Because it is a feeding site to many endangered species such as fin and the North Atlantic right whales, hawksbill, Kemp's ridley, loggerhead, and leatherback sea turtles, by law this area should be protected by the Endangered Species Act and listed as a priority ocean area for protection in the Mid-Atlantic. (www.nmfs.noaa.gov/pr/species/esa/listed.htm)
3. Due to the unique diversity of marine biota, the Outer Banks' economy is heavily impacted by the success of the fish stocks. Airguns have been shown to dramatically depress catch rates of various commercial species. (Engas, A. et al., 1996)
4. Because beaked whales are deep divers, they are found in areas where there are canyons and are heavily impacted by these surveys due to sound bouncing off the canyon walls. (Sounding the Depths, pg. 11) Cuvier's beaked whales are seen in this coastal region year round, traveling north and south along Hatteras Canyon off Cape Hatteras, and could potentially be more at risk for this reason. "In general, the heads of canyons are

known to be nursery areas for many fish and crustaceans, including commercially important ones. The sessile corals, sponges, and anemones found in the northern canyons have restricted distributions in that they must live attached to hard substrates. Hence populations within the canyons could represent crucial stock populations of sessile organisms.” (<http://www.nrdc.org/water/oceans/priority/recheck.asp>)

5. The Lamont-Doherty report states the testing will be as high as 180 decibels. “. . . a 174-decibel rumble . . . about as strong as a commercial jet at takeoff, measured about three feet away.” (Sounding the Depths, pg. 4) Prolonged exposure to continuous loud noise is known to cause hearing loss to humans as well as marine mammals. This hearing impairment is known as “threshold shift.” (Sound the Depths II, pg. 13) Though marine mammals have eyes and a sense of smell, the sense they rely on the most is sound to navigate, forage for food, mate, care for their offspring, and protect themselves from predators. To introduce sound that interferes with the most important sensory for 33 days straight is similar to blinding people with flood lights continuously for 24 hours, for 33 days. How could people feed, care for their children, or stay out of harms way? It is our moral, scientific, and legislative duty to protect this region more so than other areas along the east coast.

6. The proposed sound source consists of a 36-airgun array with a total discharge volume of ~6600 in or an 18-airgun array with a total discharge of volume of ~3300. “A single airgun array can disrupt vital behavior in endangered whales over an area of at least 100,000 square nautical miles in size.” (Boom, Baby, Boom: The Environmental Impacts of Seismic Surveys, pg. 3.) This underscores the harassment seismic testing will cause to the most endangered whale in the world – the North Atlantic right whale.

7. Other anthropogenic impacts that compromise the large whale populations are fishing gear entanglement and boat strikes. Right whales and fin whales are the most commonly reported species in the context of population size prone to vessel strikes. “Compared with the spatial extent of regulations, vessel-strike mortality continues to be highest in the mid-Atlantic coast.” (Van Der Hoop, J. M. et al. 2012) Seismic testing will add yet another stressor on the already in periled species.

8. *Sargassum* is considered an essential fish habitat and is charged by law to minimize any adverse effects on such habitat. (Fishing North Carolina’s Outer Banks: The complete Guide to Catching More, pg. 72). *Sargassum* found off North Carolina’s coast is home to 81 fish species. Most of these fishes are juveniles that meander from the Gulf Stream. Commercially important dolphin fish, amberjacks, and tuna have also been documented to use this unique habitat as well as marine mammals (dolphins) and juvenile loggerhead sea turtles many of which are endangered. (<http://oceanexplorer.noaa.gov/explorations/03edge/background/sargassum/sargassum.html>) Influenced by the currents, large windrows of *Sargassum* mats consistently form just off of Cape Hatteras. The airgun blasts are not limited to just reaching the bottom but are also reported to be heard by mariners; thus, the *Sargassum* ecosystem stands to be impacted by the airgun operations. The NC Outer Banks fishing industry relies heavily on the *Sargassum* habitat. Communication with members from Pirates Cove Marina, the fishermen fear the negative impacts on fishing especially in hunting marlin.

Please consider this very unique aquatic region as a priority ocean area for protection in the Mid-Atlantic both for marine life and the fishing community, and not allow seismic testing incidental harassment to ever occur in this region.

Thank you for your consideration.

Bonnie Monteleone

Robert C. Edwards
Mayor

Susie Walters
Mayor Pro Tem

Cliff Ogburn
Town Manager



Town of Nags Head

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M. Renée Cahoon
Commissioner

John Ratzenberger
Commissioner

Marvin Demers
Commissioner

August 19, 2014

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: 0648-XD394, Takes of Marine Mammals Incidental to Specified Activities; Marine Geophysical Survey in the Northwest Atlantic Ocean Offshore North Carolina, September to October 2014

Dear Ms. Harrison:

On behalf of Nags Head's Board of Commissioners, I am writing to comment on the application from the Lamont-Doherty Earth Observatory (Lamont-Doherty) in collaboration with the National Science Foundation (Foundation), for an Incidental Harassment Authorization (Authorization) to take marine mammals, by harassment incidental to conducting a marine geophysical (seismic) survey in the northwest Atlantic Ocean off the North Carolina coast from September through October, 2014. According to the NOAA July 31, 2014 notice, the seismic survey will take place in the Atlantic Ocean, approximately 17 to 422 kilometers (km) (10 to 262 miles (mi)) off the coast of Cape Hatteras, North Carolina.

We were stunned and disappointed to hear about this application to use air guns to relentlessly blast the marine life off Dare County's coast in the name of science. With little public notice and a comment period only open until September 2, we consider ourselves lucky to know about this application at all. It appears to us that this application has been accelerated, without full disclosure to the public.

As a municipality located on a barrier island, we must be a good steward of our fragile and pristine environment. Whether it is monitoring Nags Head's water quality or protecting the turtles that nest on our beautiful beach, we take great pride in doing everything we can to ensure that future generations will also be able to experience the magnificence of the Outer Banks.

Our area is home to many wildlife species, including the endangered right whale. Are these surveys so important that your organization is willing to ignore the major impacts to our ecosystem that will occur? Though the application states that the testing is not related to oil and natural gas exploration, we have a hard time believing that.

As you can see by the resolution our Board adopted April 2, 2014, we strongly believe that more research should be completed to fully understand the impacts of seismic testing and how we can mitigate those impacts. Further information about the impacts of manmade sound on the underwater environment and its inhabitants and the nature and effects of seismic testing is needed before blasting should be conducted. How do we know if the impacts are immediate and dramatic or subtle and delayed?

We understand that alternative technologies to seismic airgun testing exist, which may be more costly, but less harmful to marine life. We would like to see these alternatives be given more consideration during the application process.

In closing, please deny this application. Seismic airgun testing causes catastrophic impacts to the marine ecosystem, including injury or death whales and dolphins. This, in turn, will set the stage for even more negative impacts to our area.

Thank you for your consideration.

Sincerely,

A handwritten signature in dark ink, appearing to read "Bob Edwards", written in a cursive style.

Robert C. Edwards
Mayor

cc: Dare County Board of Commissioners
Bobby Outten, Manager, Dare County

Enclosure

RCE/rlt



**A Resolution of the Board of Commissioners of the Town of Nags Head, North Carolina
Expressing opposition to seismic testing as proposed in the
Bureau of Ocean Energy Management (BOEM)
Programmatic Environmental Impact Statement (PEIS) - Option A and Option B**

WHEREAS, seismic testing as proposed in the Bureau of Ocean Energy Management ("BOEM") Programmatic Environmental Impact Statement alternative A and alternative B has the potential to harm marine life; and

WHEREAS, seismic testing as proposed in BOEM Programmatic Environmental Impact Statement alternative A and alternative B has the potential to impact recreational and commercial fishing; and

WHEREAS, the Town of Nags Head is a municipality in Dare County where a major economic force is tourism related to the coastal environment; and

WHEREAS, the Town of Nags Head endeavors to be a good steward of the coastal environment and its resources; and


WHEREAS, the full impacts of seismic testing as proposed in BOEM Programmatic Environmental Impact Statement alternative A and alternative B are not yet fully understood by scientists, the Oil & Gas industry, or BOEM, and

WHEREAS, the Town of Nags Head believes that more research should be done to fully understand all impacts of seismic testing and options for mitigation those impacts; and

WHEREAS, the Town of Nags Head does not believe seismic testing as currently proposed in alternative A or alternative B of BOEM's Programmatic Environmental Impact Statement is the safest way to map oil & gas deposits in the mid-Atlantic region.

