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DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

RIN 0648-XD773

Takes of Marine Mammals Incidental to Specified Activities; Marine Geophysical Survey in the Northwest Atlantic Ocean offshore New Jersey, June to August, 2015

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Notice; issuance of an incidental harassment authorization.

SUMMARY: In accordance with the Marine Mammal Protection Act (MMPA) implementing regulations, we hereby give notice that we have issued an Incidental Harassment Authorization (Authorization) to Lamont-Doherty Earth Observatory (Lamont-Doherty), a component of Columbia University, in collaboration with the National Science Foundation (NSF), to take marine mammals, by harassment, incidental to conducting a marine geophysical (seismic) survey in the northwest Atlantic Ocean off the New Jersey coast June through August, 2015.

DATES: Effective June 1, 2015, through August 31, 2015.

ADDRESSES: A copy of the final Authorization and application are available by writing to Jolie Harrison, Chief, Incidental Take Program, Permits and Conservation Division, Office of Protected Resources, National Marine Fisheries Service, 1315 East-West Highway, Silver Spring, MD 20910, by telephoning the contacts listed here, or by visiting the internet at: *http://www.nmfs.noaa.gov/pr/permits/incidental/research.htm*.

The NSF prepared an amended Environmental Assessment (EA) in accordance with the National Environmental Policy Act of 1969 (NEPA; 42 U.S.C. 4321 *et seq*.) and the regulations published by the Council on Environmental Quality. Their EA titled, "Final Amended Environmental Assessment of a Marine Geophysical Survey by the R/V *Marcus G. Langseth* in the Atlantic Ocean off New Jersey, Summer 2015," prepared by LGL, Ltd. environmental research associates, on behalf of the NSF and the Lamont-Doherty, is available at *https://www.nsf.gov/geo/oce/envcomp/index.jsp*.

NMFS also prepared an EA titled, "Proposed Issuance of an Incidental Harassment Authorization to Lamont-Doherty Earth Observatory to Take Marine Mammals by Harassment Incidental to a Marine Geophysical Survey in the Northwest Atlantic Ocean, June – August, 2015," in accordance with NEPA and NOAA Administrative Order 216-6. To obtain an electronic copy of these documents, write to the previously mentioned address, telephone the contact listed here (see **FOR FURTHER INFORMATION CONTACT**), or download the files at: *http://www.nmfs.noaa.gov/pr/permits/incidental/research.htm*.

NMFS also issued a Biological Opinion under section 7 of the Endangered Species Act (ESA) to evaluate the effects of the survey and Authorization on marine species listed as threatened and endangered. The Biological Opinion is available online at: *http://www.nmfs.noaa.gov/pr/consultations/opinions.htm*.

FOR FURTHER INFORMATION CONTACT: Jeannine Cody, NMFS, Office of Protected Resources, NMFS (301) 427-8401.

SUPPLEMENTARY INFORMATION:

Background

Section 101(a)(5)(D) of the Marine Mammal Protection Act of 1972, as amended (MMPA; 16 U.S.C. 1361 *et seq*.) directs the Secretary of Commerce to allow, upon request, the incidental, but not intentional, taking of small numbers of marine mammals of a species or population stock, by U.S. citizens who engage in a specified activity (other than commercial fishing) within a specified geographical region if, after NMFS provides a notice of a proposed authorization to the public for review and comment: (1) NMFS makes certain findings; and (2) the taking is limited to harassment.

An Authorization shall be granted for the incidental taking of small numbers of marine mammals if NMFS finds that the taking will have a negligible impact on the species or stock(s), and will not have an unmitigable adverse impact on the availability of the species or stock(s) for subsistence uses (where relevant). The Authorization must also set forth the permissible methods of taking; other means of effecting the least practicable adverse impact on the species or stock and its habitat (*i.e*., mitigation); and requirements pertaining to the monitoring and reporting of such taking. NMFS has defined "negligible impact" in 50 CFR 216.103 as "an impact resulting from the specified activity that cannot be reasonably expected to, and is not reasonably likely to, adversely affect the species or stock through effects on annual rates of recruitment or survival."

Except with respect to certain activities not pertinent here, the MMPA defines "harassment" as: any act of pursuit, torment, or annoyance which (i) has the potential to injure a marine mammal or marine mammal stock in the wild [Level A harassment]; or (ii) has the potential to disturb a marine mammal or marine mammal stock in the wild by

causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering [Level B harassment].

Summary of Request

On December 23, 2014, NMFS received an application from Lamont-Doherty requesting that NMFS issue an Authorization for the take of marine mammals, incidental to the State University of New Jersey at Rutgers (Rutgers) conducting a seismic survey in the northwest Atlantic Ocean June through August, 2015. NMFS determined the application complete and adequate on February 20, 2015, and published a notice of proposed Authorization on March 17, 2015 (80 FR 13961). The notice afforded the public a 30-day comment period on the proposed MMPA Authorization.

Lamont-Doherty proposes to conduct a high-energy, 3-dimensional (3-D) seismic survey on the R/V *Marcus G. Langseth* (*Langseth*) in the northwest Atlantic Ocean approximately 25 to 85 kilometers (km) (15.5 to 52.8 miles [mi]) off the New Jersey coast for approximately 30 days from June 1 to August 31, 2015. The following specific aspect of the proposed activity has the potential to take marine mammals: increased underwater sound generated during the operation of the seismic airgun arrays. We anticipate that take, by Level B harassment only, of 32 species of marine mammals could result from the specified activity.

Description of the Specified Activity

Overview

Lamont-Doherty plans to use one source vessel, the *Langseth*, two pairs of subarrays configured with four airguns as the energy source, and four hydrophone streamers, and a P-Cable system to conduct the conventional seismic survey. In addition to the operations

of the airguns, Lamont-Doherty intends to operate a multibeam echosounder and a sub-bottom profiler on the *Langseth* continuously throughout the proposed survey which would run 24 hours a day. However, they would not operate the multibeam echosounder or sub-bottom profiler during transits to and from the survey area.

The purpose of the survey is to collect and analyze data on the arrangement of sediments deposited during times of changing global sea level from roughly 60 million years ago to present. The 3-D survey would investigate features such as river valleys cut into coastal plain sediments now buried under a kilometer of younger sediment and flooded by today's ocean. Lamont-Doherty's proposed seismic survey is purely scientific in nature and not related to oil and natural gas exploration on the outer continental shelf of the Atlantic Ocean. The proposed survey's principal investigator is Dr. G. Mountain (Rutgers) and the collaborating investigators are Drs. J. Austin and C. Fulthorpe, and M. Nedimovic (University of Texas at Austin).

Lamont-Doherty, Rutgers, and the NSF originally proposed conducting the survey in 2014. After completing appropriate environmental analyses under appropriate federal statutes, NMFS issued an Authorization under the MMPA and a Biological Opinion with an Incidental Take Statement (ITS) under the Endangered Species Act of 1973 (16 U.S.C. 1531 *et seq.*) to Lamont-Doherty on July 1, 2014 effective from July 1 through August 17, 2014. Lamont-Doherty commenced the seismic survey on July 1, 2014, but was unable to complete the survey due to the *Langseth* experiencing mechanical issues during the effective periods set forth in the 2014 Authorization and the ITS. Thus, Lamont-Doherty has requested a new Authorization under the MMPA and the NSF consulted with NMFS for a new Biological Opinion under the ESA to conduct this re-scheduled

survey in 2015. The project's objectives remain the same as those described for the 2014 survey (see 79 **FR** 14779, March 17, 2014 and 79 **FR** 38496, July 08, 2014, and 80 **FR** 13961, March 17, 2015).

Dates and Duration

Lamont-Doherty proposes to conduct the seismic survey for approximately 30 days. The proposed study (*e.g.*, equipment testing, startup, line changes, repeat coverage of any areas, and equipment recovery) would include approximately 720 hours of airgun operations (*i.e.*, 30 days over 24 hours). Some minor deviation from Lamont-Doherty's requested dates of June through August, 2015, is possible, depending on logistics, weather conditions, and the need to repeat some lines if data quality is substandard. Thus, this Authorization will be effective from June 1 through August 31, 2015.

Specified Geographic Area

Lamont-Doherty proposes to conduct the seismic survey in the Atlantic Ocean, approximately 25 to 85 km (15.5 to 52.8 mi) off the coast of New Jersey between approximately 39.3–39.7° N and approximately 73.2–73.8° W. Water depths in the survey area are approximately 30 to 75 m (98.4 to 246 feet [ft]). They would conduct the proposed survey outside of New Jersey state waters and within the U.S. Exclusive Economic Zone.

Detailed Description of the Specified Activities

Transit Activities

The *Langseth* will depart from New York, NY, and transit for approximately eight hours to the proposed survey area. Setup, deployment, and streamer ballasting would occur over approximately three days. At the conclusion of the 30-day survey (plus

additional days for gear deployment and retrieval), the *Langseth* will return to New York, NY.

Vessel Specifications

NMFS outlined the vessel's specifications in the notice of proposed Authorization (80 **FR** 13961, March 17, 2015). NMFS does not repeat the information here as the vessel's specifications have not changed between the notice of proposed Authorization and this notice of an issued Authorization.

Data Acquisition Activities

NMFS outlined the details regarding Lamont-Doherty's data acquisition activities using the airguns, multibeam echosounder, and the sub-bottom profiler in the notice of proposed Authorization (80 **FR** 13961, March 17, 2015). NMFS does not repeat the information here as the data acquisition activities have not changed between the notice of proposed Authorization and this notice of an issued Authorization.

For a more detailed description of the authorized action, including vessel and acoustic source specifications, metrics, characteristics of airgun pulses, predicted sound levels of airguns, etc., please see the notice of proposed Authorization (80 **FR** 13961, March 17, 2015) and associated documents referenced above this section.

Comments and Responses

NMFS published a notice of receipt of Lamont-Doherty's application and proposed Authorization in the Federal Register on March 17, 2015 (80 **FR** 13961). During the 30-day public comment period, NMFS received comments from the following:

26 private citizens, Senators Cory A. Booker and Robert Menendez, Representatives Tom MacArthur and Frank Pallone, the Marine Mammal Commission (Commission), and the following organizations: Clean Ocean Action; the Marcus Langseth Science Oversight Committee (MLSOC); the State of New Jersey Department of Environmental Protection (NJDEP); the Sierra Club - Ocean County Group (Sierra Club); the New Jersey Marine Fisheries Council; SandyHook SeaLife Foundation; and NY4 Whales.

NMFS has posted the comments online at: *http://www.nmfs.noaa.gov/pr/permits/incidental/research.htm#nj2015*.

NMFS addresses any comments specific to Lamont-Doherty's application related to the statutory and regulatory requirements or findings that NMFS must make in order to issue an Authorization. Following is a summary of the public comments and NMFS' responses.

Requests to Extend the Public Comment Period

Comment 1: Prior to the conclusion of the public comment period for the notice of proposed Authorization (80 **FR** 13961, March 17, 2015), NMFS received requests through the public comment process from Senators Cory A. Booker and Robert Menendez, and Representatives Tom MacArthur and Frank Pallone, Clean Ocean Action, and one private citizen for NMFS to extend the 30-day public comment period by an additional 60 days for constituent review and comment.

Response: NMFS acknowledges the requests from the public and members of the New Jersey Congressional delegation for an extension of the public comment period. However, NMFS did not extend the public comment period for the **Federal Register**

notice of proposed Authorization which closed on April 16, 2015 based on the following factors.

1. The NSF, sponsor of the research seismic survey, released a draft amended EA, titled, "*Draft Amended Environmental Assessment of a Marine Geophysical Survey by the R/V Marcus G. Langseth in the Atlantic Ocean off New Jersey, Summer 2015*," on the proposed seismic survey on December 19, 2014 with a 37-day public comment period. The NSF's draft amended EA tiers to a 2014 NSF Final EA for the same project and to the Programmatic Environmental Impact Statement/Overseas Environmental Impact Statement (PEIS) for Marine Seismic Research Funded by the National Science Foundation or Conducted by the U.S. Geological Survey (NSF, 2011). It contains a description of the action, addresses potential impacts to tourism and commercial and recreational fisheries, and discusses mitigation measures for marine mammals.

In response to requests from the public and from members of the New Jersey Congressional delegation, the NSF extended their public comment period for the draft amended EA by an additional 15 days providing a total of 52 days for adequate review by the public.

2. NMFS published a **Federal Register** notice of the proposed Authorization for the 2015 survey on March 17, 2015 with a 30-day public comment period. Also, on March 17, 2015, NMFS informed Clean Ocean Action of the availability of the application and **Federal Register** notice for review and comment.

We note that the 2015 seismic survey is substantively the same as the one analyzed and authorized in 2014 (see 79 **FR** 14779, March 17, 2014 and 79 **FR** 38496, July 08, 2014), except that Lamont-Doherty proposes to use a 50-percent smaller airgun array,

which equates to fewer anticipated effects on marine mammals. Thus, the 2015 proposed survey (again, substantively the same as the 2014 survey) has been in the public domain for minimally one year (March 17, 2014 through April 17, 2015). In fact, NMFS extended the public comment period for the 2014 notice of the proposed Authorization by an additional 30 days (see 79 **FR** 19580, April 9, 2014) to accommodate additional review and analyses by the same if not similar interested parties.

3. For the 2015 survey, NMFS provided the public 30 days to review and comment on our preliminary determinations, in accordance with section 101(a)(5)(D) of the MMPA. NMFS believes that the two public comment periods (*i.e.*, one for NSF's draft amended EA and one for NMFS' proposed authorization) provided a total of 82 days for the public to consider and provide input on the marine mammal effects of the 2015 action (which again, is substantively the same as last year's survey), as well as the proposed mitigation, monitoring, and reporting measures for marine mammals.

4. The NSF lead principal investigator (Dr. Gregory Mountain, Rutgers University) posted a public website on the internet at *http://geology.rutgers.edu/slin3d-home* on February 18, 2015 with information about the proposed seismic survey. The website clearly outlines the proposed project's goals, presents frequently asked questions in an easy to understand format, describes the *Langseth* and its operations, discusses compliance with federal environmental statutes, and includes clarification that the proposed project is not related to oil & gas activities.

Extending the public comment period would have impacted NSF's continuing science program, through which other Federal agencies and academic institutions use the *Langseth* for upcoming scientific research. Impacts to survey timelines typically cascade

into subsequent work, which can have financial and science mission effects on NSF and other entities.

NMFS is aware that this is a sensitive issue and appreciates the interest that the members of the New Jersey Congressional delegation and their constituents have in the protection and conservation of marine mammals and the environment.

Effects Analyses

Comment 2: The Commission commented that NMFS' presentation of the marine mammal species that could be affected, marine mammal densities, take estimation method, and numbers of takes estimated in the **Federal Register** notice differed from Lamont-Doherty's approach presented in their application. The Commission questioned why Lamont-Doherty did not include those species and associated takes included within in their 2015 application given their potential occurrence in the project area and the fact that they were included in the authorization issued by NMFS in 2014. The Commission recommended that, in the future, NMFS require Lamont-Doherty and the NSF to provide revised applications that reflect the best available scientific information concerning the species affected, marine mammal densities, take estimation method, and estimated numbers of takes, before it deems the application complete and publishes a proposed authorization.

Response: Lamont-Doherty submitted their application to NMFS in accordance with the requirements under section 101(a)(5)(D) of the MMPA to provide information that NMFS uses to analyze impacts to marine mammals. NMFS reviewed the application and considered it complete after conducting additional research and reviews which we presented in the notice of proposed Authorization (80 **FR** 13961, March 17, 2015).

While NMFS encourages applicants to include information on species and species presence within a proposed action area, NMFS uses a wide variety of information when making its determinations under the MMPA. However, NMFS does not solely rely on the information presented in the application. NMFS uses the application as a basis for consultation under the MMPA, conducts an independent review of the information presented, and presents its own information with supporting evidence to provide the best available information on mammal species that could be affected, marine mammal densities, and approaches to take estimation in the notice of proposed Authorization (80 **FR** 13961, March 17, 2015). NMFS will continue to encourage applicants for MMPA incidental take authorization to provide applications that reflect the best available scientific information and if necessary, require them to submit revised applications reflecting that information.

Comment 3: The Commission commented a revised approach for estimating take in the notice of proposed Authorization (80 **FR** 13961, March 17, 2015) (which differed from Lamont-Doherty's standard approach of multiplying the ensonified area by marine mammal density to estimate take), and understands through consultation with NMFS staff, that NMFS intends to use another method to estimate take that will likely yield different take estimates than those discussed in the notice of proposed authorization. The Commission expressed concern that public review opportunity is meaningful only if the notice of proposed Authorization contains current information on methodologies to evaluate potential impacts and recommended that NMFS publish a revised proposed Incidental Harassment Authorization in the **Federal Register** with updated estimated

numbers of takes and small numbers and negligible impact analyses to provide a more informed public comment opportunity.

