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DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

RIN 0648-XD214

Takes of Marine Mammals Incidental to Specified Activities; Taking Marine Mammals Incidental to a Marine Geophysical Survey in the Atlantic Ocean off the Eastern Seaboard, August to September 2014 and April to August 2015

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

ACTION: Notice; issuance of an Incidental Harassment Authorization (IHA).

SUMMARY: In accordance with the Marine Mammal Protection Act (MMPA), notification is hereby given that NMFS has issued an IHA to the United States (U.S.) Geological Survey (USGS), Lamont-Doherty Earth Observatory of Columbia University (L-DEO), and National Science Foundation (NSF) to take marine mammals, by Level B harassment, incidental to conducting a marine geophysical (seismic) survey in the Atlantic Ocean off the Eastern Seaboard, August to September 2014 and April to August 2015.

DATES: Effective August 21, 2014 to August 20, 2015.

ADDRESSES: A copy of the IHA and the application are available by writing to Jolie Harrison, Supervisor, Incidental Take Program, Permits and Conservation Division, Office of Protected Resources, National Marine Fisheries Service, 1315 East-West Highway, Silver Spring, MD 20910 or by telephoning the contacts listed below (see FOR FURTHER INFORMATION CONTACT).

An electronic copy of the IHA application containing a list of the references used in this

document may be obtained by writing to the address specified above, telephoning the contact listed below (see FOR FURTHER INFORMATION CONTACT) or visiting the Internet at: http://www.nmfs.noaa.gov/pr/permits/incidental.htm#applications. Documents cited in this notice, including the IHA application, may also be viewed, by appointment, during regular business hours at the aforementioned address.

An "Environmental Assessment for Seismic Reflection Scientific Research Surveys during 2014 and 2015 in Support of Mapping the U.S. Atlantic Seaboard Extended Continental Margin and Investigating Tsunami Hazards" (EA), was prepared by RPS Evan-Hamilton, Inc., an RPS Group Company, in association with YOLO Environmental, Inc., GeoSpatial Strategy Group, and Ecology and Environment, Inc., on behalf of USGS. The USGS's EA and Finding of No Significant Impact are available online at: http://woodshole.er.usgs.gov/project-pages/environmental_compliance/reports/FONSI%20SIGNED%20&%20Attachment1.pdf. NMFS also issued a Biological Opinion under Section 7 of the Endangered Species Act (ESA) to evaluate the effects of the seismic survey and IHA on marine species listed as threatened and endangered. The NMFS Biological Opinion is available online at: http://www.nmfs.noaa.gov/pr/consultations/opinions.htm.

FOR FURTHER INFORMATION CONTACT: Howard Goldstein or Jolie Harrison, Office of Protected Resources, NMFS, 301-427-8401.

SUPPLEMENTARY INFORMATION:

Background

Section 101(a)(5)(A) and (D) of the MMPA (16 U.S.C. 1361 et seq.), directs the Secretary of Commerce (Secretary) to allow, upon request, the incidental, but not intentional, taking of small numbers of marine mammals, by United States citizens who engage in a specified

activity (other than commercial fishing) within a specified geographical region if certain findings are made and either regulations are issued or, if the taking is limited to harassment, a notice of a proposed authorization is provided to the public for review.

An authorization for the incidental takings shall be granted 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), and if the permissible methods of taking requirements pertaining to the mitigation, monitoring and reporting of such takings are set forth. 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]. Level B (behavioral) harassment occurs at the level of the individual(s) and does not assume any resulting population-level consequences.

Summary of Request

On March 27, 2014, NMFS received an application from the USGS, L-DEO, and NSF (hereafter referred to as USGS) requesting that NMFS issue an IHA for the take, by Level B harassment only, of small numbers of marine mammals incidental to conducting a marine seismic survey within the Exclusive Economic Zone (EEZ) and on the high seas (i.e.,

International Waters) to map the U.S. Atlantic Eastern Seaboard Extended Continental Shelf (ECS) region and investigate tsunami hazards during August to September 2014 and April to August 2015. USGS plan to use one source vessel, the R/V Marcus G. Langseth (Langseth) and a seismic airgun array and a hydrophone streamer to collect seismic data as part of the seismic survey in the Atlantic Ocean off the Eastern Seaboard. In addition to the planned operation of the seismic airgun array and hydrophone streamer, USGS intends to operate a multi-beam echosounder and a sub-bottom profiler continuously during the seismic operations in order to map the ocean floor. The multi-beam echosounder and sub-bottom profiler would not be operated during transits at the beginning and end of the seismic survey. NMFS determined that the IHA application was adequate and complete on May 14, 2014. NMFS published a notice making preliminary determinations and proposing to issue an IHA on June 23, 2014 (79 FR 35642). The notice initiated a 30-day public comment period.

Acoustic stimuli (i.e., increased underwater sound) generated during the operation of the seismic airgun array are likely to result in the take of marine mammals. Take, by Level B harassment only, of individuals of 34 species of marine mammals is anticipated to result from the specified activity. Take is not expected to result from the use of the multi-beam echosounder or sub-bottom profiler, for reasons discussed in this notice; nor is take expected to result from collision with the source vessel because it is a single vessel moving at a relatively slow speed (4.5 knots [kts]; 8.5 kilometers per hour [km/hr]; 5.3 miles per hour [mph]) during seismic acquisition within the survey, for a relatively short period of time (approximately two 17 to 18 day legs), and it is likely that any marine mammal will be able to avoid the vessel.

Description of the Specified Activity

Overview

USGS plans to conduct a marine seismic survey within the EEZ and on the high seas to map the U.S. Atlantic Eastern Seaboard ECS region and investigate tsunami hazards during August to September 2014 and April to August 2015. USGS plans to use one source vessel, the Langseth, and a 36-airgun array and one 8 kilometer (km) (4.3 nautical mile [nmi]) hydrophone streamer to conduct the conventional seismic survey. In addition to the operations of airguns, the USGS intends to operate a multi-beam echosounder and a sub-bottom profiler on the Langseth during the seismic survey to map the ocean floor.

Dates and Duration

The Langseth will depart from Newark, New Jersey on August 21, 2014. The seismic survey is expected to take approximately 21 days to complete. At-sea time is planned to be approximately 21 days, with 18 days planned for airgun operations and 3 days planned for transiting, deployment and recovery of equipment. Approximately a one day transit will be required at the beginning and end of the program. When the 2014 survey is completed, the Langseth will then transit to Norfolk, Virginia. The survey schedule is inclusive of weather and other contingency (e.g., equipment failure) time. The planned activities for 2015 will be virtually identical to the planned activities for 2014 as geographic area, duration, and trackline coverage are similar. The exact dates for the planned activities in 2015 are uncertain, but are scheduled to occur within the April to August timeframe. The exact dates of the planned activities depend on logistics and weather conditions.

Specified Geographic Region

The planned survey will be bounded by the following geographic coordinates:

40.5694º North, -66.5324º West;

38.5808º North, -61.7105º West;

29.2456º North, -72.6766º West;

33.1752º North, -75.8697º West;

39.1583º North, -72.8697º West;

The planned activities for 2014 will generally occur towards the periphery of the planned study area (see Figures 1 and 2 of the IHA application). The planned activities for 2015 would survey more of the central portions of the study area. The tracklines planned for both 2014 and 2015 would be in International Waters (approximately 80% in 2014 and 90% in 2015) and in the U.S. EEZ. Water depths range from approximately 1,450 to 5,400 meters (m) (4,593.2 to 17,716.5 feet [ft]) (see Figure 1 and 2 of the IHA application); no survey lines will extend to water depths less than 1,000 m.

Detailed Description of the Specified Activity

USGS, Coastal and Marine Geology Program, (Primary Investigator [PI], Dr. Deborah Hutchinson) plans to conduct a regional high-energy, two-dimensional (2D) seismic survey in the northwest Atlantic Ocean within the U.S. EEZ and extending into International Waters (i.e., high seas) as far as 648.2 km (350 nmi) from the U.S. coast (see Figure 1 of the IHA application). Water depths in the survey area range from approximately 1,400 to greater than 5,400 meters (m) (4,593.2 to 17,716.5 feet [ft]). The seismic survey will be scheduled to occur in two phases; the first phase during August to September 2014 (for approximately 17 to 18 days of airgun operations), and the second phase between April and August 2015 (for approximately 17 to 18 days of airgun operations, specific dates to be determined). The planned activities for both Phase 1 and Phase 2 are included in this IHA application (see Figure 2 of the IHA application). Some minor deviation from these dates is possible, depending on logistics and weather.