NOW, THEREFORE, BE IT RESOLVED, the Board of Commissioners of the Town of Nags Head, North Carolina, is opposed to seismic testing as proposed in alternative A or alternative B of BOEM's Programmatic Environmental Impact Statement until such time as all testing options are evaluated and proper assurances for the protection of marine life are established.

This resolution adopted the 2nd of April 2014.


Robert C. Edwards, Mayor
Town of Nags Head

ATTEST


Carolyn F. Morris, Town Clerk





NATURAL RESOURCES DEFENSE COUNCIL

Via Electronic Mail

September 2, 2014

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

Email: ITP.Cody@noaa.gov

**Re: Comments on the proposed Incidental Harassment Authorization for
Lamont-Doherty Earth Observatory and National Science Foundation
survey in northwest Atlantic Ocean off the North Carolina coast**

Dear Ms. Harrison:

On behalf of our organizations and our more than one million members, we write to submit comments on the proposed Incidental Harassment Authorization (IHA) for the take of marine mammals related to a proposed Lamont-Doherty Earth Observatory (Lamont-Doherty) and National Science Foundation (NSF) geophysical seismic survey in the northwest Atlantic Ocean off Cape Hatteras, North Carolina, September 15 through October 31, 2014. 79 Fed. Reg. 44550 (July 13, 2014).

Our organizations are profoundly concerned about NMFS's intention to permit high-intensity seismic surveys to operate 24/7 for weeks on end in this highly sensitive Atlantic region because of the significant environmental harm of airgun exploration itself, the sensitivity and endangered status of numerous marine species found within the proposed study area, and the cumulative impact of this and other planned activity in the Atlantic. We are also deeply troubled by the poor analysis undertaken in support of this project, which should have received far more rigorous review, and by NMFS' conclusion of the public comment process only thirteen days before the requested authorization period begins—a practice we have seen before with NSF authorizations—making it highly unlikely that approval of the authorization as it stands, regardless of the evidence and recommendations the public supplies, is anything other than a foregone conclusion.

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 the proposed action would degrade the acoustic environment along particularly rich waters, home to noise-sensitive species off the coast of Cape Hatteras. To conduct the survey, Lamont-Doherty/NSF plans to use 36 or 18 high-volume airguns, firing intense impulses of compressed air—almost as loud as explosives—roughly every 65 or 22 seconds, 24 hours per day, for weeks on end. In addition, Lamont-Doherty/NSF intends to operate a multi-beam echosounder—a system similar to the one found to have likely caused a mass stranding of melon-headed whales on Madagascar—and a sub-bottom profiler continuously during the seismic operations.

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 location of the proposed multi-year survey, it could well affect endangered species and populations already depleted through fisheries interactions. Indeed, even with its erroneous methodology, NMFS estimates that high percentages of several regional marine mammal stocks will be taken, including roughly 22% of pantropical spotted dolphins.

The MMPA dictates that, before permitting this activity, NMFS must ensure that the project employs mitigation to obtain the least practicable impact. Unfortunately, the proposed project falls far short of this standard. Instead, it provides an analysis that consistently tends to understate impacts and fails to require available mitigation measures. The survey needlessly harms marine mammals in direct disregard of the Marine Mammal Protection Act and recklessly impacts fish and sea turtles as well.

Given the intense controversy over seismic surveys in the Atlantic region, it is a matter of some amazement to all of our organizations that NMFS did not subject this survey application to meaningful scrutiny. We urge that NMFS deny the IHA or Lamont-Doherty/NSF withdraw its application, and that—at minimum—Lamont-Doherty/NSF revise its proposed mitigation measures in the ways discussed below.

I. BACKGROUND: ENVIRONMENTAL IMPACTS

A large seismic airgun array can produce effective peak pressures of sound higher than those of virtually any other man-made source save explosives;¹ 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

¹ National Research Council, *Ocean Noise and Marine Mammals* (2003).

ambient noise thousands of miles from any given survey.² Indeed, the enormous scale of this acoustic footprint has now been confirmed by studies of seismic in numerous regions around the globe, including the Arctic, the northeast Atlantic, Greenland, and Australia.

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.³ 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.⁴

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.⁵ 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.⁶ 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.⁷ As discussed further below, the exposure levels implicated in all of these

² Niekirk, S.L., Stafford, K.M., Mellinger, D.K., Dziak, R.P., and Fox, C.G., Low-frequency whale and seismic airgun sounds recorded in the mid-Atlantic Ocean, *Journal of the Acoustical Society of America* 115: 1832-1843 (2004).

³ 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).

⁴ 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).

⁵ 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).

⁶ *Id.*; Weilgart, L. (ed.), Report of the workshop on alternative technologies to seismic airgun surveys for oil and gas exploration and their potential for reducing impacts on marine mammals, 31 Aug. – 1 Sept., 2009, Monterey, Calif. (2010) (available at www.oceanos-stiftung.org/oceanos/download.php?id=19).

⁷ 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).

studies are lower – indeed orders of magnitude lower on a decibel scale – than the threshold used to evaluate airgun behavioral impacts in the proposed IHA. 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.

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;⁸ and harbor porpoises have been seen to engage in strong avoidance responses fifty miles from an array.⁹ Seismic surveys have been implicated in the long-term loss of marine mammal biodiversity off the coast of Brazil.¹⁰ 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.¹¹

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,¹² 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.¹³ Even brief playbacks of predominantly low-frequency

⁸ 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).

⁹ 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).

¹⁰ 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).

¹¹ 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.

¹² 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 spp.*), *Canadian Journal of Fisheries and Aquatic Sciences* 49: 1357-1365 (1992).

¹³ 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.,

noise from speedboats have been shown to significantly impair the ability of some fish species to forage.¹⁴ Recent data suggest that loud, low-frequency sound also disrupts chorusing in black drum fish, a behavior essential to breeding in this commercial species.¹⁵ Several studies indicate that airgun noise can kill or decrease the viability of fish eggs and larvae.¹⁶

The amount of disruptive activity under consideration in this proposed IHA is substantial, especially when put into the context of cumulative impacts in the region from other activities.

II. PURPOSE AND NEED OF STUDY

The stated purpose of the study, as set forth in the Draft Environmental Assessment (DEA), is to investigate how the continental crust stretched and separated during the opening of the Atlantic Ocean, and what the role of magmatism was during continental breakup.

In the paltry 1-paragraph discussion of the purpose and need for the project, the Draft Environmental Assessment offers no analysis of the ability to obtain this information by modeling or alternate means, no discussion of related survey data that may be available for extrapolation or reprocessing, nor any prediction of the scientific uniqueness and value of the findings. Indeed, there is little to substantiate the immediate need for this study, other than vague statements about NSF's "need to fund seismic surveys" and "need to foster a better understanding of Earth processes." Without such basic information, it is impossible to ascertain the need for this study, or for any portion of the study—an essential consideration for the agency in meeting its regulatory mandate under the MMPA's mitigation provision.

III. MITIGATION & IMPACTS

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).

¹⁴ 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).

¹⁵ Clark, C.W., pers. comm. with M. Jasny, NRDC (Apr. 2010).