Response: NMFS' analysis in this document is based on the best available information after careful consideration of the Commission's comments on a more appropriate method for estimating take, including the Commission's recommendation on a more appropriate method to account for the survey duration of 30 days. Refer to comment 9 for NMFS' rationale regarding our recalculation of estimated takes based on the Commission's recommendation. These changes to the methodology and the resulting estimates do not have any substantial effect on our small numbers and negligible impact analyses and determinations, given that the proportion of animals taken is safely within the bounds of our small numbers practice, and the anticipated severity of impacts has not changed. We agree there may be circumstances where a change to our proposed action (*e.g.*, based on a public comment or an applicant request) may warrant a second notice and comment period before we take final action, but given the changes here we do not believe a second notice and comment period is necessary in this case.

Comment 4: The Commission expressed concerns regarding Lamont-Doherty's use of a ray trace-based model to estimate exclusion and buffer zones for NSF-funded geophysical research. They stated that the model is not conservative because it assumes spherical spreading, a constant sound speed, and no bottom interactions instead of incorporating site-specific environmental characteristics (*e.g.*, sound speed profiles, refraction, bathymetry/water depth, sediment properties/bottom loss, or absorption coefficients).

Response: We acknowledge the Commission's concerns about Lamont-Doherty's current modeling approach for estimating exclusion and buffer zones and also acknowledge that Lamont-Doherty did not incorporate site-specific sound speed profiles, bathymetry, and sediment characteristics of the research area in the current approach to estimate those zones for this proposed seismic survey.

In 2015, Lamont-Doherty explored solutions to this issue by conducting a retrospective sound power analysis of one of the lines acquired during Lamont-Doherty's truncated seismic survey offshore New Jersey in 2014 (Crone, 2015). NMFS presented this information in Table 4 in the notice of proposed Authorization (80 **FR** 13961, March 17, 2015) and presents this information again later in this notice (see Table 1) with additional information regarding the predicted radii with the upper 95 percent cross-line prediction bound radii.

Briefly, Crone's (2015) preliminary analysis, specific to the proposed survey site offshore New Jersey, confirmed that in-situ measurements and estimates of the 160- and 180-decibel (dB) isopleths collected by the *Langseth's* hydrophone streamer in shallow water were smaller than the predicted exclusion and buffer zones proposed for use in the 2015 survey. Based upon the best available information, the exclusion and buffer zone calculations are appropriate for use in this particular survey.

Lamont-Doherty's application (LGL, 2014) and the NSF's draft amended EA (NSF, 2014) describe the approach to establishing mitigation exclusion and buffer zones. In summary, Lamont-Doherty acquired field measurements for several array configurations at shallow- and deep-water depths during acoustic verification studies conducted in the northern Gulf of Mexico in 2003 (Tolstoy *et al*., 2004) and in 2007 and 2008 (Tolstoy *et*

al., 2009). Based on the empirical data from those studies, Lamont-Doherty developed a sound propagation modeling approach that conservatively predicts received sound levels as a function of distance from a particular airgun array configuration in deep water. For this proposed survey, Lamont-Doherty developed the shallow-water exclusion and buffer zones for the airgun array based on the empirically-derived measurements from the Gulf of Mexico calibration survey (Fig. 5a in Appendix H of the NSF's 2011 PEIS). Following is a summary of two additional analyses of in-situ data that support Lamont-Doherty's use of the proposed exclusion zones in this particular case.

In 2010, Lamont-Doherty assessed the accuracy of their modeling approach by comparing the sound levels of the field measurements in the Gulf of Mexico study to their model predictions (Diebold *et al*., 2010). They reported that the observed sound levels from the field measurements fell almost entirely below the predicted mitigation radii curve for deep water (Diebold *et al*., 2010).

In 2012, Lamont-Doherty used a similar process to develop mitigation radii (*i.e*., exclusion and buffer zones) for a shallow-water seismic survey in the northeast Pacific Ocean offshore Washington in 2012. Lamont-Doherty conducted the shallow-water survey using an airgun configuration that was approximately 89 percent larger than the total discharge volume proposed for this shallow-water survey (*i.e*., 6,600 cubic inches (in^3) compared to 700 in^3) and recorded the received sound levels on the shelf and slope off Washington using the *Langseth's* 8-kilometer (km) hydrophone streamer. Crone *et al*. (2014) analyzed those received sound levels from the 2012 survey and reported that the actual distances for the exclusion and buffer zones were two to three times smaller than what Lamont-Doherty's modeling approach predicted. While the results confirm

bathymetry's role in sound propagation, Crone *et al*. (2014) were able to confirm that the empirical measurements from the Gulf of Mexico calibration survey (the same measurements used to inform Lamont-Doherty's modeling approach for this survey in shallow water) overestimated the size of the exclusion and buffer zones for the shallow-water 2012 survey off Washington and were thus precautionary, in that particular case.

In summary, at present, Lamont-Doherty cannot adjust their modeling methodology to add the environmental and site-specific parameters as requested by the Commission. We continue to work with the NSF to address the issue of incorporating site-specific information to further inform the analysis and development of mitigation measures in coastal areas for future surveys with Lamont-Doherty and the NSF. NMFS will continue to work with Lamont-Doherty, the NSF, and the Commission on continuing to verify the accuracy of their modeling approach. However, Lamont-Doherty's current modeling approach represents the best available information to reach our determinations for the Authorization. As described earlier, the comparisons of Lamont-Doherty's model results and the field data collected in the Gulf of Mexico, offshore Washington, and offshore New Jersey illustrate a degree of conservativeness built into Lamont-Doherty's model for deep water, which NMFS expects to offset some of the limitations of the model to capture the variability resulting from site-specific factors, especially in shallow water.

Comment 5: The Commission disagreed with Lamont-Doherty's use of extrapolations and correction factors (or a scaling approach) to generate exclusion zones for shallow-water for this proposed survey and stated that the use of those scaling factors for shallow-water surveys is unsubstantiated. The Commission states that because Lamont-Doherty has not verified the applicability of its model to conditions outside the Gulf of Mexico, it

recommends that NMFS and/or the respective applicants 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 by incorporating site-specific environmental and operational parameters.

Response: See our response to Comment 4. Lamont-Doherty's approach compares the sound exposure level (SEL) outputs between two different types of airgun configurations in deep water. This approach allows them to derive scaling relationships between the arrays and extrapolate empirical measurements or model outputs to different array sizes and tow depths. For example, if an Airgun Source A produces sound energy that is three times greater than Airgun Source B in deep water, it is reasonable to infer that the shallow-water mitigation zones for Airgun Source A would be three times larger than the shallow-water mitigation zones for Airgun Source B. This approach of deriving scaling factors is an appropriate approach to extrapolate existing empirical measurements for shallow water. Thus, this is the best available information to extrapolate the in-situ shallow water measurements to array tow depths without field verification studies (Crone *et al*., 2014; Barton and Diebold, 2006).

Based upon NMFS and the Commission's recommendation, Lamont-Doherty used in-situ empirical measurements from the 2014 survey to compare them to the accuracy of the predicted mitigation zones used in the 2014 and 2015 survey. The preliminary in-situ measurement results from Crone (2015) show that the predicted mitigation exclusion zones are appropriate. This analysis also confirmed the effectiveness of Lamont-Doherty's use of scaling factors. Based on the best available information (Diebold *et al*, 2010; Crone *et al*., 2014; and Crone, 2015), NMFS concludes that in the case for this

survey, requiring the use of a model with environmental characteristics of the specific study area is not necessary.

Lamont-Doherty has conveyed to us that additional modeling efforts to refine the process and conduct comparative analysis may be possible with the availability of research fund and other resources. Obtaining research funds is typically through a competitive process, including those submitted to Federal agencies. The use of models for calculating buffer and exclusion zone radii and for developing take estimates is not a requirement of the MMPA incidental take authorization process. Furthermore, our agency does not provide specific guidance on model parameters nor prescribes a specific model for applicants as part of the MMPA incidental take authorization process. There is a level of variability not only with parameters in the models, but also the uncertainty associated with data used in models, and therefore the quality of the model results submitted by applicants. NMFS, however, considers this variability when evaluating applications. Applicants use models as a tool to evaluate potential impacts, estimate the number of and type of takes of marine mammals, and for designing mitigation. NMFS takes into consideration the model used and its results in determining the potential impacts to marine mammals; however, it is just one component of our analysis during the MMPA consultation process as we also take into consideration other factors associated with the proposed action, (*e.g*., geographic location, duration of activities, context, intensity, *etc*.).

Comment 6: The Commission also commented on Lamont-Doherty's retrospective sound analysis to verify the accuracy of its acoustic modeling approach for estimating exclusion and buffer zones that NMFS presented in the notice of proposed Authorization (80 **FR** 13961, March 17, 2015) (Crone, 2015). The Commission understands that Crone

(2015) used a simple logarithmic regression model to fit the data that were collected 500 m to 3.5 km in line from the source; estimated the cross-line mean based on a 1.63 correction factor (Carton, pers. comm.); and used a 95th percentile fit to the regression model for all shots along the line. The Commission states, however, because the closest hydrophone was 500 m from the source, Lamont-Doherty extrapolated the distances to the 180-dB re 1 μPa threshold based on the model—in some instances, the extrapolation was more than 400 m. The Commission also stated that Crone (2015) did not provide similar information provided in Tolstoy *et al*. (2009) and Crone *et al*. (2014), such as the slope or the y-intercept for the logarithmic regression model; the basis for the cross-line correction factor; the sound speed profile when the measurements were collected, or whether the near-field extrapolated data would have been better fitted with another model, since propagation loss in the near- and far-field may not necessarily be the same.

The Commission further stated that polynomial and non-parametric cubic spline models best represented the data off Washington (Crone *et al*., 2014), neither of which are logarithmic in nature and a linear least squares method was fit to the typical spherical spreading model to extrapolate the 160-dB re 1 μPa radii to account for radii that fall beyond the length of the hydrophone streamer.

Response: The NSF and Lamont-Doherty shared their preliminary analysis presented in Crone's draft report (2015) to both NMFS and the Commission and provided additional clarifying information via email to both parties including information on some of the points identified in the Commission's letter. Here, we provide additional information to inform the Commission's understanding of the 2015 in-situ analysis.

First, Lamont-Doherty believes that it is not correct to call the fitting parameters the *slope* and *y-intercept*, as one would do for a straight line using Cartesian coordinates and considers the use of *constant* and *exponent* parameters as more appropriate terminology when discussing the Crone (2015) results.

Second, Lamont-Doherty confirms that the regression model used in Crone (2015) is the same as equation 6 in Crone *et al*., (2014), but without the linear term, which comes third in the formulation. There are fitting parameters (*i.e*., the constant and exponent) for every shot along the line. Because Crone (2015) used a method to fit the data (which changes with every shot) for approximately 3,000 shots, it is not reasonable to list the data for every shot. However, Lamont-Doherty will continue to evaluate this exponent change variability along the line.

Third, Lamont-Doherty confirms that Crone (2015) estimated the parameters using linear least squares. However, in this case, and for equation 6 in Crone *et al*., (2014), both have a logarithmic term, which is appropriate since Crone (2015) employs linear regression models. Thus, the fitting model used is appropriate and the results for the 160-dB distance would likely not change significantly using another model to fit the data. In March, 2015, Lamont-Doherty also provided clarification to the Commission that the near-field data best fit using a logarithmic regression model.

Lamont-Doherty offered to discuss the information presented in Crone (2015) with Commission staff and members of its Committee of Scientific Advisors; however, the availability of all parties was limited before the conclusion of the public comment period and Dr. Crone was unable to discuss the results directly with the Commission prior to

their submission of their letter. Lamont-Doherty and the NSF welcome the opportunity to further discuss these results in the near future with the Commission and NMFS.

Comment 7: The Commission states that NMFS misrepresented the data from Crone (2015) in Table 4 of the **Federal Register** notice (page 13981, 80 **FR** 13961, March 17, 2015) by including the in-line measured and extrapolated means (78 and 1,521 m for the 180- and 160-dB re 1 μPa thresholds, respectively) rather than the 95th percentile cross-line predicted means, which Lamont-Doherty generally uses for its best-fit model.

Further, the Commission states that Crone (2015) indicated that the contour of the seafloor along the line was quite flat and varied by only a few meters along most of its 50-km length, which limited the shadowing and focusing that have been seen in other datasets (Crone *et al*., 2014). Crone (2015) then noted that the variability observed in Figures 3 and 4 for the 180- and 160-dB re 1 μPa thresholds, respectively, likely was caused by the shadowing and focusing of seismic energy from bathymetric features. The Commission stated that Crone's statements did not comport.

Response: NMFS's comparison of the predicted radii for the 2014 survey with the in-situ measured radii for the 2014 survey was not misrepresented as suggested by the Commission as the information and analysis provided were accurate. However, NMFS agrees with the Commission that we could have also provided a comparison of the predicted radii with the upper 95 percent cross-line prediction bound radii. We acknowledge that those results show that the percent differences in the model predicted radii and the 95th percentile cross-line predicted radii based on in-situ measurements were approximately 28 and 33 percent smaller for the 180- and 160-dB re: 1 μPa thresholds. Thus, the results demonstrate that the in situ measured and estimated 160 and

180-dB isopleths for the 2014 survey were significantly smaller than the predicted radii and therefore conservative, as emphasized by Lamont-Doherty in its application and in supporting environmental documentation. We present the complete information here in Table 1 with the additional information regarding the predicted radii with the upper 95 percent cross-line prediction bound radii.

Table 1 - Summary of RMS power levels with estimated mitigation radii calculated using streamer data, and in the last column the predicted radii used during the 2014 survey.

RMS Level (dB re 1 μPa)	In-Line Mean (m)	Estimated Cross-Line Mean (m)	Upper 95% Cross-Line Prediction Bound (m)	Predicted Levels Used for the 2014 Survey (m)
180	78	128	273	378 at 4.5-m tow depth 439 at 6-m tow depth
160	1,521	2,479	3,505	5,240 at 4.5 m tow depth 6,100 at 6-m tow depth

With respect to Crone's (2015) observations on shadowing and focusing of seismic energy, Crone (2015) did indicate that the contour of the seafloor along the line was quite flat and varied by only a few meters along most of its 50-km length, resulting in limited shadowing and focusing of seismic energy from bathymetric features frequently seen in other datasets (Crone *et al*. 2014). Crone, however, did not state that effects from shadowing and focusing were entirely absent from the 2014 data set. In fact, he noted that the limited amount of shadowing and focusing of seismic energy from bathymetric features present likely caused the minor variability observed.

Comment 8: The Commission also recommends that we require Lamont-Doherty to re-estimate the proposed zones and take estimates using site-specific parameters (including at least sound speed profiles, bathymetry, and sediment characteristics) for the proposed Authorization. They also recommend that we require the same for all future incidental harassment authorization requests submitted by Lamont-Doherty, the NSF, and other related entities.

Response: See NMFS' responses to Comment 4 and 5. There are many different modeling products and services commercially available that applicants could potentially use in developing their take estimates and analyses for MMPA authorizations. These different models range widely in cost, complexity, and the number of specific factors that one can consider in any particular modeling run. NMFS does not, and does not believe that it is appropriate to, prescribe the use of any particular modeling package. Rather, NMFS evaluates each applicant's approach independently in the context of their activity. In cases where an applicant uses a simpler model and there is concern that a model might not capture the variability across a parameter(s) that is not represented in the model, conservative choices are often made at certain decision points in the model to help ensure that modeled estimates are buffered in a manner that would not result in the agency underestimating takes or effects. In this case, results have shown that Lamont-Doherty's model reliably and conservatively estimates mitigation radii in deep water. First, the observed sound levels from the field measurements fell almost entirely below Lamont-Doherty's estimated mitigation radii for deep water (Diebold *et al*., 2010). These conservative mitigation radii are the foundation for Lamont-Doherty's shallow water radii used in this survey.

Second, Lamont-Doherty's analysis of measured shallow water radii during the 2012 survey offshore Washington (Crone *et al*., 2014) show that Lamont-Doherty's modeled radii for the Washington survey overestimated the measured 160-dB radii by approximately 10 km (6.2 mi) and overestimated the measured 180-dB radii by approximately 500 m (1,640 ft) (Crone *et al.,* 2014). Based on Crone *et al.'s* (2014) findings, NMFS find that Lamont-Doherty's shallow-water radii based on the Gulf of

Mexico calibration study were larger (*i.e*., more conservative) for that particular study.

Based on these empirical data, which illustrate the model's conservative exposure estimates across two sites, as well as the preliminary results from a third site offshore New Jersey (Crone, 2015), NMFS finds that Lamont-Doherty reasonably estimates sound exposures for this survey.

Comment 9: The Commission acknowledges that NMFS' attempt to address shortcomings in Lamont-Doherty's method to estimate take by developing an alternate approach based on the Commission's recommendation in its public comments on the 2014 survey (see page 38500, 79 **FR** 38496, July 08, 2014). NMFS' method used the total ensonified area (including overlap and the 25 percent contingency) for the 30 days multiplied by: (1) the revised density estimates from the SERDP SDSS Marine Animal Model Mapper tool for the summer months (DoN, 2007; accessed on February 10, 2015); (2) an adjustment factor of 25 percent based on Wood *et al*. (2012); and (3) an estimate of re-exposure (a ratio of 35.5) overlap of the survey.