USGS plans to use conventional seismic methodology to: (1) identify the outer limits of the U.S. continental shelf, also referred to as the ECS as defined by Article 76 of the Convention of the Law of the Sea; and (2) study the sudden mass transport of sediments down the continental shelf as submarine landslides that may pose significant tsunamigenic (i.e., tsunami-related) hazards to the Atlantic and Caribbean coastal communities..

The seismic survey will involve one source vessel, the Langseth. The Langseth will deploy an array of 36 airguns as an energy source with a total volume of approximately 6,600 in^3. The receiving system will consist of one 8,000 m (26,246.7 ft) hydrophone streamer. As the airgun array is towed along the survey lines, the hydrophone streamer will receive the returning acoustic signals from the towed airgun array and transfer the data to the on-board processing system. The data will be processed on-board the Langseth as the seismic survey occurs.

Each planned leg of the survey (2014 and 2015) will be 17 to 18 days in duration (exclusive of transit and equipment deployment and recovery) and will comprise of approximately 3,165 km (1,709 nmi) of tracklines of 2D seismic reflection coverage. The airgun array will operate continuously during the seismic survey (except for equipment testing, repairs, implemented mitigation measures, etc.). Data will continue to be acquired between line changes, as the successive track segments can be surveyed as almost one continuous line. Line turns of 90 and no greater than 120 degrees will be required to move from one line segment to the next. The 2014 seismic survey design consists primarily of the tracklines that run along the periphery of the overall study area, including several internal tracklines (see Figure 2 of the IHA application). The 2015 seismic survey design consists of additional dip and tie lines (i.e., dip lines are lines that are perpendicular to the north-south trend of the continental margin; strike lines are parallel to the margin; and tie lines are any line that connects other lines). The 2015 seismic survey

design may be modified based on the 2014 results.

In addition to the operations of the airgun array, a Kongsberg EM 122 multi-beam echosounder and a Knudsen Model 3260 Chirp sub-bottom profiler will also be operated from the Langseth continuously during airgun operations throughout the survey to map the ocean floor. The multi-beam and sub-bottom profiler will not operate during transits at the beginning and end of the survey. All planned geophysical data acquisition activities will be conducted by USGS with on-board assistance by the scientists who have planned the study. The vessel will be self-contained, and the crew will live aboard the vessel for the entire cruise.

NMFS provided a detailed description of the planned activities in a previous notice for the proposed IHA (79 FR 35642, June 23, 2014). The activities to be conducted have not changed between the proposed IHA notice and this final notice announcing the issuance of the IHA. For a more detailed description of the authorized action, including vessel and acoustic source specifications, the reader should refer to the notice for the proposed IHA (79 FR 35642, June 23, 2014), the IHA application, EA, and associated documents referenced above this section.

Comments and Responses

A notice of preliminary determinations and proposed IHA for the USGS's seismic survey was published in the Federal Register on June 23, 2014 (79 FR 35642). During the 30-day public comment period, NMFS received comments from one private citizen, Clean Ocean Action (COA); combined comments from Natural Resources Defense Council (NRDC), Humane Society of the United States (HSUS), Oceana, and Center for Biological Diversity (CBD) (hereafter referred to as NRDC et al.); and the Marine Mammal Commission (Commission). The comments are posted online at: http://www.nmfs.noaa.gov/pr/permits/incidental.htm. Following

are the substantive comments and NMFS's responses:

Effects Analyses

Comment 1: The Commission is concerned that L-DEO's modeling to estimate mitigation zones and take estimates does not indicate or consider site-specific environmental conditions, including bathymetry and sound speed profiles. The reflective/refractive arrivals are the very measurements that should be accounted for in site-specific modeling and ultimately determine underwater sound propagation. The Commission states that ignoring those factors is a serious flaw of L-DEO's model.

The Commission recommends that NMFS (1) require USGS, L-DEO, and NSF to re-estimate the proposed exclusion and buffer zones and associated takes of marine mammals using site-specific operational parameters (e.g., tow depth, source level, number/spacing of active airguns) and site-specific environmental parameters (e.g., sound speed profiles, refraction in the water column, bathymetry/water depth, sediment properties/bottom loss, and wind speed) in the action area for the proposed IHA and (2) impose the same requirement for all future IHAs submitted by USGS, L-DEO, NSF, SIO, ASC, or any other related entity. . The Commission encourages L-DEO to make comparisons at various sites, if it intends to continue using a model that does not incorporate site-specific parameters. The Commission disagrees with the conclusion that NMFS has indicated that NSF, L-DEO, and other relevant entities (USGS, SIO, etc.) are providing sufficient justification for their take estimates, given that the estimates are based on L-DEO's model or empirical measurements in the Gulf of Mexico and other recent activities have been dispersed throughout the world. The Commission states that in a recent sound exposure modeling workshop that was attended by numerous entities (including NMFS, NSF, L-DEO, USGS, and the Commission), experts confirmed that sound speed profiles and

bathymetry/sediment characteristics were the most important factors affecting underwater sound propagation and should be included in related modeling. L-DEO's modeling presentation at indicated that the model was fast, inexpensive, and simple to use, and indicated that the model is more closely related to a source model that compares airgun arrays and that it is not representative of modeling in the actual environment. Therefore, the Commission remains concerned that the L-DEO model, which may not be applicable or accurate to the action area, is not based on the best available science and does not support its continued use.

Response: At present, L-DEO cannot adjust their modeling methodology to add the environmental and site-specific parameters as requested by the Commission. NMFS is working with USGS, NSF, and L-DEO to explore ways to better consider site-specific information to inform the take estimates and development of mitigation measures in coastal areas for future seismic surveys with L-DEO and NSF, and NSF has been exploring different approaches in collaboration with L-DEO and other academic institutions with whom they collaborate. When available, NMFS will review and consider the final results from the L-DEO's expected publications (Crone et al., in prep.), in which the results of a calibration off the coast of Washington will be reported, and how they reflect on L-DEO's model.

For this seismic survey, L-DEO developed the exclusion and buffer zones based on the conservative deep-water calibration results from Diebold et al. (2010). L-DEO's current modeling approach represents the best available information to reach NMFS's determinations for the IHA. The comparisons of L-DEO's model results and the field data collected in the Gulf of Mexico and Washington illustrate a degree of conservativeness built into L-DEO's model for deep water.

NMFS acknowledges the Commission's concerns about L-DEO's current modeling

approach for estimating exclusion and buffer zones and also acknowledge that L-DEO did not incorporate site-specific sound speed profiles, bathymetry, and sediment characteristics of the research area within the current approach to estimate those zones for this IHA. However, as described below, empirical data collected at two different sites and compared against model predictions indicate that other facets of the model (besides the site-specific factors cited above) do result in a conservative estimate of exposures in the cases tested.

The USGS IHA application and EA describe the approach to establishing mitigation exclusion and buffer zones. In summary, L-DEO 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, L-DEO 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. In 2010, L-DEO assessed their 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). Based on this information, L-DEO has shown that their model can reliably estimate the mitigation radii in deep water.

L-DEO's model is most directly applicable to deep water. Reflected and refracted arrivals were considered in verifying L-DEO's model. Given the planned seismic survey is entirely in deep water, and the model has been demonstrated to be conservative in deep water, NMFS concludes that the L-DEO model is an effective means to aid in determining potential

impacts to marine mammals from the planned seismic survey and estimating take numbers, as well as establishing buffer and exclusion zones for mitigation.