¹⁶ Booman, C., Dalen, J., Leivestad, H., Levsen, A., van der Meeren, T., and Toklum, K., Effekter 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).

The requested action has the potential for temporary or permanent hearing loss and other physical effects including stranding and death; masking and reduced effectiveness of communication; vessel strike and collision; entanglement; and stress and behavioral disturbance of marine mammals. In order to issue an Incidental Take Authorization (ITA) under section 101(a)(5)(D) of the MMPA, NMFS must set forth mitigation that ensures a means of effecting the least practicable impact. The mitigation here falls far short of that high bar on various fronts.

A. Failure to Consider Time-Area Restrictions

Time and area 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.¹⁷ 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 using predictive habitat modeling and other means.¹⁸ Incredibly, the proposed IHA does not consider any areas for closures or seasonal planning for any species other than for North Atlantic right whales, and provides no justification for the particular trackline configuration mapped in its addendum—and particularly why that design, as opposed to other potential designs, represents the least practicable adverse impact on marine mammals. More specifically:

1. Cape Hatteras Special Research Area

The continental shelf break off Cape Hatteras features a major oceanic front created by the Gulf Stream, which plumes into the Atlantic and merges with Labrador Current, creating conditions for warm-core rings and high abundance of marine mammals and fish.¹⁹ Among the many species that are drawn to this area in high abundance are long-

¹⁷ See, e.g., Agardy, T., Aguilar Soto, N., Cañadas, A., Engel, M., Frantzis, A., Hatch, L., Hoyt, E., Kaschner, K., LaBrecque, E., Martin, V., Notarbartolo di Sciara, G., Pavan, G., Servidio, A., Smith, B., Wang, J., Weilgart, L., Wintle, B., and Wright, A., A global scientific workshop on spatio-temporal management of noise, Report of workshop held in Puerto Calero, Lanzarote, June 4-6, 2007 (2007); Dolman, S., Aguilar Soto, N., Notarbartolo di Sciara, G., Andre, M., Evans, P., Frisch, H., Gannier, A., Gordon, J., Jasny, M., Johnson, M., Papanicolopulu, I., Panigada, S., Tyack, P., and Wright, A., Technical report on effective mitigation for active sonar and beaked whales (2009) (working group convened by European Cetacean Society); OSPAR Commission, Assessment of the environmental impact of underwater noise (2009) (report issued as part of OSPAR Biodiversity Series, London, UK); Convention on Biological Diversity, Scientific synthesis on the impacts of underwater noise on marine and coastal biodiversity and habitats (2012) (UNEP/CBD/SBSTTA/16/INF/12).

¹⁸ 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).

¹⁹ 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

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 of a take reduction team under the MMPA.²⁰ The Cape Hatteras Special Research Area, designated by NMFS as a tool to manage the marine mammal-fishery interactions, captures the majority of the most 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.²¹ It lies between 35° N. lat. and 36° 25' N. lat. on the north and south, and 74° 35' W. long. and 75° W. long. on the east and west, representing the northwest portion of the proposed study area.

2. Other areas

NMFS has not attempted any systematic analysis of marine mammal habitat for purposes of establishing time-area closures within the study area, despite the availability of predictive habitat models and direct survey data. For example, 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. Until Duke has produced its new cetacean density model pursuant to NOAA's CetMap program, NMFS should use these sources, which represent best available science, to identify important marine mammal habitat and ensure the least practicable impact. 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; the three odontocete stocks that are the subject of a regional take reduction team; and beaked whales, whose vulnerability to anthropogenic noise is well recognized and which occur in this region in relatively high densities.

B. Failure to Ensure Marine Mammal Take Remains Below Estimates

At some point between the submission of its application and NMFS' issuance of the proposed IHA, Lamont Doherty/NSF elected to remove the 25% contingency that it typically adds to its tracklines to account for line changes, vessel turns, equipment malfunctions, and other factors, with the effect of reducing the total area ensonified (to 160 dB) by approximately 36 percent. The consequences can be read in the revised take estimates: significant reductions in species take virtually across the aboard.

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).

²⁰ 74 Fed. Reg. 23349, 23350.

²¹ 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).

Of course our organizations do not oppose the modification of tracklines to reduce ensonification of the marine environment and minimize harm to marine mammals; indeed, we have strongly recommended such measures on numerous other occasions. The modifications proposed by NMFS, however, are questionable. It remains unclear, for example, how the tracklines that were omitted from IHA Figure 1 can plausibly be eliminated, as they appear necessary to turn the source vessel. On the contrary, circumstances suggest that NMFS' modifications, far from reducing impacts to their least practicable level as the MMPA requires, were instead undertaken to lower the agency's take estimates, particularly of pantropical spotted dolphins, to levels more easily approved under the MMPA's "small numbers" standard.

We therefore fully concur with the Marine Mammal Commission that any IHA issued for this project expressly deny authorization "to repeat tracklines, accommodate the turning radius of the vessel, address equipment malfunctions, or conduct equipment testing prior to commencing or during the survey."²² Alternatively, NMFS should expressly limit LDEO/NSF to both the specified tracklines and the specified number of line-kilometers, and require cessation of the activity when the latter is reached.

C. Failure to Adequately Consider Reasonable Mitigation and Monitoring Measures

The proposed IHA does not adequately consider, or fails to consider at all, a number of other reasonable measures that could significantly reduce take from the proposed activities. These measures include, but are not limited to:

1. Survey design standards and review

NMFS should require that the airgun survey vessel use the lowest practicable source level, minimize horizontal propagation of the sound signal, and minimize track lines consistent with the purposes of the survey.²³ While cursory consideration is given to the source level, little explanation of the conclusion that a 36-airgun array is required is offered. We would note that, in the past, NMFS has recognized that MMPA mitigation begins "during the planning phases," as, for example, with consideration of whether the same research objectives could be accomplished using a smaller source. Thus, for a 2013 survey off

²² Comments of Marine Mammal Commission at 9 (Aug. 18, 2014).

²³ 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).

Spain, Lamont Doherty/NSF used two 18-airgun arrays operating in ping-pong mode rather than a single, high-source-level, 36-gun array. 78 Fed. Reg. 17359, 17376 (Mar. 21, 2013). Here NMFS has failed to engage in that analysis—an analysis that should have taken place months ago.

2. Multi-beam echosounder

NMFS should also require use of an alternative multi-beam echosounder to the one presently proposed, which uses a peak frequency between 10.5 kHz and 13 kHz. An industrial multibeam echosounder employed by Exxon occurred in close spatial and temporal association with a mass stranding of melon-headed whales off Madagascar, in 2008;²⁴ a comparable multibeam sonar system—with a center frequency of 15.5 kHz and associated source levels of 237 dB—was used by a Lamont-Doherty Earth Observatory research survey prior to the Gulf of California beaked whale strandings in September 2002, with which the survey was closely correlated, and may have played a role in that event as well.²⁵ Regardless of the potential for strandings in the present case, it is clear that high-power, lower-frequency echosounders have the potential to impact marine mammal behavior, especially of odontocetes, over a wide spatial scale—and to a far greater extent than has previously been supposed for this category of sound source.²⁶ Given the acoustic characteristics of the Langseth's echosounder, use of an alternative for part or all of the survey must be considered.

3. Sound source validation

Relatedly, NMFS should require Lamont-Doherty/NSF 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, but preferably, through modeling, out to more reasonable impact distances). Such analysis is essential particularly where, as in the case of the proposed multi-beam echosounder, NMFS has based its analysis on dubious assumptions that run counter to the propagation analysis in the Madagascar stranding report (Southall et al. 2013). Sound source validation has been required of Arctic operators for several years, as part of their IHA compliance requirements, and has proven

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 Cox, T.M., Ragen, T.J., Read, A.J., Vos, E., Baird, R.W., Balcomb, K., Barlow, J., Caldwell, J., Cranford, T., Crum, L., D'Amico, A., D'Spain, G., Fernández, A., Finneran, J., Gentry, R., Gerth, W., Gulland, F., Hildebrand, J., Houser, D., Hullar, T., Jepson, P.D., Ketten, D., MacLeod, C.D., Miller, P., Moore, S., Mountain, D., Palka, D., Ponganis, P., Rommel, S., Rowles, T., Taylor, B., Tyack, P., Wartzok, D., Gisiner, R., Mead, J., and Benner, L., Understanding the impacts of anthropogenic sound on beaked whales. 7 *J. Cetacean Res. Manage.* 177-187 (2006); 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 Crisis* 101-123 (2006).