The Commission commented that the area times the density method, which still serves as the basis for NMFS' proposed method, assumes a snapshot approach for take estimation (*i.e*., uniform distribution) and does not account for the survey occurring over a 30 day period. Thus, the Commission states that NMFS did not incorporate a time element into the take estimation method and did not apply the Wood *et al*. (2012) correction factor of 1.25 correctly.

The Commission understands that following publication of the **Federal Register** notice, NMFS began to revise the take estimates based on a different methodology for the proposed survey. The Commission understands that the total numbers of exposures likely

will decrease but the estimated numbers of individuals that could be taken likely will increase. If NMFS chooses not to amend and republish its notice, the Commission recommends that NMFS: (1) use one of the two methods described in their letter to estimate the total number of takes for each species/stock for the survey; and (2) if NMFS intends to estimate the total number of individuals for each species/stock taken during the survey, include a review of the applicable scientific literature regarding migratory, residence, and foraging patterns for the various species off the East coast and relate those data to the 30-day survey period for the proposed survey off New Jersey.

Response: NMFS agrees with the Commission's recommendation to appropriately include a time component into our calculations and has revised its take estimation methodology for the proposed survey by following their recommendation to estimate take in the following manner: (1) calculate the total area (not including contingency or overlap) that the *Langseth* would ensonify within a 24-hour period (*i.e.*, a daily ensonified area); (2) multiply the daily ensonified area by each species-specific density (when available) to derive the expected number of instance of exposures to received levels greater than or equal to 160 dB re: 1 μPa on a given day. NMFS takes this product (*i.e.*, the expected number of instance of exposures within a day) and multiplies it by the number of survey days (30) with 25 percent contingency (*i.e.*, a total of 38 days). This approach assumes a 100 percent turnover of the marine mammal population within the area for those species of marine mammals that had density estimates from the SERDP SDSS summer NODE data. For those species of marine mammals where density estimates were not available in the SERDP SDSS Marine Animal Model Mapper tool for the summer months (DoN, 2007; accessed on February 10, 2015) dataset because of their

limited or rare occurrence in the survey area, we used additional information (CETAP, 1982; AMAPPS, 2010, 2011, and 2013) to estimate take.

We present this information later in this notice (see Table 4 in this notice) and note here that our revised approach does not include the use of a turnover rate nor does it rely on the use of Wood *et al*., 2012 to determine take estimates, based on the information presented in the Commission's letter on the non-applicability of that data set for our calculations.

The method recommended by the Commission is a way to help understand the instances of exposure above the Level B threshold, however, we note that method would overestimate the number of individual marine mammals exposed above the 160-dB threshold.

Comment 10: The New Jersey Marine Fisheries Council (NJMFC) commented on the timing of the proposed study and effects to striped bass, blue fish, and black sea bass. They stated that the testing would affect fish behavior and distribution (avoidance of areas), schooling behavior and their ability to locate food. They also stated that the proposed timeframe for the study would take place during the peak abundance and fishing activity for many of New Jersey fisheries resulting in poor fish health. The NJMFSC also requested that NMFS not issue an Incidental Harassment Authorization for the take of marine mammals. The SandyHook SeaLife Foundation also submitted similar concerns stating that the survey would disperse fish, the result of which will negatively affect New Jersey's recreational and commercial fishing industry during the tourist season.

Similarly, Clean Ocean Action (COA) also requested that Lamont-Doherty not conduct the survey during the summer months and that NMFS consider alternate survey times to avoid times of peak marine mammal activity.

Finally, the New Jersey Department of Environmental Protection (NJDEP) also submitted comments expressing concern for effects to marine mammal habitat and for the potential impacts to New Jersey's marine mammal boat tour operators and the recreational and commercial fishing industry.

Response: The NJMFC did not provide references supporting their statement which limits our ability to respond to the commenters' statements. However, we refer readers to the notice of the proposed Authorization (page 13977, 80 FR 13961, March 17, 2015) which provided information on the anticipated effects of airgun sounds on fish, fish behavior, and invertebrates in the context of those animals as marine mammal prey.

NMFS considered the effects of the survey on marine mammal prey (*i.e.*, fish and invertebrates), as a component of marine mammal habitat, in the notice of the proposed Authorization (80 **FR** 13961, March 17, 2015). Studies have shown both decreases and increases in fisheries catch rates and behavioral changes in captive marine fish and squid during exposure to seismic sound (Lokkeborg *et al*., 2012; Fewtrell and McCauley, 2012). We acknowledge that disturbance of prey species has the potential to adversely affect marine mammals while foraging. However, given the limited spatio-temporal scale of the survey, the survey would ensonify only a small fraction of available habitat at any one time because the vessel is continually moving during data acquisition. We would expect prey species to return to their pre-exposure behavior once seismic firing ceased (Lokkeborg *et al*., 2012; Fewtrell and McCauley, 2012). Although there is a potential for

injury to fish or marine life in close proximity to the vessel, we expect that prey responses would have temporary effects on a marine mammal's ability to forage in the immediate survey area. However, we don't expect that temporary reductions in feeding ability would reduce an individual animal's overall feeding success.

Laboratory studies have observed permanent damage to sensory epithelia for captive fish exposed at close range to a sound source (McCauley *et al*., 2003) and abnormalities in larval scallops after exposure to low frequency noise in tanks (de Soto *et al*., 2013); however, wild fish are likely to move away from a seismic source (Fewtrell and McCauley, 2012). Finally, other studies provide examples of no fish mortality upon exposure to seismic sources (*e.g*., Popper *et al*., 2005; Boeger *et al*., 2006).

In summary, in examining impacts to fish as prey species for marine mammals, we expect fish to exhibit a range of behaviors including no reaction or habituation (Pena *et al*., 2013) to startle responses and/or avoidance (Fewtrell and McCauley, 2012). We expect that the seismic survey would have no more than a temporary and minimal adverse effect on any fish or invertebrate species that serve as prey species for marine mammals, and therefore consider the potential impacts to marine mammal habitat minimal as well.

Regarding the survey's impacts on commercial and recreational fishing, we refer readers to the NSF's amended EA for this survey (Sections III and IV) which includes consideration of the effects of sound on marine invertebrates, fish, and fisheries and the effects of the survey on the recreational and commercial fishing sectors in New Jersey. The NSF also completed an ESA Section 7 consultation to address the effects of the research seismic survey on ESA-listed species within the proposed area as well as a

consultation under the Magnuson–Stevens Fishery Conservation and Management Act for essential fish habitat.

Regarding the timing of the proposed survey, we analyzed the specified activity, including the specified dates, as presented in Lamont-Doherty's application and were able to make the requisite findings for issuing the Authorization. We do not have the authority to cancel Lamont-Doherty's research seismic activities under Section 101(a)(5)(D) of the MMPA, as that authority lies with the NSF. NMFS and the NSF considered in their EAs, a modification of the survey schedule to an alternate time. However, we determined this could result in an increase in the number of takes of North Atlantic right whales due to their increased presence off New Jersey in the fall, spring, and winter months. Whitt *et al*. (2013) concluded that right whales were not present in large numbers off New Jersey during the summer months (Jun 22 – Sep 27) which overlaps with the effective dates of the seismic survey (Jun through August). In contrast, peak acoustic detections for North Atlantic right whales occurred in the winter (Dec 18 – Apr 9) and in the spring (Apr 10– Jun 21) (Whitt, *et al*., 2013).

Comment 11: The NJDEP asserted that there was insufficient information to conclude that the impacts to the marine mammals that could potentially occur in the action area would be negligible. They state that marine mammals, especially cetaceans, would be adversely affected by noise created during seismic testing activities; noise pollution, in the form of repeated or prolonged sounds would adversely impact marine mammals by disrupting otherwise normal behaviors associated with migration, feeding, alluding predators, resting, and breeding, *etc*.; and any alterations to these behaviors would jeopardize the survival of an individual simply by increasing efforts directed at avoidance

of the noise and the perceived threat. They also state that that the project will add to an existing and increasing anthropogenic noise pollution which may already be negatively impacting species.

Response: NMFS disagrees with the commenter's assertions regarding our neglible impact determinations under the MMPA discussed in the notice of proposed Authorization (80 **FR** 13961, March 17, 2015). The NJDEP did not provide did not provide references supporting their statements related to marine mammals which limits our ability to respond to the commenter's statements. We refer to our detailed discussion of the potential effects of the proposed survey on marine mammals (pages 13967-13979) which covers acoustic impacts, masking, behavioral disturbance, and non-auditory physical effects to cetaceans and pinnipeds.

Additionally, NMFS has issued a Biological Opinion under the ESA that concluded that the issuance of the Authorization and the conduct of the seismic survey were not likely to jeopardize the continued existence of blue, fin, humpback, North Atlantic right, sei, and sperm whales. The Opinion also concluded that the issuance of the Authorization and the conduct of the seismic survey would not affect designated critical habitat for these species.

Comment 12: COA expressed concerns related to the survey's impact on the local (coastal) bottlenose dolphin population. They include: cumulative adverse impacts of the survey in light of the ongoing Unusual Mortality Event (UME); potential increases in marine mammal strandings due to the use of the multibeam echosounder; the survey's temporal overlap with the bottlenose dolphin calving period; and the potential heightened sensitivity of bottlenose dolphin calves to anthropogenic noise.

Response: In 2013, NMFS declared a UME for elevated bottlenose dolphin strandings along the Atlantic coast (New York through Florida). From July 1, 2013 – April 5, 2015, NMFS has recorded a total of 1,660 strandings from New York to Florida. Of those strandings, 153 dolphins have stranded in New Jersey, which is significantly higher than the average annual bottlenose dolphin stranding rate of 15 strandings (based on 2007-2012 data).

NMFS expects that the survey's activities would result, at worst, in a temporary modification in behavior, temporary changes in animal distribution, and/or low-level physiological effects (Level B harassment) of bottlenose dolphins. We expect these impacts to be minor at the individual level and we do not anticipate impacts on the population or impacts to rookeries, mating grounds, and other areas of similar significance.

The Authorization outlines reporting measures and response protocols with the Greater Atlantic Region Stranding Coordinator intended to minimize the impacts of, and enhance the analysis of, any potential stranding in the survey area. Lamont-Doherty's activities are approximately 20 km (12 mi) away from the habitat in which the coastal bottlenose dolphins are expected to occur (Toth *et al*., 2011; 2012), which means that area is not expected to be ensonified above 160 dB and that take of this stock or calves of this stock (*i.e*., the Western North Atlantic Northern Migratory Coastal) is not anticipated. Additionally, airgun pulses are outside of the range of frequencies in which dolphin hearing is most sensitive, and Schlundt *et al*.'s (2013) study suggests that the low-frequency content of air gun impulses may have fewer predicted impacts on bottlenose dolphins. Last, we do not have specific information related to how any

acoustic stressors may or may not exacerbate the effects of the UME with bottlenose dolphins. However, based on the fact that the acoustic effects are expected to be limited to behavioral harassment, and the survey is constantly moving (predominantly far offshore and well away from coastal species and the associated calving areas), we do not anticipate any focused adverse effects to animals involved in the UME.

Regarding COA's concerns about increased strandings, we note that Lamont-Doherty has not ever experienced a stranding event associated with their activities during the past 10 years that NMFS has issued Authorizations to them. In the past decade of seismic surveys conducted carried out by the *Langseth*, protected species observers and other crew members have neither observed nor reported any seismic-related marine mammal injuries or mortalities.

The NSF's EA (NSF, 2014) acknowledges that scientists have conducted numerous 2-D seismic surveys in the general vicinity of the proposed survey from 1979 to 2002. The previous surveys used different airgun array configurations (*e.g.*, a 6-airgun, 1,350-in^3 array in 1990; a single, 45-in^3 GI Gun in 1996 and 1998; and two 45-in^3 GI Guns in 2002). The researchers did not observe any seismic sound-related marine mammal related injuries or mortality, or impacts to fish during these past seismic surveys in the proposed survey area (NSF, 2014; G. Mountain, Pers. Comm.).

We have considered the potential for behavioral responses such as stranding and indirect injury or mortality from Lamont-Doherty's use of the multibeam echosounder. In 2013, an International Scientific Review Panel (ISRP) investigated a 2008 mass stranding of approximately 100 melon-headed whales in a Madagascar lagoon system (Southall *et al.*, 2013) associated with the use of a high-frequency mapping system. The report

indicated that the use of a 12-kHz multibeam echosounder was the most plausible and likely initial behavioral trigger of the mass stranding event. This was the first time that a relatively high-frequency mapping sonar system had been associated with a stranding event. However, the report also notes that there were several site- and situation-specific secondary factors that may have contributed to the avoidance responses that lead to the eventual entrapment and mortality of the whales within the Loza Lagoon system (e.g., the survey vessel transiting in a north-south direction on the shelf break parallel to the shore, may have trapped the animals between the sound source and the shore driving them towards the Loza Lagoon). They concluded that for odontocete cetaceans that hear well in the 10-50 kHz range, where ambient noise is typically quite low, high-power active sonars operating in this range may be more easily audible and have potential effects over larger areas than low frequency systems that have more typically been considered in terms of anthropogenic noise impacts (Southall, *et al.,* 2013). However, the risk may be very low given the extensive use of these systems worldwide on a daily basis and the lack of direct evidence of such responses previously reported (Southall, *et al*., 2013).

Given that Lamont-Doherty proposes to conduct the survey offshore and the *Langseth* is not conducting the survey parallel to any coastline, we do not anticipate that the use of the source during the seismic survey would entrap marine mammals between the vessel's sound sources and the New Jersey coastline. In addition, the Authorization includes reporting measures and response protocols to minimize the impacts of, and enhance the analysis of, any potential stranding in the survey area.

With respect to Clean Ocean Action's concerns about the survey's temporal overlap with the bottlenose dolphin calving period, we note again that Lamont-Doherty's study

area is approximately 20 km (12 mi) away from the identified habitats for coastal bottlenose dolphins and their calves in Toth *et al*. (2011, 2012) thereby reducing further the likelihood of causing an effect on this species or stock.

In response to COA's concerns that dolphin calves may be limited in their ability to flee the ensonified area due to their dependence on their mothers and small size, we considered several studies which note that seismic operators and protected species observers regularly see dolphins and other small toothed whales near operating airgun arrays, but in general there is a tendency for most delphinids to show some avoidance of operating seismic vessels (*e.g.*, Moulton and Miller, 2005; Holst *et al*., 2006; Stone and Tasker, 2006; Weir, 2008; Richardson *et al*., 2009; Barkaszi *et al*., 2009; Moulton and Holst, 2010). Also, some dolphins seem to be attracted to the seismic vessel and floats, and some ride the bow wave of the seismic vessel even when large arrays of airguns are firing (*e.g*., Moulton and Miller, 2005). Nonetheless, small toothed whales more often tend to head away, or to maintain a somewhat greater distance from the vessel, when a large array of airguns is operating than when it is silent (*e.g*., Stone and Tasker, 2006; Weir, 2008, Barry *et al*., 2010; Moulton and Holst, 2010). We note that in most cases, the avoidance radii for delphinids appear to be small, on the order of one km or less, and some individuals show no apparent avoidance. In considering the potential heightened sensitivity of neonate dolphins to noise, Schlundt *et al*. (2013) suggest that the potential for airguns to cause hearing loss in dolphins is lower than previously predicted, perhaps as a result of the low-frequency content of air gun impulses compared to the high-frequency hearing ability of dolphins.

We do not expect marine mammals to experience any repeated exposures at very close distances to the sound source because Lamont-Doherty would implement the required shutdown and power down mitigation measures to ensure that marine mammals do not approach the applicable exclusion zones for Level A harassment. In addition, we anticipate that the required ramp-up procedures at the start of the survey or anytime after a shutdown of the entire array would "warn" marine mammals in the vicinity of the airguns, and provide the time for them to leave the area and thus avoid any potential injury or impairment of their hearing abilities or annoyance at higher exposure levels.

Comment 13: COA states that we did not present species information for North Atlantic right whales in our analyses, including the Whitt *et al*. (2013) peer-reviewed study demonstrating North Atlantic right whale presence off the New Jersey coast year-round, particularly in the spring and summer months.

Response: NMFS disagrees. Table 1 in our notice of proposed authorization (pages 13966 and 13987, 80 **FR** 13961, March 17, 2015) specifically states that we base the year-round seasonal presence of North Atlantic right whales on the Whitt *et al*. (2013) paper. Whitt *et al*. (2013) conducted acoustic and visual surveys for North Atlantic right whales off the coast of New Jersey from January 2008 to December 2009 and observed one sighting of a cow-calf pair in May 2008, but no other sightings of cow-calf pairs throughout the remainder of the study. In the discussion of the Whitt et al., (2013) data, NMFS concluded that it was appropriate to increase Lamont-Doherty's original request for incidental take related to North Atlantic right whales from zero to three (3) to be conservative in estimating potential take for cow/calf pairs. NMFS based this adjustment on several sources (AMAPPS, 2010, 2011, and 2013; and Whitt *et al*., 2013) that

reported sighting information on the presence of North Atlantic right whales (including a cow/calf pair) in the survey area.