During a March 2013 meeting, L-DEO discussed the L-DEO model with the Commission, NMFS, and NSF. L-DEO compared the Gulf of Mexico (GOM) calibration measurements (Tolstoy et al., 2004; Tolstoy et al., 2009; Diebold et al., 2010) comparison with L-DEO model results. L-DEO showed that at the calibration sites the model overestimated the size of the exclusion zones and, therefore, is likely precautionary in most cases. Based on the best available information that the current model overestimates mitigation zones, we will not require L-DEO to re-estimate the proposed buffer and exclusion zones and associated number of marine mammal takes using operational and site-specific environmental parameters for this IHA.

However, we continue to work with the USGS, NSF and L-DEO on verifying the accuracy of their model. L-DEO is currently analyzing whether received levels can be measured in real-time using the ship's hydrophone streamer to estimate the sound field around the ship and determine actual distances to the buffer and exclusion zones. Crone et al. (2013) are analyzing Langseth streamer data collected in 2012 off the Washington coast shelf and slope to measure received levels in situ up to 8 km (4.3 nmi) away from the ship. While results confirm the role that bathymetry plays in propagation, it also confirmed that empirical measurements from the GOM survey used to inform buffer and exclusion zones in shallow water and model results adapted for intermediate water depths also over-estimated the size of the zones for the Washington survey. Preliminary results were presented in a poster session at the American Geophysical Union fall meeting in December 2013 (Crone et al., 2013; available at: http://berna.ldeo.columbia.edu/agu2013/agu2013.pdf) and a peer-reviewed journal publication is anticipated in 2014. When available, NMFS will review and consider the final results and how

they reflect on the L-DEO model.

L-DEO has conveyed to NMFS 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 developing take estimates are not a requirement of the MMPA ITA process. Furthermore, NMFS does not provide specific guidance on model parameters nor prescribes a specific model for applicants as part of the MMPA ITA process. There is a level of variability not only with parameters in models, but the uncertainty associated with data used in models and therefore the quality of the model results submitted by applicants. NMFS, however, takes all of this variability into consideration when evaluating applications. Applicants use models as a tool to evaluate potential impacts, estimate the number of takes of marine mammals, and for mitigation purposes. NMFS takes into consideration the model used and its results in determining the potential impacts to marine mammals; however, it is just a component of NMFS's analysis during the MMPA consultation process as NMFS also takes into consideration other factors associated with the proposed action, such as geographic location, duration of activities, context, intensity, etc. Takes generated by modeling are used as estimates, not absolutes, and are factored into NMFS's analysis accordingly. Of broader note, NMFS is currently pursuing methods that include site-specific components to allow us to better cross-check isopleth and propagation predictions submitted by applicants. Using this information, NMFS could potentially recommend modifications to take estimates and/or mitigation zones, as appropriate.

Comment 2: The Commission is unaware of changes to L-DEO's model that would explain why the estimated exclusion zones for the seismic survey (36-airgun array towed at 9 m

depth) are smaller than previously authorized and the buffer zones are larger than previously authorized (75 FR 44770; 76 FR 49737; 76 FR 75525; 77 FR 25693; 77 FR 41755).

Response: NMFS recognizes the Commission's statement that the estimated exclusion zones are smaller and buffer zones are larger than under previous IHAs. The table below compares the estimated 160, 180, and 190 dB buffer and exclusion zones for the current USGS IHA and previous IHAs for seismic surveys conducted by L-DEO or USGS on the Langseth.

Table 1. Comparison of the estimated 160, 180, and 190 dB buffer and exclusion zones for the current USGS IHA and previous IHAs for seismic surveys conducted by L-DEO or USGS on the Langseth.

Seismic Survey	Source and Volume (in^3)	Tow Depth (m)	Water Depth (m)	Predicted RMS Distances (m)		
				160 dB	180 dB	190 dB
USGS ECS Atlantic 2014	Single Bolt Airgun (40)	9	Deep (>1,000)	388	100	100
	36 Airgun Array (6,600)	9	Deep (>1,000)	5,780	927	286
L-DEO Northeastern Pacific 2012	Single Bolt Airgun (40)	6 to 15	Deep (>1,000) Intermediate (100 to 1,000) Shallow (<100)	385 578 1,050	40 60 296	12 18 150
	36 Airgun Array (6,600)	9	Deep (>1,000) Intermediate (100 to 1,000) Shallow (<100)	3,850 12,200 20,550	940 1,540 2,140	400 550 680
	36 Airgun Array (6,600)	12	Deep (>1,000) Intermediate (100 to 1,000) Shallow (<100)	4,400 13,935 23,470	1,100 1,810 2,250	460 615 770
	36 Airgun Array (6,600)	15	Deep (>1,000) Intermediate (100 to 1,000) Shallow (<100)	4,490 15,650 26,350	1,200 1,975 2,750	520 690 865
L-DEO Northwest Pacific 2012	Single Bolt Airgun (40)	9	Deep (>1,000)	385	40	12
	36 Airgun Array (6,600)	9	Deep (>1,000)	3,850	940	400
L-DEO Line Islands 2012	Two GI Airgun Array (105)	3	Deep (>1,000)	670	70	20
L-DEO Line	Single Bolt	9	Deep (>1,000)	385	40	12

Islands 2011	Airgun (40)					
	36 Airgun Array (6,600)	9	Deep (>1,000)	3,850	940	400
USGS Bering 2011	Single Bolt Airgun (40)	9	Deep (>1,000)	385	40	12
	36 Airgun Array (6,600)	9	Deep (>1,000)	3,850	940	400

The previous IHA applications and EAs provided by L-DEO or USGS for this airgun array were based on the empirical results of Tolstoy et al. (2009) and adjusted for tow depth. During the Langseth calibration, a hydrophone was used at a depth of 350 to 500 m (1,148.3 to 1,640.4 ft) at a deep-water site. However, since the hydrophone wasn't necessarily sampling the maximum in the water column down to 2,000 m (6,561.7 ft), the distances to the 160, 180, and 190 dB threshold contours cannot be used directly as buffer and exclusion zones. The previous documents use 160 dB (rms) from Tolstoy et al. (2009) and adjust for tow depth, and in recent documents use the 150 dB SEL contour from Diebold et al. (2010) model, which accounts for the large difference in the 160 dB buffer zone (3,850 vs 5,780 m). For the 190 dB exclusion zone, the rms vs SEL metrics are a significant factor. In Figures 7 and 8 of Tolstoy et al. (2009), there is not an exact 10 dB difference between SEL and 90% rms in the empirical data at short distances (200 to 500 m). In recent documents, L-DEO or USGS has been using the L-DEO modeling; modeling results are given as SEL then converted to rms values using a fixed 10 dB difference. Using this approach, the distance to 190 dB rms (approximately 180 dB SEL) is less than what was obtained using rms values of the empirical measurements. However, the distance is not underestimated with respect to the trend of SEL values of the empirical measurements obtained at the closest ranges in Figure 8 of Tolstoy et al. (2009) and also demonstrated in Figure 10 of Diebold et al. (2010). The main reason for the significant fluctuations in modeling (dB discount with SEL value) is based on converting the values calculated as 90% rms and values

obtained as SEL +10 dB. The table below compares L-DEO's previous (Tolstoy et al., 2009) and current (Tolstoy et al., 2009; Diebold et al., 2010) approach to acoustic propagation.

Table 2. Comparison of L-DEO's previous and current approach to acoustic propagation.