²⁶ The point is echoed by Southall et al., Final Report of the Independent Scientific Review Panel.

useful for establishing more accurate, *in situ* measurements of safety zones and for acquiring information on noise propagation.²⁷

4. Adequate safety zone distances

NMFS should reconsider the size of the safety zone. The proposed IHA proposes establishing a safety zone of 180 dB re 1 μ Pa (with a 500 m minimum) around the seismic array. Gedamke et al. (2011), whose lead author is the present director of NMFS' Bioacoustics Program, has put traditional means of estimating safety zones into doubt. That paper demonstrates through modeling that, when uncertainties about impact thresholds and intraspecific variation are accounted for, a significant number of whales could suffer temporary threshold shift (*i.e.*, hearing loss) beyond 1 km from a relatively small seismic array (source energy level of 220 dB re 1 μ Pa²(s)) – a distance that seems likely to exceed NMFS's estimates.²⁸ 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.²⁹ And a number of recent studies suggest that the relationship between temporary and permanent threshold shift may not be as predictable as previously believed.³⁰

Finally, NMFS 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.³¹ Visual sighting of any individual right whale at any distance should trigger shut-down; for other species, shut-down should occur if aggregations are observed within the 160 dB isopleth around the sound source.

5. Adequate real-time monitoring

²⁷ See, e.g., Burns et al., Expert Panel Review (2010), *supra*; Brower et al., Expert Panel Review (2011), *supra*.

²⁸ 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).

²⁹ 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).

³⁰ 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).

³¹ 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).

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.³² Supplemental methods that have been used on certain other projects include hydrophone buoys and other platforms for acoustic monitoring, aerial surveys, shore-based monitoring, and the use of additional small vessels. Here, the real-time monitoring effort proposed in the IHA is inadequate.

While NMFS seems to require two observers for the airgun survey during the majority of the time—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*, NMFS would allow visual and acoustic observers to work at four-hour stretches. 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*, NMFS offers no details about the training requirements of its vessel-based observers. Yet, as UK 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.³³ NMFS should require field experience in marine mammal observation of any observer.

Finally, the proposed IHA makes no consideration of limiting activities in low-visibility conditions or at night, which can reduce the risk of ship-strikes and near-field noise exposures.

6. Technology-based mitigation

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

³² 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).

³³ 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*.

governments should accelerate development and use of these technologies through both research and development funding and regulatory engagement.³⁴

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.³⁵ 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.³⁶

Considerable current effort is focused on developing quieting technologies for use in offshore exploration. Last winter, BOEM convened an international workshop on noise-reduction alternatives for deep-penetration seismic exploration, pile-driving for offshore construction, and shipping for offshore development in general. Findings of that workshop, which were released in a BOEM report, emphasize the promise of vibroseis.³⁷ Last June, parties to *NRDC v. Jewell* entered into a settlement agreement that establishes a timeframe for industry development and testing of three vibroseis prototypes;³⁸ and Geo-Kinetics has made substantial recent progress in bringing its own vibroseis unit to commercial viability, with an array potentially becoming available later this year. In 2012, BP North America patented a different noise-reduction method—one that uses software to stagger bursts of airgun fire, in order to reduce the effective source level of the array.³⁹

The proposed IHA, however, fails to include any requirement to use or test the use of new technologies in the USGS Atlantic survey.

³⁴ Weilgart, L. ed., Report of the workshop on alternative technologies to seismic airgun surveys for oil and gas exploration and their potential for reducing impacts on marine mammals, 31 Aug. – 1 Sept., 2009, Monterey, Calif. (2010), available at www.oceanos-stiftung.org/oceanos/download.php?id=19.

³⁵ *Id.*

³⁶ Spence, J., Fischer, R., Bahtiaran, 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.

³⁷ CSA Ocean Sciences, Quieting Technologies for Reducing Noise During Seismic Surveying and Pile Driving Workshop. Summary Report for the US Dept. of the Interior (2014) (BOEM rep. no. 2014-061).

³⁸ Settlement Agreement, *NRDC v. Jewell*, Case No. 2: 10-cv-01882 (E.D. La.) (settlement filed June 18, 2013).

³⁹ A. Ross and R.L. Abma, Offshore prospecting signal processing controlled source signaling, U.S. Patent 20,120,147,701 (June 14, 2012) (available at: <http://www.faqs.org/patents/app/20120147701>).

IV. IMPACTS ANALYSIS

A. Failure to Set Proper Thresholds for Marine Mammal Take

In addition to not implementing measures that would reduce take, NMFS has underestimated marine mammal take from the proposed study. 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 failure to adequately calculate impacts from masking. Nor has NMFS 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

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

The agency's use of a single, non-conservative, bright-line threshold for all species flies in the face of recent science and is untenable. In particular, 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.⁴¹ Similarly, a low-frequency, high-amplitude fish mapping device was found to silence humpback whales at distance of 200 km, where received levels ranged from 88 to 110 dB; and several other studies clearly indicate disruption of biologically significant behaviors in baleen whales are drastically lower

⁴⁰ Clark, C., Mann, D., Miller, P., Nowacek, D., and Southall, B., Comments on Arctic Ocean Draft Environmental Impact Statement at 2 (Feb. 28, 2012).

⁴¹ 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).

received levels than considered here.⁴² Sperm whale foraging success, as measured by buzz rate, appears to decline significantly on exposure to airgun received levels above 130 dB (RMS), with potentially serious long-term consequences.⁴³ Harbor porpoises are known to be acutely sensitive to a range of anthropogenic sources, including airguns. They have been observed to engage in avoidance responses fifty miles from a seismic airgun array – a result that is consistent with both captive and wild animal studies showing them abandoning habitat in response to pulsed sounds at very low received levels, well below 120 decibels (re 1 μ Pa (RMS)).⁴⁴ 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.⁴⁵

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;⁴⁶ 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

⁴² See, e.g., 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); 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); Castellote, M., Clark, C.W., and Lammers, M.O., Acoustic and behavioural changes by fin whales (*Balaenoptera physalus*) in response to shipping and airgun noise, *Biological Conservation* 147: 115-122 (2012).

⁴³ 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).

⁴⁴ E.g., Bain, D.E., and Williams, R., Long-range effects of airgun noise on marine mammals: responses as a function of received sound level and distance (2006) (IWC Sci. Comm. Doc. IWC/SC/58/E35); Kastelein, R.A., Verboom, W.C., Jennings, N., and de Haan, D., Behavioral avoidance threshold level of a harbor porpoise (*Phocoena phocoena*) for a continuous 50 kHz pure tone, *Journal of the Acoustical Society of America* 123: 1858-1861 (2008); Kastelein, R.A., Verboom, W.C., Muijsers, M., Jennings, N.V., and van der Heul, S., The influence of acoustic emissions for underwater data transmission on the behavior of harbour porpoises (*Phocoena phocoena*) in a floating pen, *Mar. Environ. Res.* 59: 287-307 (2005); Olesiuk, P.F., Nichol, L.M., Sowden, M.J., and Ford, J.K.B., Effect of the sound generated by an acoustic harassment device on the relative abundance and distribution of harbor porpoises (*Phocoena phocoena*) in Retreat Passage, British Columbia, *Mar. Mamm. Sci.* 18: 843-862 (2002).