Monitoring and Reporting

Comment 14: The Commission has indicated that monitoring and reporting requirements should provide a reasonably accurate assessment of the types of taking and the numbers of animals taken by the proposed activity. They state that "…the assessments should account for animals at the surface but not detected [*i.e.*, g(0) values] and for animals present but underwater and not available for sighting [*i.e.*, f(0) values]. They further state that g(0) and f(0) values are essential to accurately assess the numbers of marine mammals taken during geophysical surveys based on the extent of the Level B harassment zones extending from more than 10 km in some instances and to more than 26 km in other instances. In light of the comments, the Commission recommends that NMFS consult with the funding agency (*i.e.*, the NSF) and individual applicants (*e.g.*, Lamont-Doherty and other related entities) 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, accounting for applicable g(0) and f(0) values. In previous letters, the Commission has not suggested that the NSF and Lamont-Doherty collect information in the field to support the development of survey-specific correction factors (80 **FR** 4892); rather they suggest that Lamont-Doherty and other relevant entities to continue to collect appropriate sightings data in the field which NMFS can then pool to determine g(0) and f(0) values relevant to the various geophysical survey types. The Commission would welcome another meeting to help further this goal.

Response: NMFS' 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. Scientists use g(0) and f(0) values in systematic marine mammal surveys to account for the undetected animals indicated above, however, these values are not simply established and the g(0) value varies across every observer based on their sighting acumen. While we want to be clear that we do 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 Lamont-Doherty's monitoring plan, we agree 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 desirable. We are continuing to examine this issue with the NSF to develop ways to improve their post-survey take estimates. We will continue to consult with the Commission and NMFS scientists prior to finalizing any future recommendations.

We note that current monitoring measures for past and current Authorizations for research seismic surveys require the collection of visual observation data by protected species observers prior to, during, and after airgun operations. This data collection may contribute to baseline data on marine mammals (presence/absence) and provide some generalized support for estimated take numbers (as well as providing data regarding behavioral responses to seismic operation that are observable at the surface). However, it is unlikely that the information gathered from these cruises alone would result in any

statistically robust conclusions for any particular species because of the small number of animals typically observed.

MMPA Concerns

Comment 15: Clean Ocean Action states that NMFS must ensure that the Authorization complies with the MMPA and requests that NMFS deny the Authorization based on their opinion that the potential impacts to marine mammals are incompatible with the prohibitions of the MMPA and that the take would be more than negligible.

Response: Our *Federal Register* notices for the proposed and final Authorization lay out our analysis and rationale for our conclusions.

Based on the analysis of the likely effects of the specified activity on marine mammals and their habitat contained within this document, the NSF's amended EA and our own EA, and taking into consideration the implementation of the mitigation and monitoring measures, we find that Lamont-Doherty's proposed activity would result in the take of small numbers of marine mammals, would have a negligible impact on the affected species or stocks, and would not result in an unmitigable adverse impact on the availability of such species or stocks for taking for subsistence uses as no subsistence users would be affected by the proposed action.

Acoustic Thresholds

Comment 16: COA states that the current NMFS 160-decibel (dB) re: 1 µPa threshold for Level B harassment does not reflect the best available science and is not sufficiently conservative.

Response: NMFS' practice has been to apply the 160 dB re: 1 µPa received level threshold for underwater impulse sound levels to determine whether take by Level B

harassment occurs. Specifically, we derived the 160 dB threshold data from mother-calf pairs of migrating gray whales (Malme *et al*., 1983, 1984) and bowhead whales (Richardson *et al*., 1985, 1986) responding to seismic airguns. We acknowledge there is more recent information bearing on behavioral reactions to seismic airguns, and we discuss the science on this issue qualitatively in our analysis of potential effects to marine mammals (80 **FR** 13961, March 17, 2015), but those data only illustrate how complex and context-dependent the relationship is between the two, and do not, as a whole, invalidate the current threshold. Accordingly, it is not a matter of simply replacing the existing threshold with a new one.

NMFS is working to develop guidance for assessing the effects of anthropogenic sound on marine mammals, including thresholds for behavioral harassment. Until NMFS finalizes that guidance (a process that includes internal agency review, public notice and comment, and peer review), we will continue to rely on the existing criteria for Level A and Level B harassment shown in Table 5 of the notice for the proposed authorization (80 **FR** 13961, March 17, 2015).

As mentioned in the **Federal Register** notice for the proposed authorization (80 **FR** 13961, March 17, 2015), we expect that the onset for behavioral harassment is largely context dependent (*e.g*., behavioral state of the animals, distance from the sound source, etc.) when evaluating behavioral responses of marine mammals to acoustic sources. Although using a uniform sound pressure level of 160-dB re: 1 μPa for the onset of behavioral harassment for impulse noises may not capture all of the nuances of different marine mammal reactions to sound, it is a reasonable and workable way to evaluate and

manage/regulate anthropogenic noise impacts on marine mammals as NMFS considers more complex options.

Comment 17: COA requested that we use a behavioral threshold below 160 dB for estimating take based on results reported in Clark and Gagnon (2006), MacLeod *et al*. (2006), Risch *et al*. (2012), McCauley *et al*. (1998), McDonald *et al*. (1995), Bain and Williams (2006), DeRuiter *et al*. (2013). They also cite comments submitted by Clark *et al*. (2012) on the Arctic Ocean Draft Environmental Impact Statement regarding NMFS' current acoustic thresholds.

Response: NMFS is constantly evaluating new science and how to best incorporate it into our decisions. This process involves careful consideration of new data and how it is best interpreted within the context of a given management framework. Each of these cited articles emphasizes the importance of context (*e.g*., behavioral state of the animals, distance from the sound source, etc.) in evaluating behavioral responses of marine mammals to acoustic sources.

These papers and the studies discussed in our notice of proposed authorization (80 **FR** 13961, March 17, 2015) note that there is variability in the behavioral responses of marine mammals to noise exposure. However, it is important to consider the context in predicting and observing the level and type of behavioral response to anthropogenic signals (Ellison *et al*., 2012). There are many studies showing that marine mammals do not show behavioral responses when exposed to multiple pulses at received levels at or above 160 dB re: 1 µPa (*e.g*., Malme *et al*., 1983; Malme *et al*., 1984; Richardson *et al*., 1986; Akamatsu *et al*., 1993; Madsen and Mohl, 2000; Harris *et al*., 2001; Miller *et al*., 2005; and Wier, 2008). And other studies show that whales continue important behaviors

in the presence of seismic pulses (*e.g*., Richardson *et al*., 1986; McDonald *et al*., 1995; Greene *et al*., 1999a, 1999b; Nieukirk *et al*., 2004; Smultea *et al*., 2004; Holst *et al*., 2005, 2006; Dunn and Hernandez, 2009).

In a passive acoustic research program that mapped the soundscape in the North Atlantic Ocean, Clark and Gagnon (2006) reported that some fin whales (*Balaenoptera physalus*) stopped singing for an extended period starting soon after the onset of a seismic survey in the area. The study did not provide information on received levels or distance from the sound source. The authors could not determine whether or not the whales left the area ensonified by the survey, but the evidence suggests that most if not all singers remained in the area (Clark and Gagnon, 2006). Support for this statement comes from the fact that when the survey stopped temporarily, the whales resumed singing within a few hours and the number of singers increased with time (Clark and Gagnon, 2006). Also, they observed that one whale continued to sing while the seismic survey was actively operating (Figure 4; Clark and Gagnon, 2006).

The authors conclude that there is not enough scientific knowledge to adequately evaluate whether or not these effects on singing or mating behaviors are significant or would alter survivorship or reproductive success (Clark and Gagnon, 2006). Thus, to address COA's concerns related to the results of this study, it is important to note that the Lamont-Doherty's study area is well away from any known breeding/calving grounds for low frequency cetaceans and approximately 20 km (12 mi) away from the identified habitats for coastal bottlenose dolphins and their calves in Toth *et al*. (2011, 2012) thereby reducing further the likelihood of causing an effect on marine mammals.

MacLeod *et al*. (2006) discussed the possible displacement of fin and sei whales related to distribution patterns of the species during a large-scale seismic survey offshore the west coast of Scotland in 1998. The authors hypothesized about the relationship between the whale's absence and the concurrent seismic activity, but could not rule out other contributing factors (Macleod, *et al*., 2006; Parsons *et al*., 2009). We would expect that marine mammals may briefly respond to underwater sound produced by the seismic survey by slightly changing their behavior or relocating a short distance. Based on the best available information, we expect short-term disturbance reactions that are confined to relatively small distances and durations (Thompson *et al*., 1998; Thompson *et al*., 2013), with no adverse impacts on annual rates of recruitment or survival.

Regarding the suggestion that blue whales "significantly" changed course during the conduct of a seismic survey offshore Oregon, we disagree. We considered the McDonald *et al*. (1995) paper in the notice for the proposed authorization (80 **FR** 13961, March 17, 2015). In brief, the study tracked three blue whales relative to a seismic survey with a 1,600 in3 airgun array (higher than Lamont-Doherty's 700 in^3 airgun array). The whale started its call sequence within 15 km (9.3 mi) from the source, then followed a pursuit track that decreased its distance to the vessel where it stopped calling at a range of 10 km (6.2 mi) (estimated received level at 143 dB re: 1 μPa (peak-to-peak) (McDonald *et al*., 1995). After that point, the ship increased its distance from the whale, which continued a new call sequence after approximately one hour (McDonald *et al*., 1995) and 10 km (6.2 mi) from the ship. The authors suggested that the whale had taken a track paralleling the ship during the cessation phase but observed the whale moving diagonally away from the ship after approximately 30 minutes continuing to vocalize (McDonald *et al*., 1995). The

authors also suggest that the whale may have approached the ship intentionally or perhaps was unaffected by the airguns. They concluded that there was insufficient data to infer conclusions from their study related to blue whale responses (McDonald *et al*., 1995).

Risch *et al*. (2012) documented reductions in humpback whale (*Megaptera novaeangliae*) vocalizations in the Stellwagen Bank National Marine Sanctuary concurrent with transmissions of the Ocean Acoustic Waveguide Remote Sensing (OAWRS) low-frequency fish sensor system at distances of 200 kilometers (km) from the source. The recorded OAWRS produced a series of frequency modulated pulses and the signal received levels ranged from 88 to 110 dB re: 1 μPa (Risch *et al*., 2012). The authors hypothesize that individuals did not leave the area but instead ceased singing and noted that the duration and frequency range of the OAWRS signals (a novel sound to the whales) were similar to those of natural humpback whale song components used during mating (Risch *et al*., 2012). Thus, the novelty of the sound to humpback whales in the study area provided a compelling contextual probability for the observed effects (Risch *et al*., 2012). However, the authors did not state or imply that these changes had long-term effects on individual animals or populations (Risch *et al*., 2012), nor did they necessarily rise to the level of harassment. However, (Gong *et al*. 2014), disputes these findings, suggesting that (Risch *et al*. 2012) mistakes natural variations in humpback whale song occurrence for changes caused by OAWRS activity approximately 200 km away. (Risch *et al*., 2014) responded to (Gong *et al*., 2014) and highlighted the context-dependent nature of behavioral responses to acoustic stressors.

We considered the McCauley *et al*. (1998) paper (along with McCauley *et al*., 2000) in the notice of proposed authorization (80 **FR** 13961, March 17, 2015). Briefly, McCauley *et al*. (1998, 2000) studied the responses of migrating humpback whales off western Australia to a full-scale seismic survey with a 16-airgun array (2,678 in^3) and to playbacks using a single, 20-in^3airgun. Both studies point to a contextual variability in the behavioral responses of marine mammals to sound exposure. The mean received level for initial avoidance of an approaching airgun was 140 dB re: 1 μPa for resting humpback whale pods containing females. In contrast, some individual humpback whales, mainly males, approached within distances of 100 to 400 m (328 to 1,312 ft), where sound levels were 179 dB re: 1 μPa (McCauley *et al*., 2000). The authors hypothesized that the males gravitated towards the single operating airgun possibly due to its similarity to the sound produced by humpback whales breaching (McCauley *et al*., 2000). Despite the evidence that some humpback whales exhibited localized avoidance reactions at received levels below 160 dB re: 1 μPa, the authors found no evidence of any gross changes in migration routes, such as inshore/offshore displacement during seismic operations (McCauley *et al*., 1998, 2000).

With repeated exposure to sound, many marine mammals may habituate to the sound at least partially (Richardson & Wursig, 1997). Bain and Williams (2006) examined the effects of a large airgun array (maximum total discharge volume of 1,100 in^3) on six species in shallow waters off British Columbia and Washington: harbor seal, California sea lion (*Zalophus californianus*), Steller sea lion (*Eumetopias jubatus*), gray whale (*Eschrichtius robustus*), Dall's porpoise (*Phocoenoides dalli*), and the harbor porpoise. Harbor porpoises showed "apparent avoidance response" at received levels less than 145

dB re: 1 μPa at a distance of greater than 70 km (43 miles) from the seismic source (Bain and Williams, 2006). However, the tendency for greater responsiveness by harbor porpoise is consistent with their relative responsiveness to boat traffic and some other acoustic sources (Richardson *et al*. 1995; Southall *et al*., 2007). In contrast, the authors reported that gray whales seemed to tolerate exposures to sound up to approximately 170 dB re: 1 μPa (Bain and Williams, 2006) and Dall's porpoises occupied and tolerated areas receiving exposures of 170–180 dB re: 1 μPa (Bain and Williams, 2006; Parsons *et al*., 2009). The authors observed several gray whales that moved away from the airguns toward deeper water where sound levels were higher due to propagation effects resulting in higher noise exposures (Bain and Williams, 2006). However, it is unclear whether their movements reflected a response to the sounds (Bain and Williams, 2006). Thus, the authors surmised that the gray whale data (*i.e*., voluntarily moving to areas where they are exposed to higher sound levels) are ambiguous at best because one expects the species to be the most sensitive to the low-frequency sound emanating from the airguns (Bain and Williams, 2006).

DeRuiter *et al*. (2013) recently observed that beaked whales (considered a particularly sensitive species to sound) exposed to playbacks (*i.e*., simulated) of U.S. tactical mid-frequency sonar from 89 to 127 dB re: 1 μPa at close distances responded notably by altering their dive patterns. In contrast, individuals showed no behavioral responses when exposed to similar received levels from *actual* U.S. Navy tactical mid-frequency sonar operated at much further distances (DeRuiter *et al*., 2013). As noted earlier, one must consider the importance of context (for example, the distance of a sound source from the animal) in predicting behavioral responses.

Regarding the public comments submitted by Clark *et al.* (2012) on the Arctic Ocean Draft EIS in reference to our use of the current acoustic exposure criteria, please refer to our earlier response to comments.

None of these studies on the effects of airgun noise on marine mammals point to any associated mortalities, strandings, or permanent abandonment of habitat by marine mammals. Bain and Williams (2006) specifically conclude that "…although behavioral changes were observed, the precautions utilized in the SHIPS survey did not result in any detectable marine mammal mortalities during the survey, nor were any reported subsequently by the regional marine mammal stranding network..." McCauley *et al.* (2000) concluded that any risk factors associated with their seismic survey "…lasted for a comparatively short period and resulted in only small range displacement…" Further, the total discharge volume of the airgun arrays cited in McCauley *et al*., 1998, 2000; Bain and Williams, 2006 were generally over 40 percent larger than the 1,400 in^3 array configurations proposed for use during this survey (e.g., 2,768 in^3, McCauley *et al*., 1998; 6,730 in^3, Bain and Williams, 2006). Thus, Lamont-Doherty's 160-dB threshold radius is not likely to reach the threshold distances reported in these studies.

Comment 18: COA takes issue with our conclusion that Level A harassment take would not occur during the survey. Citing Lucke *et al*. (2009); Thompson *et al*. (1998); Kastak *et al*. (2008); Kujawa and Lieberman (2009); Wood *et al*. (2012); and Cox *et al*. (2006), the commenters assert that our preliminary determinations for Level A harassment take and the likelihood of temporary and or permanent threshold shift do not consider the best available science.

Response: As explained in Table 3 in the notice of proposed authorization (80 **FR** 13961, March 17, 2015), the predicted distances at which sound levels could result in Level A harassment are relatively small (439 m; 1,440 ft for cetaceans; 118 m; 387 ft for pinnipeds). At those distances, we expect that the required vessel-based visual monitoring of the exclusion zones is effective to implement mitigation measures to prevent Level A harassment.

First, if the protected species observers observe marine mammals approaching the exclusion zone, Lamont-Doherty must shut down or power down seismic operations to ensure that the marine mammal does not approach the applicable exclusion radius. Second, if the observer detects a marine mammal outside the 180- or 190-dB exclusion zones, and the animal – based on its position and the relative motion – is likely to enter the exclusion zone, Lamont-Doherty may alter the vessel's speed and/or course –when practical and safe – in combination with powering down or shutting down the airguns, to minimize the effects of the seismic survey. The avoidance behaviors discussed in the notice of proposed authorization (80 **FR** 13961, March 17, 2015) supports our expectations that individuals will avoid exposure at higher levels. Also, it is unlikely that animals would encounter repeated exposures at very close distances to the sound source because Lamont-Doherty would implement the required shutdown and power down mitigation measures to ensure that marine mammals do not approach the applicable exclusion zones for Level A harassment. Finally, ramp-up of the airguns is required.