Categories	Previous Approach to Acoustic Propagation (Tolstoy et al., 2009)	Current Approach to Acoustic Propagation (Tolstoy et al., 2009 and Diebold et al., 2010)
Model Approach	Ray trace of direct arrivals and source ghosts (reflection at the air-water interface at the array) from the array to the receivers.	Ray trace of direct arrivals and source ghosts (reflection at the air-water interface at the array) from the array to the receivers.
Model Assumptions	Constant velocity, infinite homogenous ocean layer, seafloor unbounded. Cross-line model more conservative than in-line model.	Constant velocity, infinite homogenous ocean layer, seafloor unbounded. Cross-line model more conservative than in-line model.
Propagation Measurements Analyzed	36 airguns (6,600 in^3), 6 m tow depth, 1,600 m (deep) 36 airguns (6,600 in^3), 6 m tow depth, 600 to 1,100 m (intermediate) 36 airguns (6,600 in^3), 6 m tow depth, 50 m (shallow)	36 airguns (6,600 in^3), 6 m tow depth, 50 m (shallow)
Receiver Specs	Calibration hydrophone buoy Shallow – spar buoy anchored on the seafloor, hydrophone at 18 m Intermediate – spar buoy not anchored, hydrophone at 18 m and 500 m Deep – spar buoy not anchored, hydrophone at 18 m and 350 to 500 m	Calibration hydrophone buoy and multi-channel seismic hydrophone array, both in shallow water.
Data Validation	Curve based on best fit line, 95% of received levels fall below curve	NA
Empirical Radii Appropriate for Sampling Maximum Received Level	36 airguns (shallow) – Yes, appropriate for mitigation modeling. 36 airguns (intermediate) – No, does not sample maximum received levels > 500 m. 36 airguns (deep) – No does not sample maximum received levels > 500 m.	36 airguns (shallow) – Yes, appropriate for mitigation radii.
Received Level Metric Presented	90% of cumulative energy rms levels and SEL Tolstoy et al. (2009) empirical data from Table 1.	SEL contours (150, 170, and 180) Diebold et al. (2010) modeled data from Figure 2.
RMS vs. SEL Offsets	36 airguns in deep water - ~14 dB offset, rms > SEL 36 airguns in shallow water – 8 dB offset, rms > SEL	NA
Differences between the Previous and Current Approaches	Because the deep-water calibration buoy only sampled received levels at a constant depth of 500 m, it is not appropriate to use the empirical	The current propagation model uses the maximum SPL values shown in Figure 2 in Diebold et al. (2010). These values along the diagonal

	deep-water data from Tolstoy et al. (2009) to derive mitigation radii. This is due to the buoy not capturing the intersect of all the SPL isopleths at their wildest point from the sea surface down to ~2,000 m. However, the received levels (i.e., direct arrivals and reflected and refracted arrivals) are in agreement with the current propagation model.	maximum SPL line connect the points where the isopleths attain their maximum width (providing the maximum distance associated with each sound level). These distances will differ from values obtained along the Tolstoy et al. (2009) data shown in Table 1 which derives radii from the 500 m constant depth line.

Comment 3: The Commission states that in 2011, NSF and USGS modeled sound propagation under various environmental conditions in their PEIS. L-DEO and NSF (in cooperation with Pacific Gas and Electric Company [PG&E]) also used a similar modeling approach in the recent IHA application and associated EA for a seismic survey of Diablo Canyon in California (77 FR 58256). These recent examples indicate that L-DEO, NSF, and related entities are able to implement the recommended approach, if required to do so by NMFS. The Commission understands the constraints imposed by the current budgetary environment, but notes that other agencies that contend with similar funding constraints incorporate modeling based on site-specific parameters. USGS, L-DEO, NSF and related entities should be held to that same standard. NMFS recently indicated that it does not, and does not believe it is appropriate to, prescribe the use of any particular modeling package (79 FR 38499). The Commission agrees that NMFS should not instruct applicants to use specific contractors or modeling packages, but it should hold applicants to the same standard, primarily one in which site- and operation-specific environmental parameters are incorporated into the models.

Response: PG&E submitted an IHA application to NMFS and the U.S. Fish and Wildlife Service for the Central Coastal California Seismic Imaging Project in 2012. The IHA application included a report of acoustic propagation modeling conducted by Greeneridge Sciences, Inc., sponsored by Padre Associated, Inc., to estimate received sound pressure level

radii for airgun pulses operating off central California in the vicinity of the Diablo Canyon Nuclear Power Plant. A wave-theory model and precise waveguide parameters that describe sound reflections and refractions at the ocean surface, seafloor, and water column were used to accurately model sound transmission in the ocean. As the action proponent, PG&E funded the seismic survey and related environmental compliance documents (e.g., IHA application, Environmental Assessment, etc.). NSF, as the owner of the Langseth, served as the federal nexus for the ESA section 7 consultation and need for the preparation of the NEPA document. L-DEO is the operator of the Langseth and often applies for IHAs for NSF-funded seismic surveys conducted for scientific research purposes.

There are many different modeling products and services commercially available that applicants could potentially use in developing their take estimates and analyses for MMPA ITAs. These different models range widely in cost, complexity, and the number of specific factors that can be considered 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, each applicant's approach is evaluated independently in the context of their activity. In cases where simpler models are used 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 a 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 the number of takes or extend of effects. In this case, results have shown that the L-DEO's model reliably and conservatively estimates mitigation radii in deep water. The observed sound levels from the field measurements fell almost entirely below L-DEO's estimated mitigation radii for deep water (Diebold et al., 2010). Based on the these empirical data, which illustrate the model's conservative exposure estimates

across two sites, NMFS finds that L-DEO's model effectively estimates sound exposures.

NMFS encourages applicants to incorporate modeling based on site-specific and operation-specific parameters in their IHA applications, whenever possible, but it is unrealistic to hold applicants to this same standard in IHA applications and/or NEPA documents (EAs and EISs) as activities may vary in their scope and level of anticipated impacts, and applicants may have varying funding and resource constraints. However, it is still incumbent upon NMFS to take the uncertainty that comes along with varying models into consideration in both the analysis of effects and the consideration of mitigation measures. In this case, as described elsewhere in this section, we have considered the uncertainty associated with the applicant's model and have determined that it does not change either our findings regarding the anticipated level and severity of impacts on marine mammals or our conclusion that the mitigation measures required provide the means of effecting the least practicable impact on the affected species or stocks and their habitat.

Of broader note, NMFS is currently pursuing methods (that include site-specific components) to allow us to better cross-check isopleth and propagation predictions submitted by applicants. Using this information, we could potentially recommend modifications to take estimates and/or mitigation zones, as appropriate.

Comment 4: The Commission states that NMFS indicated that based on empirical data (which illustrate the L-DEO's model's conservative exposure estimates for the Gulf of Mexico and preliminarily off Washington), it found that L-DEO's model effectively estimates sound exposures or number of takes and represents the best available information for NMFS to reach its determinations for the IHA. However, for the survey off New Jersey, NMFS increased the exclusion zone radii by a factor of 50% (equivalent to approximately a 3 dB difference in

received level at the zone edge) to be additionally precautionary (79 FR 38499). The Commission questions, if NMFS really believes the L-DEO model is based on best available science, why it then extended the exclusion zones to be precautionary and if NMFS felt the need to be precautionary and extend the exclusion zones, why it did not then also extend the buffer zones and thus the estimated numbers of takes of marine mammals.

Response: NMFS increased the exclusion zones for the L-DEO seismic survey off New Jersey due to site-specific considerations. Crone et al. (2013) confirmed that the shallow water zones in L-DEO's model were conservative in previous shallow water seismic surveys in the northeast Pacific Ocean. However, the model had limited ability to capture the variability resulting from site-specific factors present in the marine environment offshore New Jersey. In light of those limitations, and in consideration of the practicability of implementation in that particular case NMFS recommended a more conservative approach to mitigation specifically tailored to the New Jersey seismic survey that required L-DEO to enlarge the exclusion zones. As noted previously, though there are limitations with the L-DEO model, NMFS believed that L-DEO was able to adequately estimate take for the New Jersey seismic survey and had no reason to believe that potential variation in site-specific parameters would result in differences that would change our analysis of the general level or severity of effects or our necessary findings. However, in consideration of the practicability of doing so, we were able to precautionarily add a buffer to the mitigation zone.

The same site-specific considerations do not exist in this case. The current seismic survey will occur entirely in deep water depths (greater than 1,000 m). The L-DEO model reasonably predicts mitigation zones in deep water (verified by Crone et al., 2013 and Diebold et al., 2010). Diebold et al. reported that the observed sound levels from the field measurements

during the 2007/2008 calibration studies in the Gulf of Mexico fell almost entirely below the predicted mitigation radii curve for deep water. L-DEO has shown that its model reasonably predicts mitigation zones in deep water (verified by Crone et al., 2013 and Diebold et al., 2010). Therefore, NMFS did not recommend expanding the exclusion zones for this seismic survey because the model conservatively predicts received sound levels as a function of distance from a particular airgun array configuration in deep water.