⁴⁵ 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:10.1371/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).

⁴⁶ High Energy Seismic Survey Team, High energy seismic survey review process and interim operational guidelines for marine surveys offshore Southern California (1999).

(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.

In addition, using a single sound pressure level of 160-dB for harassment represents a major step backward from recent authorizations. For Navy sonar activity, NMFS has incorporated into its analysis linear risk functions that endeavor to account for risk and individual variability and to reflect the potential for take at relatively low levels. Using a single sound pressure level of 160-dB for harassment represents a major step backward from recent authorizations. For Navy sonar activity, NMFS has incorporated into its analysis linear risk functions that endeavor to account for risk and individual variability and to reflect the potential for take at relatively low levels.⁴⁷

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.⁴⁸ 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.⁴⁹ 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;⁵⁰ and, we expect, by the modeling efforts of NOAA's Sound Mapping working group, whose public release is supposed to occur in early July. NMFS should not ignore this science.

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.⁵¹

⁴⁷ See, e.g., 74 Fed. Reg. 4844, 4844-4885 (Jan. 27, 2009).

⁴⁸ See Expert Panel Review 2011.

⁴⁹ *Id.*; see also Expert Panel Review 2010.

⁵⁰ 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., 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).

⁵¹ 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).

Finally, NMFS must consider that even behavioral disturbance can amount to Level A take 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; and some sound sources can cause beaked whales to change their behavior, resulting in pathologies consistent with decompression sickness. NMFS must take into account the best available science and set lower thresholds for Level A take, which, as noted above, would lead to larger exclusion zones around the survey.

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

- i. NMFS should employ a combination of specific thresholds for which sufficient species-specific data are available and generalized thresholds for all other species.⁵² 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, NMFS 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).⁵³
- ii. Data on species for which specific thresholds are developed should be included in deriving generalized thresholds for species for which less data are available.
- iii. 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.
- iv. 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 pressure and RMS should be used. Alternatively, NMFS should

⁵² By “thresholds,” we mean either bright-line thresholds or linear risk functions.

⁵³ 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).

use the most biologically conservative method of calculating RMS, following Madsen (2005). (See section IV.C. below for additional detail.)

2. Erroneous “small numbers” and “negligible impact” determinations

Any authorization to take marine mammals must result in the incidental take of only “small numbers of marine mammals of a species or population stock,” and can have no more than a “negligible impact” on species and stocks.⁵⁴ The thresholds used in the proposed IHA do not reflect the best available science and the proposal does not meet the MMPA’s requirement that authorized take only affect small numbers of animals and have a negligible impact.

NMFS has also blatantly disregarded the MMPA’s prohibition on allowing the take of more than small numbers of marine mammals.⁵⁵ The proposed survey will take thousands of marine mammals, including more than small numbers of some stocks. For example, the proposed take for pantropical spotted dolphins is 737.⁵⁶ This amounts to 22.13% of the stock even accepting the underestimation produced by NMFS’ erroneous take methodology. Although there is no numerical cut-off for “small numbers,”⁵⁷ courts have concluded that “[a] definition of ‘small number’ that permits the potential taking of as much as 12% of the population of a species is plainly against Congress’ intent.”⁵⁸ NMFS must use the best available science in making its negligible impact and small numbers determinations.

Finally, NMFS’ reliance on marine mammal avoidance of the seismic survey to mitigate the take of marine mammals is improper. Rather, displacement of marine mammals by noise pollution is itself harassment. Furthermore, displacement of whales can drive them into shipping lanes increasing the likelihood of a collision with a vessel, or into fishing areas and risk entanglement.

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

The proposed IHA fails to consider masking effects from the mixed impulsive/continuous noise source airguns because of the “intermittent” nature of seismic pulses. But this characterization fails to account for the spreading of seismic pulses at distances from the array.⁵⁹ 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.⁶⁰ That analysis is supported by, *inter alia*, a number of papers showing that seismic exploration in the Arctic, the east Atlantic, off Greenland,

⁵⁴ See 16 U.S.C. § 1371(a)(5)(D)(i).

⁵⁵ 16 U.S.C. § 1371(a)(5)(D)(i).

⁵⁶ The potential biological removal for pantropical spotted dolphins is 17. National Marine Fisheries Service, Draft Stock Assessment Reports (2013).

⁵⁷ See H.R. Rep. No. 97-228 (1981), reprinted in 1981 U.S.C.C.A.N. 1458, 1469 (“[small numbers] is not capable of being expressed in absolute numerical limits.”).

⁵⁸ *Natural Res. Def. Council v. Evans*, 279 F. Supp. 2d at 1129, 1152 (N.D. Cal. 2003).

⁵⁹ See Expert Panel Review 2011.

⁶⁰ *Id.*; see also Expert Panel Review 2010.

and off Australia has raised ambient noise levels at significant distances from the array.⁶¹ Masking of natural sounds begins when received levels rise above ambient noise at relevant frequencies.⁶² Accordingly, NMFS must evaluate the loss of communication space – and consider the extent of acoustic propagation – at far lower received levels than the proposed IHA 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.⁶³ 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.⁶⁴ Remarkably, the proposed IHA – instead of applying the Cornell/NOAA model – simply states that masking effects on marine mammals would be “minor.” Failure to adequately account for the toll of masking ultimately affects the accuracy of the agency’s take and negligible impact findings.

4. Failure to set proper thresholds for hearing loss

⁶¹ 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., 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).

⁶² 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).

⁶³ 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).

⁶⁴ Fleishman, E., and Streever, B., Assessment of cumulative effects of anthropogenic underwater sound: project summary and status, at 2 (2012).

As you know, NMFS is presently revising its criteria for temporary and permanent auditory impacts and, by extension, direct tissue injury.⁶⁵ Several of the signatories to this letter, based on consultation and review by three bioacousticians, have submitted extensive comments on the draft criteria, which address, among other issues, new data that have appeared since the Southall et al. study was published in 2007. These include, for example, data indicating 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) previously tested.⁶⁶ None of these considerations, and few of the relevant studies appearing since 2007, appear to be discussed in the IHA notice.

Hearing loss remains a very significant risk where, as here, the agency has not required aerial 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. NMFS should take a conservative approach and apply a more precautionary standard.

5. Failure to set proper thresholds for high- and mid-frequency sources

NMFS has also failed to adequately consider the potential impacts from or set an appropriate take threshold for the survey's multi-beam echosounder and sub-bottom profiler. NMFS mentions but then discounts the 2008 mass stranding in Madagascar of 100 melon-headed whales associated with the use of a 12 kHz multi-beam echosounder. This echosounder is similar or identical to the one proposed for use in this project. Instead, NMFS simply suggests that the risk "may be very low" because these systems are used worldwide and there is a lack of direct evidence – other than the melon-headed whale incident, of course – of other such responses. To essentially discount and ignore such a significant stranding is in stark conflict with NMFS' obligation under the MMPA to use best available science in evaluating impacts. Nor does NMFS attempt to quantify takes from either system.

6. Failure to Include a Contingency Estimate

As noted above, NMFS has allowed Lamont Doherty/NSF to downgrade its take estimates based on certain questionable changes to its activity plan, eliminating its contingency plans for reshoots, vessel turns, equipment malfunctions, and other factors. Omitting these takes runs counter to common sense—and is not justifiable unless NMFS

⁶⁵ 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).

⁶⁶ 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).

expressly bars the proponents from running more line-kilometers than set forth in the IHA or from engaging in any “contingent” activities, as discussed above.

7. Failure to Adequately Assess Cumulative Impacts of the Activity

In its Draft Environmental Assessment – upon which the proposed IHA relies – Lamont-Doherty/NSF failed to adequately analyze the cumulative impacts of its survey. An agency must take a hard look at the cumulative impacts of the proposed action and determine and provide a meaningful analysis of the environmental impacts of these activities. “NEPA always requires that an environmental analysis for a single project consider the cumulative impacts of that project together with ‘past, present and reasonably foreseeable future actions.’” CEQ’s regulations for implementing NEPA emphasize that “[c]umulative impacts can result from individually minor but collectively significant actions taking place over a period of time.”