Regarding the Lucke *et al*. (2009) study, the authors found a threshold shift (TS) of a harbor porpoise after exposing it to airgun noise (single pulse) with a received sound pressure level (SPL) at 200.2 dB (peak –to-peak) re: 1 μPa, which corresponds to a sound

exposure level of 164.5 dB re: 1 μPa2 s after integrating exposure. We currently use the root-mean-square (rms) of received SPL at 180 dB and 190 dB re: 1 μPa as the threshold above which permanent threshold shift (PTS) could occur for cetaceans and pinnipeds, respectively. Because the airgun noise is a broadband impulse, one cannot directly extrapolate the equivalent of rms SPL from the reported peak-to-peak SPLs reported in Lucke *et al*. (2009). However, applying a conservative conversion factor of 16 dB for broadband signals from seismic surveys (Harris *et al*. 2001; McCauley *et al*. 2000) to correct for the difference between peak-to-peak levels reported in Lucke *et al*. (2009) and rms SPLs, the rms SPL for TTS would be approximately 184 dB re: 1 μPa, and the received levels associated with PTS (Level A harassment) would be higher. This is still above the current 180 dB rms re: 1 μPa threshold for injury. Yet, we recognize that the temporary threshold shift (TTS) of harbor porpoise is lower than other cetacean species empirically tested (Finneran *et al*. 2002; Finneran and Schlundt, 2010; Kastelein *et al*., 2012). We considered this information in the notice of proposed authorization (80 **FR** 13961, March 17, 2015).

The Thompson *et al*. (1998) telemetry study on harbor (*Phoca vitulina*) and grey seals (*Halichoerus grypus*) suggested that avoidance and other behavioral reactions by individual seals to small airgun sources may at times be strong, but short-lived. The researchers conducted 1-hour controlled exposure experiments exposing individual seals fitted with telemetry devices to small airguns with a reported source level of 215-224 dB re: 1 μPa (peak-to-peak) (Thompson *et al*., 1998; Gordon *et al*., 2003). The researchers measured dive behavior, swim speed heart rate and stomach temperature (indicator for feeding), but they did not measure hearing threshold shift in the animals. The researchers

observed startle responses, decreases in heart rate, and temporary cessation of feeding. In six out of eight trials, harbor seals exhibited strong avoidance behaviors, and swam rapidly away from the source (Thompson *et al*., 1998; Gordon *et al*., 2003). One seal showed no detectable response to the airguns, approaching within 300 m (984 ft) of the source (Gordon *et al*., 2003). However, they note that the behavioral responses were short-lived and the seals' behavior returned to normal after the trials (Thompson *et al*., 1998; Gordon *et al*., 2003). The study does not discuss temporary threshold shift or permanent threshold shift in harbor seals and the estimated rms SPL for this survey is approximately 200 dB re: 1 µPa, well above NMFS' current 180 dB rms re: 1 µPa threshold for injury for cetaceans and NMFS' current 190 dB rms re: 1 µPa threshold for injury for pinnipeds (accounting for the fact that the rms sound pressure level (in dB) is typically 16 dB less than the peak-to-peak level).

In a study on the effect of non-impulsive sound sources on marine mammal hearing, Kastak *et al*. (2008) exposed one harbor seal to an underwater 4.1 kHz pure tone fatiguing stimulus with a maximum received sound pressure of 184 dB re: 1 µPa for 60 seconds (Kastak *et al*., 2008; Finneran and Branstetter, 2013). A second 60-second exposure resulted in an estimated threshold shift of greater than 50 dB at a test frequency of 5.8 kHz (Kastak *et al*., 2008). The seal recovered at a rate of -10 dB per log(min). However, 2 months post-exposure, the researchers observed incomplete recovery from the initial threshold shift resulting in an apparent permanent threshold shift of 7 to 10 dB in the seal (Kastak *et al*., 2008). We note that seismic sound is an impulsive source, and the context of the study is related to the effect of non-impulsive sounds (i.e., a continuous

6-second exposure) on marine mammals. In contrast, Lamont-Doherty's seismic survey has a short, pulsed, intermittent shot-interval of 5 to 6 seconds every 12.5 m traveled.

We also considered two other Kastak *et al*. (1999, 2005) studies. Kastak *et al*. (1999) reported TTS of approximately 4-5 dB in three species of pinnipeds (harbor seal, California sea lion, and northern elephant seal) after underwater exposure for approximately 20 minutes to sound with frequencies ranging from 100-2,000 Hz at received levels 60-75 dB above hearing threshold. This approach allowed similar effective exposure conditions to each of the subjects, but resulted in variable absolute exposure values depending on subject and test frequency. Recovery to near baseline levels was reported within 24 hours of sound exposure. Kastak *et al*. (2005) followed up on their previous work, exposing the same test subjects to higher levels of sound for longer durations. The animals were exposed to octave-band sound for up to 50 minutes of net exposure. The study reported that the harbor seal experienced TTS of 6 dB after a 25-minute exposure to 2.5 kHz of octave-band sound at 152 dB (183 dB SEL). The California sea lion demonstrated onset of TTS after exposure to 174 dB (206 dB SEL).

We considered that PTS could occur at relatively lower levels, such as at levels that would normally cause TTS, if the animal experiences repeated exposures at very close distances to the sound source. However, an animal would need to stay very close to the sound source for an extended amount of time to incur a serious degree of PTS, which in this case, would be highly unlikely due to the required mitigation measures in place to avoid Level A harassment and the expectation that a mobile marine mammal would generally avoid an area where received sound pulse levels exceed 160 dB re: 1 μPa (rms) (review in Richardson *et al*. 1995; Southall *et al*. 2007).

We also considered recent studies by Kujawa and Liberman (2009) and Lin *et al.* (2011). These studies found that despite completely reversible threshold shifts that leave cochlear sensory cells intact, large threshold shifts could cause synaptic level changes and delayed cochlear nerve degeneration in mice and guinea pigs, respectively. We note that the high level of TTS that led to the synaptic changes shown in these studies is in the range of the high degree of TTS that Southall *et al.* (2007) used to calculate PTS levels. It is not known whether smaller levels of TTS would lead to similar changes. NMFS acknowledges the complexity of noise exposure on the nervous system, and will re-examine this issue as more data become available.

In contrast, a recent study on bottlenose dolphins (Schlundt, *et al*., 2013) measured hearing thresholds at multiple frequencies to determine the amount of TTS induced before and after exposure to a sequence of impulses produced by a seismic air gun. The airgun volume and operating pressure varied from 40-150 in^3 and 1000-2000 psi, respectively. After three years and 180 sessions, the authors observed no significant TTS at any test frequency, for any combinations of air gun volume, pressure, or proximity to the dolphin during behavioral tests (Schlundt, *et al*., 2013). Schlundt *et al*. (2013) suggest that the potential for airguns to cause hearing loss in dolphins is lower than previously predicted, perhaps as a result of the low-frequency content of airgun impulses compared to the high-frequency hearing ability of dolphins.

NEPA Concerns

Comment 19: COA states that we should prepare an Environmental Impact Statement (EIS), not an EA, to adequately consider the potentially significant impacts of the

proposed Authorization, including the cumulative impacts and consideration of a full range of alternatives.

Response: We prepared an EA to evaluate whether significant environmental impacts may result from the issuance of an Authorization to Lamont-Doherty for the take of marine mammals incidental to conducting their seismic survey in the northwest Atlantic Ocean. After completing the EA, which includes two no action alternatives, we determined that there would not be significant impacts to the human environment related to our issuance of an Authorization and accordingly issued a Finding of No Significant Impact (FONSI). Therefore, this action does not require an EIS.

Comment 20: COA states that our analysis of alternatives in the EA was incomplete because the NSF's EA did not sufficiently evaluate the No Action alternative.

Response: The NEPA and the implementing CEQ regulations (40 CFR parts 1500-1508) require consideration of alternatives to proposed major federal actions and NAO 216-6 provides agency policy and guidance on the consideration of alternatives to our proposed action. An EA must consider all reasonable alternatives, including the No Action Alternative. This provides a baseline analysis against which we can compare the other alternatives.

NMFS' EA titled, "Issuance of an Incidental Harassment Authorization to Lamont Doherty Earth Observatory to Take Marine Mammals by Harassment Incidental to a Marine Geophysical Survey in the Northwest Atlantic Ocean, Summer, 2015," addresses the potential environmental impacts of four alternatives, namely:

– Issue the Authorization to Lamont-Doherty for take, by Level B harassment, of marine mammals during the seismic survey, taking into account the prescribed means of take, mitigation measures, and monitoring requirements;

– Not issue an Authorization to Lamont-Doherty in which case we assume that the activities would not proceed; or

– Not issue an Authorization to Lamont-Doherty in which case, for the purposes of NEPA analysis only, we assume that the activities would proceed and cause incidental take without the mitigation and monitoring measures prescribed in the Authorization; or

– Issue the Authorization to Lamont-Doherty for take, by Level B harassment, of marine mammals during the seismic survey by incorporating additional mitigation requirements.

To warrant detailed evaluation as a reasonable alternative, an alternative must meet our purpose and need. In this case, an alternative meets NMFS' purpose and need if it satisfies the requirements under section 101(a)(5)(D) the MMPA. We evaluated each potential alternative against these criteria; identified two action alternatives along with two No Action Alternatives; and carried these forward for evaluation in our EA.

General Comments

Comment 21: Several commenters expressed general opposition or general support for the survey.

Response: We acknowledge their comments and thank them for their interest.

Description of Marine Mammals in the Area of the Specified Activity

Table 2 in this notice provides the following: all marine mammal species with possible or confirmed occurrence in the proposed activity area; information on those

species' regulatory status under the MMPA and the Endangered Species Act of 1973 (16 U.S.C. 1531 *et seq*.); abundance; occurrence and seasonality in the activity area.

Table 2 - General information on marine mammals that could potentially occur in the proposed survey area during the summer (June through August) in 2015.

Species	Stock Name	Regulatory Status[1, 2]	Stock/Species Abundance[3]	Occurrence and Range	Season
North Atlantic right whale (*Eubalaena glacialis*)	Western Atlantic	MMPA - D ESA – EN	456	common coastal/shelf	year-round[4]
Humpback whale (*Megaptera novaeangliae*)	Gulf of Maine	MMPA - D ESA – EN	823	common coastal	spring - fall
Common minke whale (*Balaenoptera acutorostrata*)	Canadian East Coast	MMPA - D ESA – NL	20,741	rare coastal/shelf	spring - summer
Sei whale (*Balaenoptera borealis*)	Nova Scotia	MMPA - D ESA – EN	357	uncommon shelf edge	spring
Fin whale (*Balaenoptera physalus*)	Western North Atlantic	MMPA - D ESA – EN	1,618	common pelagic	year-round
Blue whale (*Balaenoptera musculus*)	Western North Atlantic	MMPA - D ESA – EN	440	uncommon coastal/pelagic	occasional
Sperm whale (*Physeter macrocephalus*)	Nova Scotia	MMPA - D ESA – EN	2,288	common pelagic	year-round
Dwarf sperm whale (*Kogia sima*)	Western North Atlantic	MMPA - NC ESA – NL	3,785	uncommon shelf	year-round
Pygmy sperm whale (*K. breviceps*)	Western North Atlantic	MMPA - NC ESA – NL	3,785	uncommon shelf	year-round
Cuvier's beaked whale (*Ziphius cavirostris*)	Western North Atlantic	MMPA - NC ESA – NL	6,532	uncommon shelf/pelagic	spring - summer
Blainville's beaked whale (*Mesoplodon densirostris*)	Western North Atlantic	MMPA - NC ESA – NL	7,092[5]	uncommon shelf/pelagic	spring - summer
Gervais' beaked whale (*M. europaeus*)	Western North Atlantic	MMPA - NC ESA – NL	7,092[5]	uncommon shelf/pelagic	spring - summer
Sowerby's beaked whale (M. bidens)	Western North Atlantic	MMPA - NC ESA – NL	7,092[5]	uncommon shelf/pelagic	spring - summer
True's beaked whale (*M. mirus*)	Western North Atlantic	MMPA - NC ESA – NL	7,092[5]	uncommon shelf/pelagic	spring - summer
Northern bottlenose whale (*Hyperoodon ampullatus*)	Western North Atlantic	MMPA - NC ESA – NL	unknown	rare pelagic	unknown
Rough-toothed dolphin (*Steno bredanensis*)	Western North Atlantic	MMPA - NC ESA – NL	271	rare pelagic	summer
Bottlenose dolphin (*Tursiops truncatus*)	Western North Atlantic Offshore	MMPA - NC ESA – NL	77,532	common pelagic	spring - summer
	Western North Atlantic Northern Migratory Coastal	MMPA - D ESA – NL	11,548[6]	uncommon coastal within the 25-m isobath and estuaries	summer
Pantropical spotted dolphin (*Stenella attenuata*)	Western North Atlantic	MMPA - NC ESA – NL	3,333	rare pelagic	summer - fall
Atlantic spotted dolphin (*S. frontalis*)	Western North Atlantic	MMPA - NC ESA – NL	44,715	common coastal	summer - fall
Spinner dolphin (*S. longirostris*)	Western North Atlantic	MMPA - NC ESA – NL	unknown	rare pelagic	unknown
Striped dolphin (*S. coeruleoalba*)	Western North Atlantic	MMPA - NC ESA – NL	54,807	uncommon shelf	summer
Short-beaked common dolphin (*Delphinus delphis*)	Western North Atlantic	MMPA - NC ESA – NL	173,486	common shelf/pelagic	summer - fall

White-beaked dolphin (*Lagenorhynchus albirostris*)	Western North Atlantic	MMPA - NC ESA – NL	2,003	rare coastal/shelf	summer
Atlantic white-sided-dolphin (*L. acutus*)	Western North Atlantic	MMPA - NC ESA – NL	48,819	uncommon shelf/slope	summer - winter
Clymene dolphin (*Stenella clymene*)	Western North Atlantic	MMPA - NC ESA – NL	6,086[7]	rare slope	summer
Fraser's dolphin (*Lagenodelphis hosei*)	Western North Atlantic	MMPA - NC ESA – NL	726[8]	Pelagic	Rare
Risso's dolphin (*Grampus griseus*)	Western North Atlantic	MMPA - NC ESA – NL	18,250	common shelf/slope	year-round
Melon-headed whale (*Peponocephala electra*)	Western North Atlantic	MMPA - NC ESA – NL	2,283[9]	Pelagic	Rare
False killer whale (*Pseudorca crassidens*)	western North Atlantic	MMPA - NC ESA – NL	442	rare pelagic	spring - summer
Pygmy killer whale (*Feresa attenuate*)	Western North Atlantic	MMPA - NC ESA – NL	1,108[10]	Pelagic	unknown
Killer whale (*Orcinus orca*)	Western North Atlantic	MMPA - NC ESA – NL	28[11]	Coastal	unknown
Long-finned pilot whale (*Globicephala melas*)	Western North Atlantic	MMPA - NC ESA – NL	26,535	uncommon shelf/pelagic	summer
Short-finned pilot whale (*G. macrorhynchus*)	Western North Atlantic	MMPA - NC ESA – NL	21,515	uncommon shelf/pelagic	summer
Harbor porpoise (*Phocoena phocoena*)	Gulf of Maine/ Bay of Fundy	MMPA - NC ESA – NL	79,883	common coastal	year-round
Gray seal (*Halichoerus grypus*)	Western North Atlantic	MMPA - NC ESA – NL	331,000	common coastal	fall - spring
Harbor seal (*Phoca vitulina*)	Western North Atlantic	MMPA - NC ESA – NL	75,834	common coastal	fall - spring
Harp seal (*Pagophilus groenlandicus*)	Western North Atlantic	MMPA - NC ESA – NL	8,600,000	rare pack ice	Jan - May

[1] MMPA: D = Depleted, S = Strategic, NC = Not Classified.
[2] ESA: EN = Endangered, T = Threatened, DL = Delisted, NL = Not listed.
[3] NOAA Technical Memorandum NMFS-NE-228, U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments - 2013 (Waring *et al.*, 2014) and the Draft 2014 U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments (*in review*, 2014).
[4] Seasonality based on Whitt *et al.*, 2013.
[5] Undifferentiated beaked whales abundance estimate (Waring *et al*., 2014).
[6] During summer months, the primary habitat of the western north Atlantic, Northern Migratory Coastal Stock of bottlenose dolphins is primarily in waters less than 20 m deep within the 25-m isobath, including estuarine and inshore waters (Waring et al., 2014; Kenney 1990). Toth *et a*l. (2012) suggested a portioning of the Northern Migratory Coastal Stock in waters off of New Jersey. They identified two clusters, one cluster inhabiting waters 0-1.9 km from the shore and a second cluster inhabiting waters 1.9 to 6 km from shore.
[7] There is no abundance information for this species in the Atlantic. The best available estimate of abundance was 6,086 (CV=0.93) (Mullin and Fulling, 2003).
[8] There is no abundance information for this species in the Atlantic. The best available estimate of abundance was 726 (CV=0.70) for the Gulf of Mexico stock (Mullin and Fulling, 2004).
[9] There is no abundance information for this species in the Atlantic. The best available estimate of abundance was 2,283 (CV=0.76) for the Gulf of Mexico stock (Mullin, 2007).
[10] There is no abundance information for this species in the Atlantic. Abundance estimate derived from the Northern Gulf of Mexico stock = 152 (Mullin, 2007) and the Hawaii stock = 956 (Barlow, 2006).
[11] There is no abundance information for this species in the Atlantic. Abundance estimate derived from the Northern Gulf of Mexico stock = 28 (Waring *et al*., 2014).