Comment 5: COA and NRDC et al. states that the potential impacts on marine species from sound-producing sources other than airguns were not meaningfully evaluated. The commenters state that a 12 kHz multi-beam echosounder operated by an ExxonMobil survey vessel off the coast of Madagascar was implicated by an independent scientific review panel in the mass stranding of melon-headed whales in 2008. Commenters state that a beaked whale stranding observed in the action area of a 2002 L-DEO seismic survey in the Gulf of California may have been linked to the use of this technology as well. COA states that based on the correlation between these previous stranding events and the use of multi-beam echosounder technology, it is imperative that NMFS fully assess the potential for this source to impact marine mammals both on its own and with the operation of the airgun array.

Response: NMFS disagrees with the commenter's assessment that the potential impacts on marine species from sound-producing sources other than airguns, was not meaningfully evaluated. NMFS assessed the potential for the operation of the multi-beam echosounder and sub-bottom profiler to impact marine mammals, both on their own and simultaneously with the operation of the airgun array. NMFS assumes that, during simultaneous operations of the airgun array and the other sources, any marine mammals close enough to be affected by the multi-beam echosounder and sub-bottom profiler will already be affected by the airguns. However, whether

or not the airguns are operating simultaneously with the other sources, marine mammals are expected to exhibit no more than short-term and inconsequential responses to the multi-beam echosounder and sub-bottom profiler given their characteristics (e.g., narrow, downward-directed beam) and other considerations described previously in the notice of the proposed IHA (79 FR 35642, June 23, 2014). Such reactions are not considered to constitute "taking" (NMFS, 2001). Therefore, USGS provided no additional allowance for animals that could be affected by sound sources other than airguns and NMFS has not authorized take from these other sound sources. NMFS's notice of the proposed IHA (79 FR 35642, June 23, 2014) states that the multi-beam echosounder and sub-bottom profiler will not operate during transits at the beginning and end of the planned seismic survey; therefore, NMFS does not expect any potential impacts from these sound sources in shallow water or coastal areas.

Regarding the 2008 stranding of melon headed whales in Madagascar referenced by commenters, the use of a high-power (source level 236 to 242 dB) 12 kHz multi-beam echosounder was deemed the most plausible and likely behavioral trigger that caused a large group of melon-headed whales to leave their typical habitat and then ultimately strand as a result of secondary factors such as malnourishment and dehydration. In addition to the source level associated with that particular multi-beam echosounder, its movement pattern (i.e., directed manner down the shelf break within a channel) contributed to displacing this species, via an avoidance response, from its typical deep-water habitat to the shallow-water lagoon system where the stranding occurred. This USGS seismic survey is not being operated in this manner. This species was also identified as a particularly behaviorally sensitive species to anthropogenic sound (i.e., not all species expected to respond in the same manner as this species) and a "confluence of factors" may have caused this group of whales to orient in a manner relative to

the multi-beam echosounder that caused an avoidance response leading to an out-of-habitat area (i.e., not every exposure situation where this type of source is used is expected to result in a similar behavioral response and/or outcome). Furthermore, behavioral responses can be quite complex and variable, depending on a multitude of factors, including context (Ellison et al., 2011).

Regarding the 2002 stranding in the Gulf of California, the multi-beam echosounder system was on a different vessel, the R/V Maurice Ewing (Ewing), which is a vessel no longer operated by L-DEO. Although COA and NRDC et al. suggests that the multi-beam echosounder system or other acoustic sources on the Ewing may have been associated with the 2002 stranding of 2 beaked whales, as noted in Cox et al. (2006), "whether or not this survey caused the beaked whales to strand has been a matter of debate because of the small number of animals involved and a lack of knowledge regarding the temporal and spatial correlation between the animals and the sound source." As noted by Yoder (2002), there was no scientific linkage to the event with the Ewing's activities and the acoustic sources being used.

As noted by Hildebrand (2006), "the settings for these stranding (e.g., Canary Islands, Greece, Bahamas, etc.) are strikingly consistent: an island or archipelago with deep water nearby, appropriate for beaked whale foraging habitat. The conditions for mass stranding may be optimized when the sound source transits a deep channel between two islands, such as in the Bahamas, and apparently in the Madeira incident." The activities planned for the USGS seismic survey are in remote deep water, far from any land mass and islands, and do not relate at all to the environmental scenarios noted by Hildebrand (2006) as being consistent settings for other mass strandings of beaked whales.

MMPA Concerns

Comment 6: COA state that NMFS must ensure that the IHA complies with the MMPA and requests that NMFS deny the IHA 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: NMFS disagrees with the commenters' assessment. Section 101(a)(5)(D) of the MMPA directs NMFS to allow, upon request, the incidental taking by harassment of small numbers of marine mammals for periods of not more than one year by U.S. citizens who engage in a specified activity within a specific geographic region if certain findings are made and a notice of a proposed IHA is provided to the public for review. In order to grant an IHA under section 101(a)(5)(D) of the MMPA, NMFS must find that the taking by harassment of marine mammal species or stocks will have a negligible impact on such species or stocks and will not have an unmitigable adverse impact on the availability of such species or stocks for taking for subsistence uses. Where applicable, the IHA must also prescribe the permissible methods of taking by harassment pursuant to the activity, and other means of effecting the least practicable impact on such species or stocks and their habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance. NMFS followed all applicable legal standards and made all relevant findings before issuing an IHA to USGS under section 101(a)(5)(D) of the MMPA.

As described in the notice for the proposed IHA (79 FR 35642, June 23, 2014) and this document, USGS requested that NMFS issue an IHA to take small numbers of marine mammals by Level B harassment only incidental to conducting a seismic survey within a specific geographic area (see "Summary of Request"). Based on the best scientific information available, NMFS expect that USGS's activities would result in take by Level B harassment only in the

form of behavioral modifications during the period of the USGS's active airgun operations. Due to the nature, degree, and context of Level B harassment anticipated and described in the notice of the proposed IHA (79 FR 35642, June 23, 2014) and this document, NMFS does not expect the activity to impact rates of annual recruitment or survival for any affected species or stock, particularly given the required mitigation and monitoring measures that would minimize impacts to marine mammals (see "Negligible Impact" section). NMFS has determined that the required mitigation and monitoring measures (described in the notice for the proposed IHA [79 FR 35642, June 23, 2014], and included within the final IHA), 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 (see "Mitigation" section). There are not relevant subsistence uses of marine mammals implicated by this action.

Based on the analysis of the likely effects of the specified activity on marine mammals and their habitat contained within the notice of the proposed IHA (79 FR 35642, June 23, 2014) this document, and the USGS's EA, and taking into consideration the implementation of the required mitigation and monitoring measures, NMFS finds that the USGS seismic survey will have a negligible impact on such species or stocks and will not have an unmitigable adverse impact on the availability of such species or stocks for taking for subsistence uses. NMFS has therefore issued an IHA to USGS to take small numbers of marine mammals by Level B harassment only for a period less than one year. NMFS has complied with the MMPA and disagrees with the commenter's assessment that the potential impacts to marine mammals from USGS's seismic survey are incompatible with the prohibitions of the MMPA and that the take would be more than negligible.

Comment 7: COA states that NMFS's take estimates for marine mammals which no

population or stock data are available are speculative and may be significant underestimations. COA states that it is not clear how these takes were assigned and what, if any, measures would be taken during the seismic survey if it is determined that take numbers for these animals were significantly miscalculated.