The agency has failed to meet the statutory requirements of NEPA and its regulations because it improperly limited the scope of the EA and failed to include sufficient information on the cumulative impacts of the project on marine mammals, fish, and sea turtles. The agency’s cumulative impacts analysis improperly discounts cumulative impacts because the noise pollution is temporary. This rationale is flawed because impacts can accumulate even if there is no accumulation of sound.

Acoustic disturbance can result in long-term avoidance or abandonment of habitat, particularly in naïve populations. For example, following a single Navy exercise in the Northern Bahamas, in 2000, 14 beaked whales and several other marine mammals stranded and virtually the entirety of the population disappeared from the area. Even if animals do not suffer death or permanent injury or habitat abandonment from a single event, recurring acoustic disturbance increases the likelihood that a seismic survey will interfere with essential functions such as breeding, feeding, and communications. Therefore, noise pollution even when temporary can have cumulative effects on animal populations.

Moreover, regional populations or stocks of marine mammals, or other wildlife, may be repeatedly exposed to disturbance from seismic, sonar, and ship noise. NMFS and Lamont-Doherty/NSF must analyze both the auditory and behavioral impacts of repeated exposure to noise pollution on a population that may alter behavior. Repeated exposure that causes temporary threshold shift could amplify the impact of a subsequent exposure. In some animals, temporary threshold shift can result in permanent threshold shift. Lamont-Doherty/NSF must at least evaluate intermittent exposure to multiple seismic and other acoustically disturbing activities.

The cumulative impacts analysis must include a full evaluation of the cumulative impacts of oil and gas seismic surveys planned for and anticipated in the Atlantic; the USGS/NSF seismic survey off the North and Mid-Atlantic and any other NSF, Lamont-Doherty, or USGS planned surveys; and military training and testing sonar activities. The failure to

evaluate the cumulative impacts of temporally and spatially adjacent activities in the environmental assessment falls short of NEPA's requirements and results in a misrepresentation of the activities ultimate impact.

Additionally, concurrent activities can accumulate sound in habitat, and the EA's determination that project is only a "minor contribution" to overall noise is flawed. NOAA has already developed cetacean noise maps for the Atlantic area where this project occurs. It shows that certain areas are already ensonified by vessel traffic at levels that are near the thresholds for some acoustically sensitive species. Lamont-Doherty/NSF and NMFS must analyze the noise pollution cumulatively with the project. While the EA describes other proximate activities, it lacks meaningful analysis of the cumulative impacts of these projects.

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

The survey considered in the proposed IHA has the potential to detrimentally affect multiple fish species, harm vital fish habitat, and conflict with multiple fisheries. 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. 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.⁶⁷ 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 square kilometers around a single array.⁶⁸ 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.⁶⁹ Impacts on fisheries were found to last for some time beyond the survey period, not fully recovering within 5 days of post-survey monitoring.⁷⁰ 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.⁷¹

⁶⁷ McCauley *et al.*, Marine seismic surveys: analysis and propagation of air-gun signals, and effects of air-gun exposure.

⁶⁸ 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., Saltaug, 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).

⁶⁹ 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).

⁷⁰ Engås *et al.*, Effects of seismic shooting.

⁷¹ 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).

Yet the IHA ignores the potential for acoustic impacts on Essential Fish Habitat and assumes without support that effects on both fish and fisheries would be localized and “minor.” NMFS must improve its scant analysis.

V. COMPLIANCE WITH OTHER STATUTES

A. Magnuson-Stevens Fishery Conservation and Management Act (“Magnuson Act”)

Lamont-Doherty/NSF did not provide any meaningful analysis of the proposed action’s impacts on essential fish habitat. NMFS has a statutory obligation to consult on the impact of federal activities on essential fish habitat under the Magnuson-Stevens Fishery Conservation and Management Act (“Magnuson Act”).

The Magnuson Act requires consultation with NMFS when actions to be permitted, funded, or undertaken by a federal agency may adversely affect essential fish habitat. The statute defines adverse effect as “any impact that reduces quality and/or quantity of EFH [and] may include direct (e.g., contamination or physical disruption), indirect (e.g., loss of prey, reduction in species’ fecundity), site-specific or habitat wide impacts, including individual, cumulative, or synergistic consequences of actions.” The essential fish habitat consultation should include an evaluation of the effects of the action on essential fish habitat and proposed mitigation. Upon receipt of an essential fish habitat assessment, NMFS is required to provide essential fish habitat conservation recommendations for federal actions that would adversely affect essential fish habitat. As required by Section 305(b)(4) of the Magnuson Act, the Federal agency must respond with a description of measures proposed for avoiding, mitigating, or offsetting the impact of the activities on essential fish habitat and explain its reasons for not following any essential fish habitat conservation recommendations.

The EFH consultation here is inadequate because it assumes that noise does not affect habitat. This is in error because noise pollution is indeed a habitat concern. The EA is similarly inadequate in that it wrongly concludes that “[t]here would be no anticipated negative impacts on Essential Fish Habitat (EFH).”

As discussed above, the impacts of seismic surveys on fish are documented. Sound can impact fish habitat because it can alter the ability of fish to communicate, avoid predators, and locate prey. Studies indicate auditory damage can result from noise, including airguns. Seismic surveys alter the habitat in ways that cause displacement and disturbance of fish and decreased catch, as well as mortality to fish eggs and larvae. Therefore, seismic surveys do impair essential fish habitat. The acoustic environment is a key element of habitat. Indeed, NMFS recently recognized that the best scientific data indicates that sound can be an essential characteristic of habitat. Accordingly, the agency identified noise as a primary constituent element of critical habitat for beluga whales.

The agencies should have identified which areas of essential fish habitat are within the project area and evaluated the impact of the proposed project on those habitat areas. NMFS failure to do so violates the MSA.

B. Endangered Species Act (“ESA”)

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” To accomplish this goal, agencies must consult with the delegated agency of the Secretary of Commerce or Interior whenever their actions “may affect” a listed species. NMFS has the discretion to impose terms, conditions, and mitigation on any authorization.

The ESA not only bans the acts of parties directly causing a take, but also bans the acts of third parties whose acts bring about the taking. NMFS may not approve the seismic survey unless it first obtains authorization for take under the ESA.

NMFS’ decision to issue an incidental harassment authorization is an action triggering the duty to comply with section 7 of the ESA. The ESA’s consultation requirement applies to Federal agencies taking any action. NMFS states that it is engaged in formal consultation on the proposed seismic survey.

As described thoroughly above, the seismic survey puts several ESA-listed species at risk. The proposed seismic surveys can have harmful impacts on listed marine mammals, which must be fully and accurately vetted through the consultation process. Accordingly, NMFS must complete consultation using best available science and obtain any take authorizations before authorizing the proposed seismic survey here. Moreover, NMFS must adopt robust mitigation measures such as those described in the alternatives section above to avoid adverse impacts to listed species.

C. Coastal Zone Management Act (“CZMA”)

The CZMA requires that applicants for federal permits to conduct an activity affecting a natural resource of the coastal zone of a state “shall provide in the application to the licensing or permitting agency a certification that the proposed activity complies with the enforceable policies of the state’s approved program and that such activity will be conducted in a manner consistent with the program.” The marine mammals and fish that will be affected by the seismic survey are all “natural resources” protected by the coastal states’ coastal management programs. Accordingly, impacted states should be given the opportunity to review the IHA for consistency with their coastal management programs.