Potential Effects of the Specified Activities on Marine Mammals

We provided a summary and discussion of the ways that the types of stressors associated with the specified activity (*e.g.*, seismic airgun operations, vessel movement,

and entanglement) impact marine mammals (via observations or scientific studies) in the notice of proposed Authorization (80 **FR** 13961, March 17, 2015).

The "Estimated Take by Incidental Harassment" section later in this document will include a quantitative discussion of the number of marine mammals anticipated to be taken by this activity. The "Negligible Impact Analysis" section will include a discussion of how this specific activity will impact marine mammals. The Negligible Impact analysis considers the anticipated level of take and the effectiveness of mitigation measures to draw conclusions regarding the likely impacts of this activity on the reproductive success or survivorship of individuals and from that on the affected marine mammal populations or stocks.

Operating active acoustic sources, such as airgun arrays, has the potential for adverse effects on marine mammals. The majority of anticipated impacts would be from the use of acoustic sources. The effects of sounds from airgun pulses might include one or more of the following: tolerance, masking of natural sounds, behavioral disturbance, and temporary or permanent hearing impairment or non-auditory effects (Richardson *et al*., 1995). However, for reasons discussed in the proposed Authorization, it is very unlikely that there would be any cases of temporary or permanent hearing impairment resulting from Lamont-Doherty's activities. As outlined in previous NMFS documents, the effects of noise on marine mammals are highly variable, often depending on species and contextual factors (based on Richardson *et al*., 1995).

In the "Potential Effects of the Specified Activity on Marine Mammals" section of the notice of proposed Authorization (80 **FR** 13961, March 17, 2015), we included a qualitative discussion of the different ways that Lamont-Doherty's seismic survey may

potentially affect marine mammals. Marine mammals may behaviorally react to sound when exposed to anthropogenic noise. These behavioral reactions are often shown as: changing durations of surfacing and dives, number of blows per surfacing, or moving direction and/or speed; reduced/increased vocal activities; changing/cessation of certain behavioral activities (such as socializing or feeding); visible startle response or aggressive behavior (such as tail/fluke slapping or jaw clapping); avoidance of areas where noise sources are located; and/or flight responses (*e.g*., pinnipeds flushing into water from haulouts or rookeries).

Masking is the obscuring of sounds of interest by other sounds, often at similar frequencies. Marine mammals use acoustic signals for a variety of purposes, which differ among species, but include communication between individuals, navigation, foraging, reproduction, avoiding predators, and learning about their environment (Erbe and Farmer, 2000; Tyack, 2000). Masking, or auditory interference, generally occurs when sounds in the environment are louder than, and of a similar frequency as, auditory signals an animal is trying to receive. Masking is a phenomenon that affects animals that are trying to receive acoustic information about their environment, including sounds from other members of their species, predators, prey, and sounds that allow them to orient in their environment. Masking these acoustic signals can disturb the behavior of individual animals, groups of animals, or entire populations. For the airgun sound generated from Lamont-Doherty's seismic survey, sound will consist of low frequency (under 500 Hz) pulses with extremely short durations (less than one second). Masking from airguns is more likely in low-frequency marine mammals like mysticetes. There is little concern that masking would occur near the sound source due to the brief duration of these pulses

and relative silence between air gun shots (approximately 5 to 6 seconds). Masking is less likely for mid- to high-frequency cetaceans and pinnipeds.

Hearing impairment (either temporary or permanent) is also unlikely. Given the higher level of sound necessary to cause permanent threshold shift as compared with temporary threshold shift, it is considerably less likely that permanent threshold shift would occur during the seismic survey. Cetaceans generally avoid the immediate area around operating seismic vessels, as do some other marine mammals. Some pinnipeds show avoidance reactions to airguns.

The *Langseth* will operate at a relatively slow speed (typically 4.6 knots [8.5 km/h; 5.3 mph]) when conducting the survey. Protected species observers would monitor for marine mammals, which would trigger mitigation measures, including vessel avoidance where safe. Therefore, NMFS does not anticipate nor do we authorize takes of marine mammals from vessel strike.

NMFS refers the reader to Lamont-Doherty's application, our EA, and the NSF's amended EA for additional information on the behavioral reactions (or lack thereof) by all types of marine mammals to seismic vessels. We have reviewed these data along with new information submitted during the public comment period and based our decision on the relevant information.

Anticipated Effects on Marine Mammal Habitat

NMFS included a detailed discussion of the potential effects of this action on marine mammal habitat, including physiological and behavioral effects on marine mammal prey items (*e.g.*, fish and invertebrates) in the notice of proposed Authorization (80 **FR** 13961, March 17, 2015). While we anticipate that the specified activity may result in marine

mammals avoiding certain areas due to temporary ensonification, the impact to habitat is temporary and reversible. Further, we also considered these impacts to marine mammals in detail in the notice of proposed Authorization as behavioral modification. The main impact associated with the activity would be temporarily elevated noise levels and the associated direct effects on marine mammals.

Mitigation

In order to issue an incidental take authorization under section 101(a)(5)(D) of the MMPA, NMFS must prescribe, where applicable, the permissible methods of taking pursuant to such activity, and other means of effecting the least practicable adverse impact on such species or stock and its habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance, and on the availability of such species or stock for taking for certain subsistence uses (where relevant).

Lamont-Doherty reviewed the following source documents and incorporated a suite of proposed mitigation measures into their project description:

(1) Protocols used during previous NSF-funded seismic research cruises as approved by us and detailed in the NSF's 2011 PEIS and 2014 amended EA;

(2) Previous incidental harassment authorization applications and authorizations that we have approved and authorized; and

(3) Recommended best practices in Richardson *et al*. (1995), Pierson *et al*. (1998), and Weir and Dolman, (2007).

Lamont-Doherty proposed to implement the following mitigation measures for marine mammals:

(1) Vessel-based visual mitigation monitoring;

(2) Proposed exclusion zones;

(3) Power down procedures;

(4) Shutdown procedures;

(5) Ramp-up procedures; and

(6) Speed and course alterations.

Vessel-based Visual Mitigation Monitoring

Lamont-Doherty would position observers aboard the seismic source vessel to watch for marine mammals near the vessel during daytime airgun operations and during any start-ups at night. Observers would also watch for marine mammals near the seismic vessel for at least 30 minutes prior to the start of airgun operations after an extended shutdown (*i.e.*, greater than approximately eight minutes for this proposed cruise). When feasible, the observers would conduct observations during daytime periods when the seismic system is not operating for comparison of sighting rates and behavior with and without airgun operations and between acquisition periods. Based on the observations, the *Langseth* would power down or shutdown the airguns when marine mammals are observed within or about to enter a designated exclusion zone for cetaceans or pinnipeds.

During seismic operations, at least four protected species observers would be aboard the *Langseth*. Lamont-Doherty would appoint the observers with NMFS concurrence and they would conduct observations during ongoing daytime operations and nighttime ramp-ups of the airgun array. During the majority of seismic operations, two observers would be on duty from the observation tower to monitor marine mammals near the seismic vessel. Using two observers would increase the effectiveness of detecting animals near the source vessel. However, during mealtimes and bathroom breaks, it is sometimes

difficult to have two observers on effort, but at least one observer would be on watch during bathroom breaks and mealtimes. Observers would be on duty in shifts of no longer than four hours in duration.

Two observers on the *Langseth* would also be on visual watch during all nighttime ramp-ups of the seismic airguns. A third observer would monitor the passive acoustic monitoring equipment 24 hours a day to detect vocalizing marine mammals present in the action area. In summary, a typical daytime cruise would have scheduled two observers (visual) on duty from the observation tower, and an observer (acoustic) on the passive acoustic monitoring system. Before the start of the seismic survey, Lamont-Doherty would instruct the vessel's crew to assist in detecting marine mammals and implementing mitigation requirements.

The *Langseth* is a suitable platform for marine mammal observations. When stationed on the observation platform, the eye level would be approximately 21.5 m (70.5 ft) above sea level, and the observer would have a good view around the entire vessel. During daytime, the observers would scan the area around the vessel systematically with reticle binoculars (*e.g.*, 7 x 50 Fujinon), Big-eye binoculars (25 x 150), and with the naked eye. During darkness, night vision devices would be available (ITT F500 Series Generation 3 binocular-image intensifier or equivalent), when required. Laser range-finding binoculars (Leica LRF 1200 laser rangefinder or equivalent) would be available to assist with distance estimation. They are useful in training observers to estimate distances visually, but are generally not useful in measuring distances to animals directly. The user measures distances to animals with the reticles in the binoculars.

Lamont-Doherty would immediately power down or shutdown the airguns when

observers see marine mammals within or about to enter the designated exclusion zone. The observer(s) would continue to maintain watch to determine when the animal(s) are outside the exclusion zone by visual confirmation. Airgun operations would not resume until the observer has confirmed that the animal has left the zone, or if not observed after 15 minutes for species with shorter dive durations (small odontocetes and pinnipeds) or 30 minutes for species with longer dive durations (mysticetes and large odontocetes, including sperm, pygmy sperm, dwarf sperm, killer, and beaked whales).

Mitigation Exclusion Zones

Lamont-Doherty would use safety radii to designate exclusion zones and to estimate take for marine mammals. Table 3 shows the distances at which one would expect to receive sound levels (160-, 180-, and 190-dB,) from the airgun subarrays and a single airgun. If the protected species visual observer detects marine mammal(s) within or about to enter the appropriate exclusion zone, the *Langseth* crew would immediately power down the airgun array, or perform a shutdown if necessary (see Shut-down Procedures).

Table 3 - Distances to which sound levels greater than or equal to 160 re: 1 µPa could be received during the proposed survey offshore New Jersey in the north Atlantic Ocean, June through August, 2015.

Source and Volume (in^3)	**Tow Depth (m)**	**Water Depth (m)**	**Predicted RMS Distances (m)[1]**		
			190 dB[2]	180 dB	160 dB
Single Bolt airgun (40 in^3)	6	< 100	21	73	995
4-Airgun subarray (700 in^3)	4.5	<100	101	378	5,240
4-Airgun subarray (700 in^3)	6	<100	118	439	6,100

[1] Predicted distances for 160 dB based on information in Table 1 of the NSF's application.
[2] Lamont-Doherty did not request take for pinniped species in their application and consequently did not include distances for the 190-dB isopleth for pinnipeds in Table 1 of their application. Because NMFS anticipates that pinnipeds have the potential to occur in the survey area, Lamont-Doherty calculated the distances for the 190-dB isopleth and submitted them to NMFS on for inclusion in this table.

The 180- or 190-dB level shutdown criteria are applicable to cetaceans and pinnipeds as specified by NMFS (2000).

Power Down Procedures

A power down involves decreasing the number of airguns in use such that the radius of the 180-dB or 190-dB exclusion zone is smaller to the extent that marine mammals are no longer within or about to enter the exclusion zone. A power down of the airgun array can also occur when the vessel is moving from one seismic line to another. During a power down for mitigation, the *Langseth* would operate one airgun (40 in^3). The continued operation of one airgun would alert marine mammals to the presence of the seismic vessel in the area. A shutdown occurs when the *Langseth* suspends all airgun activity.

If the observer detects a marine mammal outside the exclusion zone and the animal is likely to enter the zone, the crew would power down the airguns to reduce the size of the 180-dB or 190-dB exclusion zone before the animal enters that zone. Likewise, if a mammal is already within the zone after detection, the crew would power-down the airguns immediately. During a power down of the airgun array, the crew would operate a single 40-in^3 airgun which has a smaller exclusion zone. If the observer detects a marine mammal within or near the smaller exclusion zone around the airgun (Table 3), the crew would shut down the single airgun (see next section).

Resuming Airgun Operations After a Power Down: Following a power-down, the *Langseth* crew would not resume full airgun activity until the marine mammal has cleared the 180-dB or 190-dB exclusion zone. The observers would consider the animal to have cleared the exclusion zone if:

- The observer has visually observed the animal leave the exclusion zone; or
- An observer has not sighted the animal within the exclusion zone for 15 minutes for species with shorter dive durations (*i.e.*, small odontocetes or pinnipeds), or 30 minutes for species with longer dive durations (*i.e.*, mysticetes and large odontocetes, including sperm, pygmy sperm, dwarf sperm, and beaked whales); or

The *Langseth* crew would resume operating the airguns at full power after 15 minutes of sighting any species with short dive durations (*i.e.*, small odontocetes or pinnipeds). Likewise, the crew would resume airgun operations at full power after 30 minutes of sighting any species with longer dive durations (*i.e.*, mysticetes and large odontocetes, including sperm, pygmy sperm, dwarf sperm, and beaked whales).

NMFS estimates that the *Langseth* would transit outside the original 180-dB or 190-dB exclusion zone after an 8-minute wait period. This period is based on the average speed of the *Langseth* while operating the airguns (8.5 km/h; 5.3 mph). Because the vessel has transited away from the vicinity of the original sighting during the 8-minute period, implementing ramp-up procedures for the full array after an extended power down (*i.e.*, transiting for an additional 35 minutes from the location of initial sighting) would not meaningfully increase the effectiveness of observing marine mammals approaching or entering the exclusion zone for the full source level and would not further minimize the potential for take. The *Langseth's* observers are continually monitoring the exclusion zone for the full source level while the mitigation airgun is firing. In general, observers can observe to the horizon (10 km; 6.2 mi) from the height of the *Langseth's* observation deck and should be able to say with a reasonable degree of confidence whether a marine mammal would be encountered within the relevant exclusion zone

distance before resuming airgun operations at full power.

Shutdown Procedures

The *Langseth* crew would shut down the operating airgun(s) if they see a marine mammal within or approaching the exclusion zone for the single airgun. The crew would implement a shutdown:

(1) If an animal enters the exclusion zone of the single airgun after the crew has initiated a power down; or

(2) If an observer sees the animal is initially within the exclusion zone of the single airgun when more than one airgun (typically the full airgun array) is operating.

Resuming Airgun Operations after a Shutdown: Following a shutdown in excess of eight minutes, the *Langseth* crew would initiate a ramp-up with the smallest airgun in the array (40-in^3). The crew would turn on additional airguns in a sequence such that the source level of the array would increase in steps not exceeding 6 dB per five-minute period over a total duration of approximately 30 minutes. During ramp-up, the observers would monitor the exclusion zone, and if he/she sees a marine mammal, the *Langseth* crew would implement a power down or shutdown as though the full airgun array were operational.

During periods of active seismic operations, there are occasions when the *Langseth* crew would need to temporarily shut down the airguns due to equipment failure or for maintenance. In this case, if the airguns are inactive longer than eight minutes, the crew would follow ramp-up procedures for a shutdown described earlier and the observers would monitor the full exclusion zone and would implement a power down or shutdown if necessary.

If the full exclusion zone is not visible to the observer for at least 30 minutes prior to the start of operations in either daylight or nighttime, the *Langseth* crew would not commence ramp-up unless at least one airgun (40-in^3 or similar) has been operating during the interruption of seismic survey operations. Given these provisions, it is likely that the vessel's crew would not ramp up the airgun array from a complete shutdown at night or in thick fog, because the outer part of the zone for that array would not be visible during those conditions.

If one airgun has operated during a power down period, ramp-up to full power would be permissible at night or in poor visibility, on the assumption that marine mammals would be alerted to the approaching seismic vessel by the sounds from the single airgun and could move away. The vessel's crew would not initiate a ramp-up of the airguns if an observer sees the marine mammal within or near the applicable exclusion zones during the day or close to the vessel at night.

Ramp-up Procedures

Ramp-up of an airgun array provides a gradual increase in sound levels, and involves a step-wise increase in the number and total volume of airguns firing until the full volume of the airgun array is achieved. The purpose of a ramp-up is to "warn" marine mammals in the vicinity of the airguns, and to provide the time for them to leave the area and thus avoid any potential injury or impairment of their hearing abilities. Lamont-Doherty would follow a ramp-up procedure when the airgun array begins operating after an 8 minute period without airgun operations or when shut down has exceeded that period. Lamont-Doherty has used similar waiting periods (approximately eight to 10 minutes) during previous seismic surveys.

Ramp-up would begin with the smallest airgun in the array (40 in^3). The crew would add airguns in a sequence such that the source level of the array would increase in steps not exceeding six dB per five minute period over a total duration of approximately 30 to 35 minutes. During ramp-up, the observers would monitor the exclusion zone, and if marine mammals are sighted, Lamont-Doherty would implement a power-down or shut-down as though the full airgun array were operational.