Response: Although no known current regional population or stock abundance estimates for the northwest Atlantic Ocean are available for the Fraser's, spinner, and Clymene dolphins, or the Bryde's, melon-headed, pygmy killer, false killer, and killer whales, limited OBIS-SEAMAP sightings data exist for these species within or adjacent to the action area. Even where the limited number of sightings suggests that density is very low and encounters less likely, for any species with OBIS-SEAMAP sightings data within or adjacent to the action area, including both species of marine mammals that did not have density model outputs within the SERDP/NASA/NOAA and OBIS-SEAMAP database (i.e., humpback whale [summer], Bryde's whale, sei whale, blue whale, northern bottlenose whale, Atlantic white-sided dolphin, Fraser's dolphin, spinner dolphin, Clymene dolphin [summer], melon-headed whale, pygmy killer whale, false killer whale, and killer whale) and species with density outputs that did not extend into the planned study area at all (i.e., sei whale), NMFS believes it is wise to include coverage for potential takes. Generally, to quantify this coverage, NMFS assumed that USGS could potentially encounter one group for each species during each of the seismic survey legs (recognizing that interannual variation and the potential presence of ephemeral features could drive differing encounter possibilities in the two legs), and NMFS thinks it is reasonable to use the average (mean) groups size (weighted by effort and rounded up) to estimate the take from these potential encounters. The mean group size were determined based on data reported from the Cetacean and Turtle Assessment Program (CeTAP) surveys (CeTAP, 1982) and the Atlantic

Marine Assessment Program for Protected Species (AMAPPS) surveys in 2010, 2011, 2012, and 2013. Because we believe it is unlikely, we do not think it is necessary to assume that the largest group size will be encountered. USGS proposed this same approach in their IHA application, and is aware that they will not be covered in the unlikely event that a larger group is ensonified above 160 dB.

PSOs based on the vessel will record data to estimate the numbers of marine mammals exposed to various received sound levels and to document apparent disturbance reactions or lack thereof. Data would be used to estimate numbers of animals potentially taken by harassment. If the estimated numbers of animals potentially taken by harassment approach or exceed the number of authorized takes, USGS will have to re-initiate consultation with NMFS under the MMPA and/or ESA.

Comment 8: The Commission states that in estimating the numbers of potential takes for the proposed IHA, USGS used density data from the Ocean Biogeographic Information System Spatial Ecological Analysis of Megavertebrate Populations (OBIS-SEAMAP), specifically data originating from Navy Operating Area Density Estimates (NODE). USGS considered those estimates to be the best available data. However, those data apply only to the U.S. EEZ, which comprises only 20 percent of the proposed action area in 2014 and 10 percent in 2015. It is unclear if USGS assumed the densities in areas outside the U.S. EEZ to be 0, if it applied the densities estimated for waters within the EEZ to those other areas, or if it did some permutation of those two methods. In any case, the densities could have been underestimated.

Although NMFS indicated in the notice of the proposed IHA (79 FR 35642, June 23, 2014) that the OBIS-SEAMAP data were determined to be the best available information for density data, the Commission understands that NMFS subsequently determined that the data

from the Navy's Atlantic Fleet Training and Testing Navy Marine Species Density Database (AFTT NMSDD) are superior and are now considered the best available. Therefore, the Commission understands that NMFS intends to use the AFTT NMSDD data to re-estimate the numbers of marine mammals that could be taken during the seismic survey. The Commission agrees that the AFTT NMSDD data are preferable and should be used to re-estimate the numbers of takes for all marine mammal species and used for the analyses required under both the MMPA and the ESA. Furthermore, the Commission recommends that the same methods to be used to determine the densities for the analyses conducted under the MMPA and ESA.

Response: NMFS's Office of Protected Resources, Permits and Conservation Division, has carefully considered both the SERDP-SDSS and NMSDD data to determine which is more appropriate for calculating take estimates. NMFS considers the NMSDD dataset useful in predicting marine mammal density and distribution in the open ocean where better data are unavailable. However, for this study and for the reasons described below, NMFS's Office of Protected Resources, Permits and Conservation Division has determined that applying the SERDP-SDSS finer-scale density estimates from the immediately adjacent and more similar areas is the more accurate approach.

The survey study area extends from Georges Bank southward to Blake Ridge in the northwest Atlantic Ocean. The entire study area encompasses 543,601 km^2 (158,488.7 nmi^2) and covers portions of the continental slope, continental rise, and abyssal plain. Approximately 40% of the study area is within the U.S. EEZ ("study area" means the polygon drawn around the two legs of the survey). For the 2014 leg, USGS planned a total of 3,165 km (1,709 nmi) of tracklines within the action area. Of those 442.6 km (239 nmi) (14%) are within the U.S. EEZ. For the 2015 leg, USGS planned a total of 3,115 km (1,682 nmi) of tracklines within the action area. Of

those 558.2 km (301.4 nmi) (18%) are within the U.S. EEZ. There are no tracklines located within the continental shelf and approximately 99% of the tracklines are located outside the continental shelf. Less than 0.5% of the tracklines are within the continental slope. For both years 89% of the seismic survey's tracklines will occur within the abyssal plain, 11% within the continental rise, and less than 1% of the tracklines will occur within the continual shelf.

The USGS determined that they could obtain and analyze the best available information for density data from the SERDP-SDSS Marine Animal Mapper online system. The SERDP-SDSS model outputs provide color-coded maps of cetacean density as well as maps that depict the precision of the models. The NMFS, Office of Protected Resources, Permits and Conservation Division, considers the NODES models from the SERDP-SDSS used here at Tier 1 data. These models accurately predict density within the continental shelf, slope, and rise based on fine-scale spatially relevant (e.g., collected within the immediate vicinity) marine mammal survey data and environmental factors. NMFS, Office of Protected Resources, Permits and Conservation Division, considers it as a robust dataset to estimate densities with the least amount of uncertainty.

Generally, the NMSDD maps for the study area in question have shown much higher densities of marine mammals adjacent to the U.S. EEZ line compared to the SERDP-SDS prediction. The NMSDD predicts density information for species outside the U.S. EEZ using two additional sources of information based on habitat suitability models, the Sea Mammal Research Unit Limited (SMRU Ltd.), University of St. Andrews, Scotland Global Density Models (SMRU Ltd., 2012) and the Kaschner model (2006). The Navy applied the SMRU Ltd. model to areas or seasons where the NODE density spatial model data contained in SERDP-SDSS were not available. The Kaschner model (2006) predicts the average annual geographical

ranges of marine mammal species on a global scale. The model uses a Relative Environmental Suitability (RES) model that synthesizes general, qualitative observations about the spatial and temporal relationships between four environmental factors (depth, sea surface temperature, distance to land, and mean annual distance to ice edge) and the worldwide distribution of a particular species. The Kaschner model is not as robust (and in some cases unsuccessful) in predicting spatially-relevant patterns of cetacean distribution at a finer scale because the model is parameterized for a broader region and scale. Thus, in many cases, predicted distributions may not correspond well with the known distribution of particular species (Calabrese et al., 2014; Redfern et al., 2006; Williams et al., 2014), leading to inaccurate extrapolations (i.e., including areas that are not known to be habitat) that do not comport with the expected distribution of a particular species. The Navy considered this model as tertiary to the NODE density spatial model data contained in SERDP-SDSS and secondary to the SMRU Ltd. data. They only applied the Kaschner model data to areas where NODE or SMRU Ltd. data were available.

The SERDP-SDSS model outputs for density estimates do not extend beyond the U.S. EEZ. Thus data for 60% of the USGS's study area are not available in the online system. However, the USGS used the system to extract the mean density (animals per square kilometer) for marine mammals within 40% of the study area that is within the U.S. EEZ. Because the SERDP-SDSS provides fine-scale predictions with greater certainty over the continental shelf, slope, and rise, NMFS, Office of Protected Resources, Permits and Conservation Division, feels that is reasonable to extrapolate the density estimates from the coastal and shelf areas to areas further offshore (i.e., continental rise and abyssal plain zone). Generally, we would expect higher densities of marine mammal over the continental shelf, slope, and rise. Thus, extrapolating these densities to the offshore study area seems the most reasonable approach

given the datasets available. In relying on basic ecological principles, NMFS, Office of Protected Resources, Permits and Conservation Division, would expect lower densities of marine mammals within the study area that extends beyond the U.S. EEZ over the continental rise and abyssal plain in contrast to the results shown in NMSDD.

Comment 9: NRDC et al. and the Commission state that NMFS made erroneous small numbers and negligible impact determinations. They state that the MMPA clearly prohibits agencies from taking marine mammals on the high seas, and since the take prohibition applies outside the EEZ as well as in U.S. waters, NMFS must make a negligible impact and small numbers determination to authorize take for the populations in both the U.S. EEZ and on the high seas outside the U.S. EEZ. NRDC et al. and the Commission also state that notice for the proposed IHA suggests that NMFS is authorizing the take of 43.44% of the pantropical spotted dolphin stock, which is not a small number.