VI. CONCLUSION

Ms. Jolie Harrison
September 2, 2014
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For the above reasons, and in light of the serious potential impacts of the proposed study, we urge that NMFS deny the IHA or Lamont-Doherty/NSF withdraw its application. At minimum, Lamont-Doherty/NSF should revise its proposed mitigation measures in the ways discussed above, including by redrawing its survey lines to reflect well-established areas of heightened biological significance and by providing meaningful site-specific analysis.

Very truly yours,

Michael Jasny
Director, Marine Mammal Protection
NRDC

Miyoko Sakashita
Senior Attorney and Oceans Director
Center for Biological Diversity

18 September 2014

Dr. Jolie Harrison
Chief, Permits and Conservation Division
Office of Protected Resources, NMFS
1315 East-West Highway
Silver Spring, MD 20910

Dear Dr. Harrison,

I am writing to comment upon NOAA's proposed authorization for "Takes of Marine Mammals Incidental to Specified Activities; Marine Geophysical Survey in the Northwest Atlantic Ocean Offshore North Carolina, September to October 2014". My major concerns center around the potential impacts on beaked whales within the proposed seismic survey area.

Multiple survey efforts off Cape Hatteras, North Carolina have documented year-round presence of beaked whales (*Ziphius cavirostris* and *Mesoplodon* spp., OBIS SEAMAP publically available data) in the proposed survey area. Within that area, beaked whales are non-randomly distributed. They are found exclusively along the deep continental shelf edge and beyond. Their very geographically-specific distribution patterns suggest that animals may not be able to respond to seismic activity by simply moving away from the area, as is suggested in the authorization document.

Beaked whale abundances are very difficult to assess, for the reasons well-articulated in NOAA's Stock Assessment Reports. I am unclear, though, as to how the stock abundances for beaked whales were determined. Table 1 in the authorization document lists the abundance estimate for each beaked whale species as 7,092 individuals. The stated best estimate for Cuvier's beaked whale (*Z. cavirostris*) is 6,532 individuals (minimum 5,021; PBR = 50). The 7,092 (minimum 4,632; PBR 46) estimate in Table 1 is for combined *Mesoplodon* spp. from Florida to the Bay of Fundy. While this is currently the best available estimate, this number simply *does not represent* the true abundance of *any one* species. Thus, the total population of each potentially impacted *Mesoplodon* species is an overestimate, and the potential impact on any single species, an underestimate.

Beaked whales are known prolonged, deep divers (e.g. Tyack *et al.* 2006; Schorr *et al.* 2014). Thus, visual monitoring efforts, even with prolonged 30 minute survey windows, are insufficient to assure no beaked whales are in the exclusion zone. The addition of passive acoustics is important, but it is unclear as to whether the tow depth (approximately 20 m) is sufficient to detect beaked whale vocalizations, which usually occur only beyond 400 m depth. Thus, more detailed information on effective monitoring of these deep diving species would be valuable.

Lastly, beaked whales are also known to experience atypical mass stranding events when exposed to other anthropogenic sound sources, specifically military mid-frequency sonar (reviewed by Cox *et al.* 2006). The sound sources used in seismic surveys are of similar amplitude (“246 to 253 decibels (dB) re: 1 μ Pa (peak to peak)” ; information from authorization document), although the frequency of airgun output is much lower. There are, simply put, insufficient data available on beaked whale responses to these types of anthropogenic sounds.

I am appreciative of the serious consideration the Lamont-Doherty – NSF investigators have given to monitoring and mitigation steps, and the extra requirements that NOAA has demanded for this activity to be authorized. I do believe, though, that the potential impacts on beaked whales are unknown, and that special consideration needs to be given to this group of cetaceans in any authorization. I hope that the regional stranding organizations are also notified if this activity does occur, and that NOAA has a robust response plan, should it be required.

Sincerely,

D. Ann Pabst
Professor, Biology and Marine Biology
University of North Carolina Wilmington



0648-XD394

Ginger Taylor

Tue, Sep 2, 2014 at 11:42 PM

I, Ginger Taylor of 6205 Mallard Drive, Wilmington, NC 28403 do hereby oppose seismic testing of any nature and especially off the coast of Cape Hatteras, NC. Therefore, I also oppose the proposal to issue an Authorization to Lamont-Doherty to incidentally take, by Level B harassment only, 24 species of marine mammals during the specified activity that is scheduled to take place September 15, 2014 - October 31, 2015 for said reasons listed below:

1. The Federal Register's Revised Take Table as of July 25, 2014 is not completely accurate. According to their list: North Atlantic right whales and fin have a 0% take risk both of which are endangered species. Surveys done by Duke and UNCW report sightings of many marine mammals are actually higher in the fall due to migration patterns. Fin and Cuvier's beaked whales are reportedly seen year round while Humpback whales are seen in the fall and winter. Right whales migrate in the fall from Bay of Fundy to Florida to calve. Though aerial surveys report rare sightings, they are RARE as a species. We cannot assume because we don't see them, they are not in the Cape Hatteras vicinity. An aerial survey reported seeing right whales off the coast of Fort Fisher, NC in early November 2009; therefore, right whales are making their way just North of Fort Fisher and could potentially be feeding in a popular feeding sight off Cape Hatteras in October. (<http://www.starnewsonline.com/article/20091112/articles/911129985?p=1&tc=pg&tc=ar>) But regardless, seismic testing has been reported to travel 100,000 miles which spans the distance from the Bay of Fundy to Florida. (Boom, Baby, Boom: The Environmental Impacts of Seismic Surveys, pg. 3.)
- > 2. Due to the steep slope off of Cape Hatteras that causes nutrient rich upwelling, the cold waters of the Labrador Current, and the warm waters of the Gulf Stream, this location is an unusually dynamic area for foraging unlike any other region on the entire east coast. "In the pelagic and mid-water depths there is high diversity of vertebrates, migratory birds, mammals, and turtles as well as fish. On the bottom there is also diversity of invertebrates." (Blake, J. A et al., Gooday, A. J. et al, Hecker, B, Milliman, J. D. and Rhodas, D. C, et al) This is a foraging hotbed for an unusually high density of species. The seismic testing that will occur there will create enough noise to disrupt eating, mating, and navigation for 33 days straight, "792 hours of continuous airgun operations" according to the Lamont-Doherty report. Because it is a feeding site to many endangered species such as fin and the North Atlantic right whales, hawksbill, Kemp's ridley, loggerhead, and leatherback sea turtles, by law this area should be protected by the Endangered Species Act and listed as a priority ocean area for protection in the Mid-Atlantic. (www.nmfs.voaa.gov/pr/speicis/esa/listed.htm) As Sylvia Earle suggests, "A Hope Spot!"
- > 3. Due to the unique diversity of marine biota, the Outer Banks' economy is heavily impacted by the success of the fish stocks. Airguns have been shown to dramatically depress catch rates of various commercial species. (Engas, A. et al., 1996)
- > 4. Because beaked whales are deep divers, they are found in areas where there are canyons and are heavily impacted by these surveys due to sound bouncing off the canyon walls. (Sounding the Depths, pg. 11) Cuvier's beaked whales are seen in this coastal region year round, traveling north and south along Hatteras Canyon off Cape Hatteras, and could potentially be more at risk for this reason.
- > 5. The Lamont-Doherty report states the testing will be as high as 180 decibels. "... a 174-decibel rumble . . . about as strong as a commercial jet at takeoff, measured about three feet away." (Sounding the Depths, pg. 4) Prolonged exposure to continuous loud noise is known to cause hearing loss to humans as well as marine mammals. This hearing impairment is known as "threshold shift." (Sound the

Depths II, pg. 13) Though marine mammals have eyes and a sense of smell, the sense they rely on the most is sound to navigate, forage for food, mate, care for their offspring, and protect themselves from predators. To introduce sound that interferes with the most important sensory for 33 days straight is similar to blinding people with flood lights for 24 hours for 33 days. How could people feed, care for their children, or stay out of harms way? It is our moral, scientific, and legislative duty to protect this region more so than other areas along the east coast.