If the complete exclusion zone has not been visible for at least 30 minutes prior to the start of operations in either daylight or nighttime, Lamont-Doherty would not commence the ramp-up unless at least one airgun (40 in^3 or similar) has been operating during the interruption of seismic survey operations. Given these provisions, it is likely that the crew would not ramp up the airgun array from a complete shut-down at night or in thick fog, because the outer part of the exclusion zone for that array would not be visible during those conditions. If one airgun has operated during a power-down period, ramp-up to full power would be permissible at night or in poor visibility, on the assumption that marine mammals would be alerted to the approaching seismic vessel by the sounds from the single airgun and could move away. Lamont-Doherty would not initiate a ramp-up of the airguns if an observer sights a marine mammal within or near the applicable exclusion zones.

Special Procedures for Situations or Species of Concern

Considering the highly endangered status of North Atlantic right whales, the *Langseth* crew would shut down the airgun(s) immediately in the unlikely event that observers detect this species, regardless of the distance from the vessel. The *Langseth* would only begin ramp-up if observers have not seen the North Atlantic right whale for 30 minutes.

The *Langseth* would avoid exposing concentrations of humpback, sei, fin, blue, and/or sperm whales to sounds greater than 160 dB and would power down the array, if necessary. For purposes of this planned survey, a concentration or group of whales will consist of six or more individuals visually sighted that do not appear to be traveling (*e.g.*, feeding, socializing, etc.).

Speed and Course Alterations

If during seismic data collection, Lamont-Doherty detects marine mammals outside the exclusion zone and, based on the animal's position and direction of travel, is likely to enter the exclusion zone, the *Langseth* would change speed and/or direction if this does not compromise operational safety. Due to the limited maneuverability of the primary survey vessel, altering speed, and/or course can result in an extended period of time to realign onto the transect. However, if the animal(s) appear likely to enter the exclusion zone, the *Langseth* would undertake further mitigation actions, including a power down or shut down of the airguns.

Mitigation Conclusions

NMFS has carefully evaluated Lamont-Doherty's proposed mitigation measures in the context of ensuring that we prescribe the means of effecting the least practicable impact on the affected marine mammal species and stocks and their habitat. Our evaluation of potential measures included consideration of the following factors in relation to one another:

- The manner in which, and the degree to which, the successful implementation of the measure is expected to minimize adverse impacts to marine mammals;

- The proven or likely efficacy of the specific measure to minimize adverse impacts as planned; and
- The practicability of the measure for applicant implementation.

Any mitigation measure(s) prescribed by NMFS should be able to accomplish, have a reasonable likelihood of accomplishing (based on current science), or contribute to the accomplishment of one or more of the general goals listed here:

1. Avoidance or minimization of injury or death of marine mammals wherever possible (goals 2, 3, and 4 may contribute to this goal).

2. A reduction in the numbers of marine mammals (total number or number at biologically important time or location) exposed to airgun operations that we expect to result in the take of marine mammals (this goal may contribute to 1, above, or to reducing harassment takes only).

3. A reduction in the number of times (total number or number at biologically important time or location) individuals would be exposed to airgun operations that we expect to result in the take of marine mammals (this goal may contribute to 1, above, or to reducing harassment takes only).

4. A reduction in the intensity of exposures (either total number or number at biologically important time or location) to airgun operations that we expect to result in the take of marine mammals (this goal may contribute to a, above, or to reducing the severity of harassment takes only).

5. Avoidance or minimization of adverse effects to marine mammal habitat, paying special attention to the food base, activities that block or limit passage to or from

biologically important areas, permanent destruction of habitat, or temporary destruction/disturbance of habitat during a biologically important time.

6. For monitoring directly related to mitigation—an increase in the probability of detecting marine mammals, thus allowing for more effective implementation of the mitigation.

Based on the evaluation of Lamont-Doherty's proposed measures, as well as other measures proposed by NMFS, NMFS has preliminarily determined that the proposed mitigation measures provide the means of effecting the least practicable impact on marine mammal species or stocks and their habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance.

Monitoring

In order to issue an Incidental Take Authorization for an activity, section 101(a)(5)(D) of the MMPA states that NMFS must set forth "requirements pertaining to the monitoring and reporting of such taking". The MMPA implementing regulations at 50 CFR 216.104 (a)(13) indicate that requests for Authorizations must include the suggested means of accomplishing the necessary monitoring and reporting that will result in increased knowledge of the species and of the level of taking or impacts on populations of marine mammals that we expect to be present in the proposed action area.

Lamont-Doherty submitted a marine mammal monitoring plan in section XIII of the Authorization application. NMFS, the NSF, or Lamont-Doherty may modify or supplement the plan based on comments or new information received from the public during the public comment period.

Monitoring measures prescribed by NMFS should accomplish one or more of the following general goals:

1. An increase in the probability of detecting marine mammals, both within the mitigation zone (thus allowing for more effective implementation of the mitigation) and during other times and locations, in order to generate more data to contribute to the analyses mentioned later;

2. An increase in our understanding of how many marine mammals would be affected by seismic airguns and other active acoustic sources and the likelihood of associating those exposures with specific adverse effects, such as behavioral harassment, temporary or permanent threshold shift;

3. An increase in our understanding of how marine mammals respond to stimuli that we expect to result in take and how those anticipated adverse effects on individuals (in different ways and to varying degrees) may impact the population, species, or stock (specifically through effects on annual rates of recruitment or survival) through any of the following methods:

a. Behavioral observations in the presence of stimuli compared to observations in the absence of stimuli (*i.e.*, to be able to accurately predict received level, distance from source, and other pertinent information);

b. Physiological measurements in the presence of stimuli compared to observations in the absence of stimuli (*i.e.*, to be able to accurately predict received level, distance from source, and other pertinent information);

c. Distribution and/or abundance comparisons in times or areas with concentrated stimuli versus times or areas without stimuli;

4. An increased knowledge of the affected species; and

5. An increase in our understanding of the effectiveness of certain mitigation and monitoring measures.

Monitoring Measures

Lamont-Doherty will sponsor marine mammal monitoring during the present project to supplement the mitigation measures that require real-time monitoring, and to satisfy the monitoring requirements of the Authorization. Lamont-Doherty planned the monitoring work as a self-contained project independent of any other related monitoring projects that may occur in the same regions at the same time. Further, Lamont-Doherty is prepared to discuss coordination of its monitoring program with any other related work that might be conducted by other groups working insofar as it is practical for Lamont-Doherty.

Vessel-Based Passive Acoustic Monitoring

Passive acoustic monitoring would complement the visual mitigation monitoring program, when practicable. Visual monitoring typically is not effective during periods of poor visibility or at night, and even with good visibility, is unable to detect marine mammals when they are below the surface or beyond visual range. Passive acoustical monitoring can improve detection, identification, and localization of cetaceans when used in conjunction with visual observations. The passive acoustic monitoring would serve to alert visual observers (if on duty) when vocalizing cetaceans are detected. It is only useful when marine mammals call, but it can be effective either by day or by night, and does not depend on good visibility. The acoustic observer would monitor the system in real time so that he/she can advise the visual observers if they acoustically detect

cetaceans.

The passive acoustic monitoring system consists of hardware (i.e., hydrophones) and software. The "wet end" of the system consists of a towed hydrophone array connected to the vessel by a tow cable. The tow cable is 250 m (820.2 ft) long and the hydrophones are fitted in the last 10 m (32.8 ft) of cable. A depth gauge, attached to the free end of the cable, which is typically towed at depths less than 20 m (65.6 ft). The *Langseth* crew would deploy the array from a winch located on the back deck. A deck cable would connect the tow cable to the electronics unit in the main computer lab where the acoustic station, signal conditioning, and processing system would be located. The Pamguard software amplifies, digitizes, and then processes the acoustic signals received by the hydrophones. The system can detect marine mammal vocalizations at frequencies up to 250 kHz.

One acoustic observer, an expert bioacoustician with primary responsibility for the passive acoustic monitoring system would be aboard the *Langseth* in addition to the four visual observers. The acoustic observer would monitor the towed hydrophones 24 hours per day during airgun operations and during most periods when the *Langseth* is underway while the airguns are not operating. However, passive acoustic monitoring may not be possible if damage occurs to both the primary and back-up hydrophone arrays during operations. The primary passive acoustic monitoring streamer on the *Langseth* is a digital hydrophone streamer. Should the digital streamer fail, back-up systems should include an analog spare streamer and a hull-mounted hydrophone.

One acoustic observer would monitor the acoustic detection system by listening to the signals from two channels via headphones and/or speakers and watching the real-time

spectrographic display for frequency ranges produced by cetaceans. The observer monitoring the acoustical data would be on shift for one to six hours at a time. The other observers would rotate as an acoustic observer, although the expert acoustician would be on passive acoustic monitoring duty more frequently.

When the acoustic observer detects a vocalization while visual observations are in progress, the acoustic observer on duty would contact the visual observer immediately, to alert him/her to the presence of cetaceans (if they have not already been seen), so that the vessel's crew can initiate a power down or shutdown, if required. The observer would enter the information regarding the call into a database. Data entry would include an acoustic encounter identification number, whether it was linked with a visual sighting, date, time when first and last heard and whenever any additional information was recorded, position and water depth when first detected, bearing if determinable, species or species group (*e.g*., unidentified dolphin, sperm whale), types and nature of sounds heard (*e.g*., clicks, continuous, sporadic, whistles, creaks, burst pulses, strength of signal, etc.), and any other notable information. Acousticians record the acoustic detection for further analysis.

Observer Data and Documentation

Observers would record data to estimate the numbers of marine mammals exposed to various received sound levels and to document apparent disturbance reactions or lack thereof. They would use the data to estimate numbers of animals potentially 'taken' by harassment (as defined in the MMPA). They will also provide information needed to order a power down or shut down of the airguns when a marine mammal is within or near the exclusion zone.

When an observer makes a sighting, they will record the following information:

1. Species, group size, age/size/sex categories (if determinable), behavior when first sighted and after initial sighting, heading (if consistent), bearing and distance from seismic vessel, sighting cue, apparent reaction to the airguns or vessel (*e.g*., none, avoidance, approach, paralleling, *etc*.), and behavioral pace.

2. Time, location, heading, speed, activity of the vessel, sea state, visibility, and sun glare.

The observer will record the data listed under (2) at the start and end of each observation watch, and during a watch whenever there is a change in one or more of the variables.

Observers will record all observations and power downs or shutdowns in a standardized format and will enter data into an electronic database. The observers will verify the accuracy of the data entry by computerized data validity checks during data entry and by subsequent manual checking of the database. These procedures will allow the preparation of initial summaries of data during and shortly after the field program, and will facilitate transfer of the data to statistical, graphical, and other programs for further processing and archiving.

Results from the vessel-based observations will provide:

1. The basis for real-time mitigation (airgun power down or shutdown).

2. Information needed to estimate the number of marine mammals potentially taken by harassment, which Lamont-Doherty must report to the Office of Protected Resources.

3. Data on the occurrence, distribution, and activities of marine mammals and turtles in the area where Lamont-Doherty would conduct the seismic study.

4. Information to compare the distance and distribution of marine mammals and turtles relative to the source vessel at times with and without seismic activity.

5. Data on the behavior and movement patterns of marine mammals detected during non-active and active seismic operations.

Reporting

Lamont-Doherty would submit a report to us and to the NSF within 90 days after the end of the cruise. The report would describe the operations conducted and sightings of marine mammals and turtles near the operations. The report would provide full documentation of methods, results, and interpretation pertaining to all monitoring. The 90-day report would summarize the dates and locations of seismic operations, and all marine mammal sightings (dates, times, locations, activities, associated seismic survey activities). The report would also include estimates of the number and nature of exposures that could result in "takes" of marine mammals by harassment or in other ways.

In the unanticipated event that the specified activity clearly causes the take of a marine mammal in a manner not permitted by the authorization (if issued), such as an injury, serious injury, or mortality (*e.g.*, ship-strike, gear interaction, and/or entanglement), Lamont-Doherty shall immediately cease the specified activities and immediately report the take to the Chief, Permits and Conservation Division, Office of Protected Resources, NMFS, at 301-427-8401 and the Greater Atlantic Regional Stranding Coordinator at (978) 281-9300. The report must include the following information:

- Time, date, and location (latitude/longitude) of the incident;

- Name and type of vessel involved;
- Vessel's speed during and leading up to the incident;
- Description of the incident;
- Status of all sound source use in the 24 hours preceding the incident;
- Water depth;
- Environmental conditions (e.g., wind speed and direction, Beaufort sea state, cloud cover, and visibility);
- Description of all marine mammal observations in the 24 hours preceding the incident;
- Species identification or description of the animal(s) involved;
- Fate of the animal(s); and
- Photographs or video footage of the animal(s) (if equipment is available).

Lamont-Doherty shall not resume its activities until we are able to review the circumstances of the prohibited take. We shall work with Lamont-Doherty to determine what is necessary to minimize the likelihood of further prohibited take and ensure MMPA compliance. Lamont-Doherty may not resume their activities until notified by us via letter, email, or telephone.

In the event that Lamont-Doherty discovers an injured or dead marine mammal, and the lead visual observer determines that the cause of the injury or death is unknown and the death is relatively recent (*i.e.*, in less than a moderate state of decomposition as we describe in the next paragraph), Lamont-Doherty will immediately report the incident to the Chief, Permits and Conservation Division, Office of Protected Resources, NMFS, at 301-427-8401 and the Greater Atlantic Regional Stranding Coordinator at (978) 281-

9300. The report must include the same information identified in the paragraph above this section. Activities may continue while NMFS reviews the circumstances of the incident. NMFS would work with Lamont-Doherty to determine whether modifications in the activities are appropriate.

In the event that Lamont-Doherty discovers an injured or dead marine mammal, and the lead visual observer determines that the injury or death is not associated with or related to the authorized activities (*e.g.*, previously wounded animal, carcass with moderate to advanced decomposition, or scavenger damage), Lamont-Doherty would report the incident to the Chief, Permits and Conservation Division, Office of Protected Resources, NMFS, at 301-427-8401 and the Greater Atlantic Regional Stranding Coordinator at (978) 281-9300, within 24 hours of the discovery. Lamont-Doherty would provide photographs or video footage (if available) or other documentation of the stranded animal sighting to NMFS.

Estimated Take by Incidental Harassment

Except with respect to certain activities not pertinent here, the MMPA defines "harassment" as: any act of pursuit, torment, or annoyance which (i) has the potential to injure a marine mammal or marine mammal stock in the wild [Level A harassment]; or (ii) has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering [Level B harassment].

In the notice of proposed Authorization, NMFS explained the impacts and parts of the seismic survey that were likely to result in take (*i.e.*, the acoustic stressors), as well as those that were not, and further indicated the acoustic thresholds that would be used in

the take calculations. This information remains unchanged. However, NMFS received valuable input from the Commission during the public comment period recommending that we modify our method of estimating take to better incorporate the duration of the survey. We agree with the Commission's recommendations and have modified our survey methods to incorporate duration for the majority of species and also included species-specific modifications for a few species with unique circumstances that support the use of a different method to quantify take.

The following sections describe NMFS' methods to estimate take by incidental harassment. We have based these estimates on the number of marine mammals that could be harassed by seismic operations with the airgun sub-array during approximately 4,906 km of transect lines in the northwest Atlantic Ocean as depicted in Figure 1 (Figure 1 of Lamont-Doherty's application).

NMFS' Density Estimates: For the Authorization, NMFS reviewed Lamont-Doherty's take estimates presented in Table 3 of their application and revised the density estimates (where available) as well as the take calculations for several species based upon the best available density information from the SERDP SDSS Marine Animal Model Mapper tool for the summer months (DoN, 2007; accessed on February 10, 2015).

For species where ; mean group size information from CETAP (1982) and the Atlantic Marine Assessment Program for Protected Species (AMAPPS) surveys in 2010, 2011, and 2013.

NMFS' Take Estimates: In order to estimate the potential number of instances that marine mammals would be exposed to airgun sounds above the 160-dB Level B

harassment threshold (*i.e.*, taken), NMFS used the following approach for a majority of the species:

(1) Calculate the total area (not including contingency or overlap) that the *Langseth* would ensonify above the 160-dB Level B harassment threshold within a 24-hour period which includes some within day overlap (*i.e.*, a daily ensonified area of 1,226 km^2 [473 square miles (mi^2)] based on the *Langseth* traveling 200 km [124 mi] in one day);

(2) Multiply the daily ensonified area by each species-specific density (when available) to derive the expected number of instance of exposures to received levels greater than or equal to 160 dB re: 1 μPa on a given day; and

(3) Multiply the product (*i.e.*, the expected number of instance of exposures within a day) by the number of survey days that includes a 25 percent contingency (*i.e.*, a total of 38 days).

Table 5 presents the revised estimates of the possible numbers of instances that marine mammals would be exposed to sound levels greater than or equal to 160 dB re: 1 μPa during the proposed seismic survey. In many cases, this estimate of instances of take is likely an overestimate of the number of *individuals* that are taken, because it assumes 100 percent turnover in the area every day, (*i.e.*, that each new day results in takes of entirely new individuals with no repeat takes of the same individuals over the 30-day period). However, it is difficult to quantify what degree of an overestimate of individuals it might be. Except as described later for a few specific species, this number of instances is used as the estimate of individuals (and authorized take) even though we know it is high.