Response: NMFS agrees that the MMPA applies outside of the U.S. EEZ on the high seas. NMFS considered takes outside of the U.S. EEZ both in our negligible impact and small numbers determinations. NMFS makes it small numbers determination based on the number of marine mammals that would be taken relative to the populations of the affected species or stocks. NMFS's take estimates for the current survey are based on a consideration of the number of marine mammals that could be harassed by seismic operations within the entire seismic survey area, both within and outside of the U.S. EEZ. Given that the take estimates were calculated for the entire survey area, NMFS concluded that a portion of the takes would take place within the U.S. EEZ and the remainder would take place outside of the U.S. EEZ. As explained previously in this document, approximately 80% of the survey tracklines in 2014 and approximately 90% of the survey tracklines in 2015 are outside of the U.S. EEZ. Therefore, as the small numbers

determination section in the notice for the proposed IHA explained, NMFS apportioned 10 to 20% of the total authorized takes to the U.S. EEZ in order to make its small numbers determination for the affected U.S. EEZ stocks. Table 6 in this document has been updated to reflect this apportionment. All of the takes that NMFS expects to occur within the U.S. EEZ represent a small number relative the affected U.S. EEZ stocks.

For species for which regional abundance data exists (North Atlantic right whale, humpback whale, minke while, sei whale, fin whale, blue whale, sperm whale, Atlantic white-sided dolphin, short-finned pilot whale, long-finned pilot whale, Northern bottlenose whale, and harbor porpoise), Table 4 of the notice for the proposed IHA clearly reflected that the estimated take for the entire survey area represented a small number relative to the regional populations. For species for which only stock abundance data exists (pygmy sperm whale, dwarf sperm whale, Cuvier's beaked whale, Mesoplodon, bottlenose dolphin, Atlantic spotted dolphin, pantropical spotted dolphin, striped dolphin, short-beaked common dolphin, rough-toothed dolphin, Risso's dolphin), NMFS concluded that if the authorized take represents a small number of the U.S. EEZ stock, it will also represent a small number of the greater regional population, based on the larger and wider ranging populations expected in the high seas. This conclusion is supported by the fact that, for the species with both regional and stock-specific abundance populations, the regional abundance is on the order of five to twenty times higher than the abundance of the stock. We have clarified the small numbers determination in this document accordingly.

With respect to the pantropical spotted dolphin, Table 4 in the notice for the proposed IHA indicated that 43% of the stock would be taken. However, this number represents the total authorized take for the entire survey area as compared to the population of the U.S. EEZ stock.

The small numbers section explained that to determine whether the authorized take would be a small number of the affected U.S. EEZ stock, NMFS apportioned 10 to 20% of the authorized take to the U.S. EEZ, as described above, and determined that approximately 6.5% percent of the U.S. EEZ stock would be taken. The remainder of the takes would occur outside the U.S EEZ. Although no regional abundance estimate exists for the pantropical spotted dolphin, it is one of the most abundant cetaceans on the globe and occurs in all tropical to warm temperate waters between 40^{o} North and South (Folkens, 2002). Therefore, we are confident that the authorized take represents a small number compared to the greater regional Atlantic pantropical spotted dolphin population that occurs outside of the U.S. EEZ.

Comment 10: The Commission states that under section 101(a)(5)(D)(iii) of the MMPA an IHA can be issued only after notice in the Federal Register and opportunity for public comment. However, that public review opportunity is meaningful only if the proposed IHA contains accurate information and the relevant analyses. If, subsequent to the publication, substantive changes are made to the underlying information or NMFS's analyses, re-publication with a new opportunity to comment is appropriate. In this instance, it appears that NMFS's published analyses were not based on the best available information and that it may have significantly underestimated the likely numbers of takes for at least some of the marine mammal species and stocks that occur in the proposed action area. The Commission recommends that NMFS publish a revised proposed IHA 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. Further, the Commission recommends that, to the extent possible, NMFS strive to identify and incorporate any substantive changes that might be made in a proposed IHA prior to publication in the Federal Register.

Response: NMFS's analysis in this document is based on the best available information and NMFS does not believe that the estimated number of takes for the marine mammal species and stocks in the action area have been significantly underestimated. Please see the response to comment 8 for NMFS's rationale regarding the careful consideration of both the SERDP-SDSS and NMSDD to determine which is more appropriate for using density data and calculating take estimates. In the case of marine mammals species with OBIS-SEAMAP sightings within or adjacent to the action area and expected to be encountered, where density data was limited or unavailable, NMFS updated the mean group sizes that were determined based on data reported from the Cetacean and Turtle Assessment Program (CeTAP) surveys (CeTAP, 1982) as well as the reports from the Atlantic Marine Assessment Program for Protected Species (AMAPPS) surveys in 2010, 2011, 2012, and 2013. However, for most of the marine mammal species, the estimated number of takes did not change between the notice of the proposed IHA (79 FR35642, June 23, 2014) and the final IHA. The small numbers and negligible impact analyses and determinations made by NMFS still remain accurate. NMFS strives to identify and incorporate any substantive changes before publishing a notice of proposed IHA in the Federal Register, but may need to make substantive changes based on information and comments received during the 30-day public comment period. NMFS acknowledges the Commission's recommendation, but will not be publishing a notice of a revised proposed IHA in the Federal Register.

Mitigation

Comment 11: NRDC et al. states that time and area restrictions designed to protect high-value habitat are one of the most effective means to reduce the potential impacts of noise and disturbance. They also state that the proposed IHA does not consider any areas for closure, trackline avoidance or seasonal planning for any species of marine mammals.

Response: NMFS disagrees with NRDC et al.'s assessment. NMFS used the Navy's NODE model for determining the density data of marine mammal species (where it was available) and calculating estimated take numbers. USGS has indicated that they plan on avoiding banks, canyons, seamounts, and North Atlantic right whale critical habitat. NMFS was not able to identify any other important habitat areas of specific importance to marine mammals from this dataset that are appropriate for avoidance or time-area restrictions. Further, the seismic survey's planned tracklines, which are widespread over a large geographic area, combined with the transiting vessel and airgun array, make time-area restrictions and avoiding specific habitat areas impractical and likely would not provide significant reduction in potential impacts from underwater sound or sufficient conservation benefits for this specific project. NMFS notes that areas for closure, trackline avoidance, or seasonal planning were also considered in the USGS EA and not included in the proposed IHA as they were deemed unnecessary or not practicable. For responses to the specific time-area restrictions NRDC et al. suggest, see the responses below in this section.

Concerning the avoidance of marine mammals through the modification of tracklines, the IHA states that the Langseth should alter speed or course during seismic operation if a marine mammal, based on its position and relative motion, appears likely to enter the relevant exclusion zone. If speed or course alteration is not safe or practicable, or if after alteration the marine mammal still appears likely to enter the exclusion zone, further mitigation measures, such as a power-down or shut-down, shall be taken. The USGS EA, which NMFS adopted, also considers that slight track adjustments are possible to avoid fisheries conflicts: "minimizing potential adverse effects on fisheries may be accomplished by adjusting tracklines and communicating with fishermen about respective locations of vessels, equipment, and rate of travel or drift."

Because of limited ship maneuverability, trackline adjustments must also be done to "maintain safety and avoid entanglement."

Concerning seasonal planning, seasonal (four seasons where available) distributions of marine animals are incorporated into the EA through the descriptions presented in chapter 3. A complete table of the seasonal distributions of potentially affected marine mammal species is given in the IHA application (Table 3). The EA also evaluated as an alternative conducting the seismic survey at a different time of year. Weather conditions in the Atlantic Ocean and ship schedules constrain the possible survey time window to May through September. In addition, scheduling the survey in mid-summer when daylight hours are maximized and sea states are generally minimal facilitates observations of marine wildlife.