> 6. The proposed sound source consists of a 36-airgun array with a total discharge volume of ~6600 in or an 18-airgun array with a total discharge of volume of ~3300. "A single airgun array can disrupt vital behavior in endangered whales over an area of at least 100,000 square nautical miles in size." (Boom, Baby, Boom: The Environmental Impacts of Seismic Surveys, pg. 3.) This underscores the harassment seismic testing will cause to the most endangered whale in the world – the North Atlantic right whale.

> 7. Other anthropogenic impacts that compromise the large whale populations are fishing gear entanglement and boat strikes. Right whales and fin whales are the most commonly reported species in the context of population size prone to vessel strikes. "Compared with the spatial extent of regulations, vessel-strike mortality continues to be highest in the mid-Atlantic coast." (Van Der Hoop, J. M. et al. 2012) Seismic testing will add yet another stressor on the already in periled species.



0648-XD394

Linda Ward

Tue, Sep 2, 2014 at 3:37 PM

I am writing to urge the denial of an application to take marine animals during seismic surveying off Hatteras Island, NC this fall (2014). It is distressing to think that an application even exists to use air guns to blast the marine life off Dare County, NC coast in the name of science. Please consider further research about the impacts of manmade sound on the underwater environment and its inhabitants.

Linda J. Ward, M.Sci.

Sent from my iPad



Comments 0648-XD394 proposed incidental harassment authorization

Meira Warshauer

Tue, Sep 2, 2014 at 10:29 PM

I request the NOAA reject the Lamont-Doherty permit application for incidental take off Cape Hatteras in Sept/Oct 2014 the following reasons:

1. Cape Hatteras is home to an unusually large number of species of marine life, because of the convergence of currents from cold waters, the Labrador Current, and warm waters of the Gulf Stream, as well as the upwelling from deep canyons near the continental shelf. The airguns will disrupt their feeding patterns, communication channels, and in the case of certain cetaceans, their diving and breathing patterns as well. Carried out continuously over the span of 33 days, the airguns will cause long term disruption of survival activities for fish, turtles, and cetaceans.

2. Cetaceans are especially sensitive to sound stimuli. The pulses will invade their primary feeding area and cause significant harassment. It is being presented as though the noise will be a short-term inconvenience, but for many species of cetaceans, there is no research on how the noise will affect them. (Federal Register vol. 79, no. 147, p. 44558) Disruption of survival patterns can hardly be viewed as a mere inconvenience.

3. The Cape Hatteras area includes deep canyons where beaked whales may be diving. The noise can trigger a panic response causing them to surface too quickly, and suffer the bends, which can lead to fatality. While the Lamont Doherty claims to have a track record of no associated fatalities, we would not like Cape Hatteras to be the exception to that record.

The over 30 stranded mammals on Cape Hatteras from Naval sonar operation in 2005 is a troublesome precedent. While the Navy's techniques may differ from the L.D. operation, the sensitivity of the cetacean population in the area remains a concern. The airguns will bring unnecessary stress to already declining populations of identified cetaceans in the area. Cuvier's beaked whales, for example, have been sighted year round. Right whales

were sighted as far south as Fort Fisher in early November, 2009.

(<http://www.starnewsonline.com/article/20091112/articles/911129985?p=2&tc=pg>)

Fin whales are also seen in the area, as are others.

4. The proposed mitigation of stopping the airguns if cetaceans are observed is inadequate, since the animals could be outside the sighting area, but still harmed by the airgun due to the greater range of sound in the acoustically efficient sea and canyons.

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Meira Warshauer

Jolie Harrison

Chief, Permits and Conservation Division

Office of Protected Resources, NMFS

1315 East-West Highway

Silver Spring, MD 20910

Comments on Seismic Testing off the Outer Banks of North Carolina in Sept and Oct, 2014: 0648-XD394

William McLellan
UNC Wilmington

This proposal to conduct seismic surveys off the Outer Banks of North Carolina greatly concerns me for two reasons.

The first concern is with the use of full scale industrial seismic exploration vessels in the exact habitat that we have found high beaked whale abundances. For the past three years, a joint program with Duke University and UNC Wilmington has been conducting monthly aerial surveys for seasonal distribution and vessel operations focused on tagging and identification of marine mammals. The aerial surveys track from the coastal shelf east over the first and second shelf breaks to pelagic waters. Sightings data have been uploaded to OBIS SEAMAP, presented at annual Navy meetings with NOAA staff present, and recently been forwarded to senior NOAA research staff from the NE Science Center. The proposed tracklines for seismic testing track directly over the highest density of beaked whale sightings, but the proposal barely mentions the potential for beaked whale interactions. In essence, beaked whales will be present within the seismic testing area for the entire sampling period. In my opinion, standard operating procedures to shut down seismic activity when marine mammals are sighted are not effective when mitigating interactions specifically with beaked whales. Beaked whale dive times have now been extended to over two hours for Cuvier's beaked whales (*Ziphius cavirostris*) (Schorr *et al.* 2014). Our Lab recently published myoglobin data for cetaceans collected from strandings from the exact locations associated with these seismic surveys. One of animals presented in the recent publication (Velten *et. at* 2013) was an adult female True's beaked whale (*Mesoplodon mirus*) testing out with the highest level of myoglobin EVER measured in a mammal. This extreme level of myoglobin implies this animal could dive on a breath hold for extended periods of time. The combined dive time lengths and potential for extended breath hold diving violate the ability for vessel based observers to shut down seismic operations based on visual sightings of animals surfacing near the operations vessel.

If seismic operations are not able to alter their testing as beaked whales are encountered in real time there is a likelihood that those beaked whales will be directly affected by the seismic energy inputs into the surrounding ocean. While the proposal states there will be little effect on local marine mammals, there have been many publications that link anthropogenic sound sources, both commercial and

military, with morbidity and mortality of cetaceans, especially beaked whales. The location of beaked whales continuously in the same space and time as the proposed seismic surveys suggests there could be negative interactions between these two. As the Marine Mammal Stranding Coordinator for the State of North Carolina I am extremely troubled by the use of seismic testing off the coast of North Carolina and the possibility of cetacean strandings. We are still responding to the largest Unusual Mortality Event ever investigated on the east coast, which has involved over 1400 bottlenose dolphins (*Tursiops truncatus*) and nearly 300 in North Carolina. The North Carolina stranding network received NO Prescott stranding grant support in 2013. Yet, this seismic activity could increase beaked whales and other cetacean strandings that are known to inhabit these waters. Strandings of these species require vastly more time, effort and resources than is exerted for response to the more common bottlenose and other dolphins species. Beaked whales require a team to commit 2-3 days of stranding response, diagnostic testing and necropsy effort for each individual animal. I have personally spent one week per each beaked whale stranding that has occurred in the state over the past 3-4 years. Short-finned pilot whales (*Globicephala macrorhynchus*) also overlap the geographic region of the proposed seismic tests. In 2005, a mass stranding of 35 short-finned pilot whales occurred along the coast near the site of the proposed seismic tests. This mass stranding event was investigated by NOAA as it occurred coincident with Navy sonar exercises. NOAA's report (Hohn *et al.* 2006) stated that it could not be determined whether there was or was not a causal link between the exposure to anthropogenic sound source and the stranding event. It is frankly unacceptable that this seismic activity will be conducted with no plan to investigate strandings and no additional support provided to the state stranding network. Funded science cannot simply push responsible oversight off to unfunded scientists!

The second concern is simply the compressed timing for this public comment period. The proposal states seismic activity will begin off Cape Hatteras in the middle of September, 2014. The current comment period ends on Sept 2, 2014 which leaves less than two weeks to compile and act on suggestions proposed during the comment period. The proposed seismic activities should be postponed until all comments are received and acted upon. If that does not take place it brings in to question the validity of the entire comment process.

Literature Cited

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