Table 5 - Densities, mean group size, and estimates of the possible numbers of marine mammals and population percentages exposed to sound levels greater than or equal to 160 dB re: 1 μPa over 30 days during the proposed seismic survey in the north Atlantic Ocean, summer 2015.

Species	Density Estimate[1]	Modeled Number of Instances of Exposures to Sound Levels ≥ 160 dB[2]	Authorized Take[3]	Percent of Species or Stock[4]	Population Trend[5]
Blue whale	0	0	1	0.23	Unknown
Fin whale	0.014	0.65	3	0.23	Unknown
Humpback whale	0	0	3	0.36	Increasing
Minke whale	0	0	2	0.01	Unknown
North Atlantic right whale	0	0	3[6]	0.65	Increasing
Sei whale	0.74	34.48	5[7]	1.40	Unknown
Sperm whale	17.07	795.26	31[7]	1.35	Unknown
Dwarf sperm whale	0.004	0.19	2	0.06	Unknown
Pygmy sperm whale	0.004	0.19	2	0.06	Unknown
Cuvier's beaked whale	0.57	26.56	3	0.45	Unknown
Gervais' beaked whale	0.57	26.56	4	0.43	Unknown
Sowerby's beaked whale	0.57	26.56	3	0.42	Unknown
True's beaked whale	0.57	26.56	3	0.42	Unknown
Blainville beaked whale	0.57	26.56	3	0.42	Unknown
Bottlenose dolphin	269	12,532.17	12,532	16.16	Unknown
Pantropical spotted dolphin	0	0	6	0.18	Unknown
Atlantic spotted dolphin	87.3	4,067.13	4,067	18.19	Unknown
Striped dolphin	0	0	52	0.09	Unknown
Short-beaked common dolphin	0	0	36	0.02	Unknown
White-beaked dolphin	0	0	16	0.80	Unknown
Atlantic white-sided dolphin	0	0	53	0.11	Unknown
Risso's dolphin	32.88	1,531.81	1,532	16.79	Unknown
Clymene dolphin	0	0	27	0.44	Unknown
False killer whale	0	0	7	1.58	Unknown
Pygmy killer whale	0	0	2	1.32	Unknown
Killer whale	0	0	7	1.86	Unknown
Long-finned pilot whale	0.444	20.69	21	0.16	Unknown
Short-finned pilot whale	0.444	20.69	21	0.19	Unknown
Harbor porpoise	0	0	4	0.005	Unknown
Gray seal	0	0	2	0.001	Increasing
Harbor seal	0	0	2	0.003	Unknown

Harp seal	0	0	2	0.00003	Increasing

[1] Except where noted, densities are the mean values for the survey area calculated from the SERDP SDSS NODES summer model expressed as number of individuals per 1,000 km^2 (Read *et al*., 2009).
[2] The modeled number of instances of exposures to sound levels ≥ 160 dB re: 1 μPa is the product of the species density (where available), the daily ensonified area of 1,226 km^2, and the number of survey days (30 plus 25 percent contingency for a total of 38 days).
[3] Take estimate includes adjustments for species with no density information or where the SERDP SDSS NODES summer model (DoN, 2007; accessed on February 10, 2015) produced a density estimate of less than 1, NMFS increased the take estimates based on sighting information and mean group size from the Atlantic Marine Assessment Program for Protected Species (AMAPPS) surveys in 2010, 2011, and 2013.
[4,5] Table 2 in this notice lists the stock species abundance estimates used in calculating the percentage of species/stock. Population trend information from Waring *et al*., 2014. Unknown = Insufficient data to determine population trend.
[6] For North Atlantic right whales, NMFS increased the estimated mean group size of one whale (based on CeTAP (1982) and AMAPPS (2010, 2011, and 2013) survey data) to three whales account for cow/calf pairs based on information from Whitt *et al*. (2013).
[7] For sei and sperm whales, the result of the total number of instances of exposures for the duration of the survey would likely overestimate the take estimates because of sei and sperm whale movement patterns and habitat preferences. NMFS adjusted the authorized incidental take based on the mean number of individuals sighted during the 2010, 2011, and 2013 AMAPPS summer surveys (northern and southern legs). These surveys also included fine scale-surveys of NJ waters.

Take Estimates for Species with One Instance of Exposure or Less: Using the approach described earlier, the model generated instances of take for some species that were less than or equal to one over the 38-day duration. Those species include the fin whale (0.65), and the dwarf and pygmy sperm whale (0.18). NMFS based the take estimates to 3 and 2, respectively on sighting information and mean group size from CETAP (1982) and the Atlantic Marine Assessment Program for Protected Species (AMAPPS) surveys in 2010, 2011, and 2013.

Take Estimates for Species with No Density Information in SERDP-SDSS: For those species of marine mammals where density estimates were not available in the SERDP SDSS Marine Animal Model Mapper tool for the summer months (DoN, 2007) dataset because of their limited or rare occurrence in the survey area, we used additional data based on sighting information and mean group size from CETAP (1982) and the Atlantic Marine Assessment Program for Protected Species (AMAPPS) surveys in 2010, 2011, and 2013 to estimate take. Those species include the following: North Atlantic Right, humpback, minke, and blue whales; pantropical spotted, striped, short-beaked common,

white-beaked, Atlantic white-sided, and Clymene dolphin; pygmy, false killer, and killer whales; harbor porpoise; and gray, harbor, and harp seals.

For North Atlantic Right whales, NMFS increased the take estimate from zero to three based on a more reasonable group size estimate based on CETAP (1982) and AMAPPS (2010, 2011, and 2013) survey data as well as additional supporting information from Whitt *et al*. (2013) which reported on the occurrence of cow-calf pair in nearshore waters off New Jersey.

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

Take Estimates for Sei and Sperm Whales: For sei and sperm whales, the result of the total number of instances of exposures for the duration of the survey would be 34.48 and 795.26, respectively. However, equating this number with the take of individuals would likely overestimate the numbers for these species even more than for others because of their known habitat use.

Sei and sperm whale known movement patterns, habitat preferences, and survey data suggest that significantly fewer individuals would be exposed than the instances model estimates. NMFS adjusted the take estimate based on the following factors:

- There are rare sightings of sei whales in the proposed survey area based on NMFS-sponsored aerial or vessel based transect surveys conducted during the summer.

- Sei whales are often associated with deeper waters and areas along continental shelf

edges (Hain *et al*. 1985). However, studies note that sei whale may disrupt this general offshore pattern during occasional incursions into shallower inshore waters (Waring *et al*., 2014).

- Individual sei whales are capable of using large sections of the North Atlantic Ocean for seasonal migration and feeding. Sei whales have the capacity to move large distances in short periods of time (Olsen *et al*., 2009).

- Sperm whales have a strong preference for waters deeper than 1,000 m (Reeves and Whitehead, 1997). It is not reasonable to expect that over 700 sperm whales would occur in the survey area which is on the shelf in reasonably flat and shallow bottom topography.

- While deep water is their typical habitat, sperm whales rarely inhabit waters less than 300 m in depth (Clarke, 1956).

- Sperm whales have occurred near Long Island, NY, in water between 40-55 m deep (Scott and Sadove, 1997). When found relatively close to shore, sperm whale presence is usually associated with sharp increases in topography where upwelling occurs and biological production is high, implying the presence of a good food supply (Clarke, 1956). Such areas include oceanic islands and along the outer continental shelf.

In consideration of this and other information, NMFS is authorizing incidental take for five sei and 31 sperm whales based on the mean number of individuals reported by experienced teams of marine mammal observers (vessel and aerial based) during the 2010, 2011, and 2013 AMAPPS summer surveys (northern and southern legs).

The AMAPPS surveys are a robust dataset of marine mammal sightings (also corrected for detectability [g(0)] of marine mammals in the survey area) which includes fine scale-surveys of New Jersey waters. The summer surveys were of similar duration to

Lamont-Doherty's survey (approximately 12 to 41 days) and provide the best available information comparable to the duration of NSF's survey.

Encouraging and Coordinating Research

Lamont-Doherty would coordinate the planned marine mammal monitoring program associated with the seismic survey in the northwest Atlantic Ocean with applicable U.S. agencies.

Analysis and Determinations

Negligible Impact

Negligible impact is "an impact resulting from the specified activity that cannot be reasonably expected to, and is not reasonably likely to, adversely affect the species or stock through effects on annual rates of recruitment or survival'' (50 CFR 216.103). The lack of likely adverse effects on annual rates of recruitment or survival (i.e., population level effects) forms the basis of a negligible impact finding. Thus, an estimate of the number of takes, alone, is not enough information on which to base an impact determination. In addition to considering estimates of the number of marine mammals that might be "taken" through behavioral harassment, NMFS must consider other factors, such as the likely nature of any responses (their intensity, duration, etc.), the context of any responses (critical reproductive time or location, migration, etc.), as well as the number and nature of estimated Level A harassment takes, the number of estimated mortalities, effects on habitat, and the status of the species.

In making a negligible impact determination, NMFS considers:

- The number of anticipated injuries, serious injuries, or mortalities;
- The number, nature, and intensity, and duration of Level B harassment; and

- The context in which the takes occur (*e.g.*, impacts to areas of significance, impacts to local populations, and cumulative impacts when taking into account successive/contemporaneous actions when added to baseline data);
- The status of stock or species of marine mammals (*i.e.*, depleted, not depleted, decreasing, increasing, stable, impact relative to the size of the population);
- Impacts on habitat affecting rates of recruitment/survival; and
- The effectiveness of monitoring and mitigation measures to reduce the number or severity of incidental take.

To avoid repetition, our analysis applies to all the species listed in Table 5, given that the anticipated effects of the seismic airguns are expected to be similar in nature, and there is no information about the size, status, or structure of any species or stock that would lead to a different analysis. In some cases we add species-specific factors.

For reasons stated previously in this document and based on the following factors, Lamont-Doherty's specified activities are not likely to cause long-term behavioral disturbance, permanent threshold shift, or other non-auditory injury, serious injury, or death. They include:

- The anticipated impacts of Lamont-Doherty's survey activities on marine mammals are temporary behavioral changes due to avoidance of the area.
- The likelihood that marine mammals approaching the survey area will be traveling through the area or opportunistically foraging within the vicinity, as no breeding, calving, pupping, or nursing areas, or haul-outs, overlap with the survey area.

- The low potential of the survey to have an effect on coastal bottlenose dolphin populations due to the fact that Lamont-Doherty's study area is approximately 20 km (12 mi) away from the identified habitats for coastal bottlenose dolphins and their calves.
- The low likelihood that North Atlantic right whales would be exposed to sound levels greater than or equal to 160 dB re: 1 μPa due to the requirement that the *Langseth* crew must shutdown the airgun(s) immediately if observers detect this species, at any distance from the vessel.
- The likelihood that, given sufficient notice through relatively slow ship speed, NMFS expects marine mammals to move away from a noise source that is annoying prior to its becoming potentially injurious;
- The availability of alternate areas of similar habitat value for marine mammals to temporarily vacate the survey area during the operation of the airgun(s) to avoid acoustic harassment;
- NMFS also expects that the seismic survey would have no more than a temporary and minimal adverse effect on any fish or invertebrate species that serve as prey species for marine mammals, and therefore consider the potential impacts to marine mammal habitat minimal;
- The relatively low potential for temporary or permanent hearing impairment and the likelihood that Lamont-Doherty would avoid this impact through the incorporation of the required monitoring and mitigation measures; and
- The high likelihood that trained visual protected species observers would detect marine mammals at close proximity to the vessel.

NMFS does not anticipate that any injuries, serious injuries, or mortalities would

occur as a result of Lamont-Doherty's proposed activities, and NMFS does not authorize injury, serious injury, or mortality. We anticipate only behavioral disturbance to occur primarily in the form of avoidance behavior to the sound source during the conduct of the survey activities.

Table 5 in this document outlines the number of requested Level B harassment takes that we anticipate as a result of these activities. NMFS anticipates that 32 marine mammal species could occur in the proposed action area. Of the marine mammal species under our jurisdiction that are known to occur or likely to occur in the study area, six of these species are listed as endangered under the ESA and depleted under the MMPA, including: the blue, fin, humpback, north Atlantic right, sei, and sperm whales

Many animals perform vital functions, such as feeding, resting, traveling, and socializing, on a diel cycle (*i.e.*, 24 hour cycle). Behavioral reactions to noise exposure (such as disruption of critical life functions, displacement, or avoidance of important habitat) are more likely to be significant if they last more than one diel cycle or recur on subsequent days (Southall *et al.*, 2007). While NMFS anticipates that the seismic operations would occur on consecutive days, the estimated duration of the survey would last no more than 30 days but would increase sound levels in the marine environment in a relatively small area surrounding the vessel (compared to the range of the animals), which is constantly travelling over distances, and some animals may only be exposed to and harassed by sound for less than a day.

In summary, NMFS expects marine mammals to avoid the survey area, thereby reducing the risk of higher exposure and related impacts. We do not anticipate disruption to reproductive behavior and there is no anticipated effect on annual rates of recruitment

or survival of affected marine mammals.

Due to the nature, degree, instances, and context of Level B (behavioral) harassment anticipated and described (see "Potential Effects on Marine Mammals" section in this notice), NMFS does not expect the activity to impact annual rates of recruitment or survival for any affected species or stock. The seismic survey would not take place in areas of significance for marine mammal feeding, resting, breeding, or calving and would not adversely impact marine mammal habitat, including the identified habitats for coastal bottlenose dolphins and their calves.

Based on the analysis herein of the likely effects of the specified activity on marine mammals and their habitat, and taking into consideration the implementation of the proposed monitoring and mitigation measures, NMFS finds that Lamont-Doherty's proposed seismic survey would have a negligible impact on the affected marine mammal species or stocks.

Small Numbers

As mentioned previously, NMFS estimates that Lamont-Doherty's activities could potentially affect, by Level B harassment only, 32 species of marine mammals under our jurisdiction. For each species, these take estimates are small numbers relative to the population sizes: less than 19 percent of the regional populations estimates of Atlantic spotted dolphins, less than 17 percent of Risso's and bottlenose dolphins; and under 2 percent for all other species and stocks. We have provided the regional population and take estimates for the marine mammal species that may be taken by Level B harassment in Tables 2 and Table 5 in this notice.

Impact on Availability of Affected Species or Stock for Taking for Subsistence Uses

There are no relevant subsistence uses of marine mammals implicated by this action.

Endangered Species Act (ESA)

There are six marine mammal species listed as endangered under the Endangered Species Act that may occur in the proposed survey area: the blue, fin, humpback, North Atlantic right, sei, and sperm whales. Under section 7 of the ESA, the NSF has initiated formal consultation with NMFS on the proposed seismic survey. NMFS (*i.e.*, National Marine Fisheries Service, Office of Protected Resources, Permits and Conservation Division) has also consulted internally with NMFS on the issuance of an Authorization under section 101(a)(5)(D) of the MMPA.

In May, 2015, the Endangered Species Act Interagency Cooperation Division issued a Biological Opinion with an ITS to us and to the NSF which concluded that the issuance of the Authorization and the conduct of the seismic survey were not likely to jeopardize the continued existence of blue, fin, humpback, North Atlantic right, sei, and sperm whales. The Biological Opinion also concluded that the issuance of the Authorization and the conduct of the seismic survey would not affect designated critical habitat for these species.

National Environmental Policy Act (NEPA)

The NSF has prepared a draft amended EA titled, "Environmental Assessment of a Marine Geophysical Survey by the R/V Marcus G. Langseth in the Atlantic Ocean off New Jersey, summer 2015," prepared by LGL, Ltd. environmental research associates, on behalf of the NSF and Lamont-Doherty. We have also prepared an EA titled, "Proposed Issuance of an Incidental Harassment Authorization to Lamont Doherty Earth

Observatory to Take Marine Mammals by Harassment Incidental to a Marine Geophysical Survey in the Northwest Atlantic Ocean, June – August, 2015," and FONSI in accordance with NEPA and NOAA Administrative Order 216-6. We provided relevant environmental information to the public through our notice of proposed Authorization (80 **FR** 13961, March 17, 2015) and considered public comments received prior to finalizing our EA and deciding whether or not to issue a Finding of No Significant Impact (FONSI). We concluded that issuance of an Incidental Harassment Authorization would not significantly affect the quality of the human environment and have issued a FONSI. Because of this finding, it is not necessary to prepare an environmental impact statement for the issuance of an Authorization to Lamont-Doherty for this activity. Our EA and FONSI for this activity are available upon request (see ADDRESSES).

Authorization

We have issued an Incidental Harassment Authorization to Lamont-Doherty for the take of marine mammals, incidental to conducting a marine seismic survey in the Atlantic Ocean, June 1, 2015 to August 31, 2015.

Dated: May 8, 2015.

Perry F. Gayaldo,
Deputy Director, Office of Protected Resources,
National Marine Fisheries Service.

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