Comment 12: NRDC et al. state that because of the incredibly rich diversity of species that congregate around Georges Bank throughout the year and, most heavily, during the summer months, the seismic survey should be prohibited from entering Georges Bank or the slope waters off Georges Bank, and the survey tracklines should be designed to ensure a buffer zone minimally sufficient to minimize potential behavioral impacts on naïve deep-diving whales and disruption of communication with baleen whales.

Response: Three lines of the combined 2014 and 2015 tracklines are near Georges Bank. The shallow ends of these three tracklines are in 2,500 to 2,600 m (8,202.1 to 8,530.2 ft) water depth, or deeper than the "slope waters" that NRDC et al. reference. These tracklines are on the upper rise of the continental margin. The distance from the landward (turning) ends of the tracklines in 2015 to the shelf-slope break on Georges Bank are approximately 50 km (27 nmi, eastern) and 70 km (37.8 nmi, western); thus, no survey tracklines are actually within Georges Bank. The trackline closest to the eastern end of Georges Bank and the New England seamounts

will image the Munson-Nygren-Retriever submarine landslides and will provide a comparison to understand why one region fails and another does not. Both of the tracklines that come closest to Georges Bank will address the hazards objectives of the planned seismic survey. The portion of the seismic survey near Georges Bank represents a small part of the planned action area.

Comment 13: NRDC et al. states that to the extent that survey tracklines cut across the three identified canyons, Oceanographer, Gilbert, and Lydonia, USGS should redraw them to avoid overrunning these important foraging waters and to ensure a sufficient buffer between the trackline and the canyon.

Response: The seismic survey tracklines south of Georges Bank are intentionally planned by USGS to avoid Oceanographer, Gilbert, and Lydonia canyons. They have been located to address the submarine landslide and tsunami hazards objective of the project. An important part of understanding where and why landslides occur is to also understanding where and why they do not occur in the same area. The three lines closest to Georges Bank are located away from canyons and known landslides in order to understand why one part of the margin fails and another does not.

Oceanographer, Gilbert, and Lydonia canyons are in close proximity to each other on the south side of Georges Bank. The Gilbert channel merges with the Lydonia channel in approximately 2,800 m (9,186.4 ft) water depth. Oceanographer Canyon merges with the Lydonia/Gilber system in approximately 3,400 m (11,154.9 ft).

The distances of the three tracklines on the south side of Georges Bank from the Lydonia/Gilbert system are 75, 150, and 150 km (40.5, 81, and 81 nmi), respectively. The distances from Oceanographer are 100, 130, and 130 km (54, 70.2, and 70.2 nmi), respectively. The 160 dB buffer zone is 5.78 km (3.1 nmi) on either side of each trackline, leaving a generous

distance of approximately (69 km [37.3 nmi]) to the nearest of Oceanographer, Gilbert, and Lydonia canyons.

In more general terms, the ensonification zone at the landward ends of the three tracklines extends to approximately 2,400 to 2,500 m (7,874 to 8,202.1 ft) water depth. The base of the canyon system on the upper rise of Georges Bank in this region is in approximately 3,500 m (11,842.9 ft) of water. The track distance from 2,500 to 3,500 m is approximately 45 km (24.3 nmi), or, for the three tracklines, represents approximately 135 km (72.9 nmi) (16 hours of surveying), or only two percent of the total planned tracklines. Hence the portion of the seismic survey near Georges Bank represents a small part of the planned action area. The tracklines have been designed to connect to or cross existing data to take advantage of existing data sources. Therefore, NMFS disagrees with the recommendation that USGS should redraw the tracklines to avoid Oceanographer, Gilbert, and Lydonia canyons because the tracklines are not close to these canyons and a sufficient buffer exists between these tracklines and the canyons.

Comment 14: NRDC et al. states that there are several major submarine canyons, including Norfolk, Washington, Baltimore, Hudson, and Veatch. Because of its established importance as a biologically rich foraging ground for numerous species of marine mammals and other marine life, NRDC et al. states that the survey line should be redrawn to avoid Hudson Canyon. To the extent that other survey tracklines cut across these additional identified canyons, NRDC et al. states that USGS should redraw them to avoid overrunning these important foraging waters and to ensure a sufficient buffer between the trackline and the canyon.

Response: USGS designed the tracklines to avoid Hudson Canyon. The trackline referred to by NRDC et al. does not cross the Hudson Canyon until well along the downslope channel extension in approximately 4,200 m (13,779.5 ft) water depth on the continental rise. At

the landward end, the closest approach between the trackline and Hudson Canyon is 21 km (11.3 nmi). This is between three and four times the radius of the 160 dB ensonified area (5.78 km). This trackline was originally laid out to connect to an existing scientific borehole (ODP 1073), but was shortened to connect to existing seismic data that allow for an acceptable tie to the well. Hence the seismic survey was modified in an effort to avoid collecting new data over existing data. The scientific borehole represents an important location for correlating and dating units for understanding landslide occurrence.

Of the five remaining tracklines in the mid-Atlantic region, four are more than 300 km (162 nmi) from the shelf-slope break and associated canyons. The fifth and southernmost line is south of Cape Hatteras, where canyons are not well developed. USGS and NMFS estimate the closest canyon, Pamlico Canyon, to this fifth trackline is approximately 200 km (108 nmi) to the northeast. Therefore, NMFS disagrees with the recommendation that USGS should redraw the tracklines to avoid overrunning these foraging waters and to ensure a sufficient buffer between the trackline and the canyons.

Comment 15: NRDC et al. states that the survey tracklines currently run across or approach the Bear, Physalia, Mytilus, and Retriever seamounts (a seamount chain which may act as a dispersal corridor to help species to cross the Atlantic). NRDC et al. states that the seismic survey tracklines should be modified and redesigned to avoid the four seamounts in order to ensure the least practicable impact on marine mammals and should include a buffer zone to minimize marine mammal take.

Response: Although the NRDC et al. comment only mentions the four seamounts within the U.S. 200 nmi limit, there are additional seamounts beyond 200 nmi, including Picket, Buell, Balanus, and Asterias seamounts. The planned tracklines do not run across any of these

seamounts. Except for the small and deep seamount called Asterias seamount, at the seaward end of the tracklines, the closest approach of the trackline to any of the eight seamounts is 15 km (8.1 nmi), with ranges up to 58 km (31.3 nmi). For the four seamounts inside the U.S. 200 nmi limit, the distances between the tracks and the base of the seamount range from 16.3 to 47 km (8.8 to 25.4 nmi). Given that the exclusion zone along the tracklines is 5,780 m (18,963.3 ft), a buffer zone already exists between the tracklines and these seamounts.

NMFS notes that one of the seismic survey's tracklines is within 6.6 km (3.6 nmi) of Asterias seamount at the seaward end of the trackline, but this seamount only rises above the seafloor by 1,200 m (3,937 ft) and has a water depth at its top of 3,609 m (11,840.6 ft) (ETOPO1). This is much deeper than the four seamounts within the U.S. 200 nmi limit, which, at their tops, have water depths of 1,112, 2,366, 2,475, and 2,153 m (3,648.3, 7,762.5, 8,120.1, and 7,063.6 ft), respectively (read from digital map released by Andrews et al., 2014). Asterias seamount, due to its small size and large depth, is not considered a feature that would modify currents and circulation to the extent that the larger, shallower seamounts would.

Therefore, NMFS disagrees with the recommendation that the seismic survey tracklines should be modified and redesigned to avoid Bear, Physalia, Mytilus, and Retriever seamounts and should include a buffer zone to minimize marine mammal take because the tracklines do not cross these seamounts and a buffer zone already exists between the tracklines and these seamounts.

Comment 16: NRDC et al. states that in order to protect the North Atlantic right whale and comply with the ESA, NMFS must exclude all of the North Atlantic right whale's year-round feeding and mating habitat areas from the seismic survey and vessel activities. These areas include both designated critical habitat as well as areas that have not yet been designated as

critical habitat, but are known to be important habitat.

Response: NMFS has not excluded the seismic survey from North Atlantic right whale designated critical habitat and other habitat known to be important to the North Atlantic right whale because the planned activities are not in close proximity to these areas. The trackline that has the closest approach to the northeast Atlantic Ocean designated critical habitat is approximately 190 km (102.6 nmi) from the area. The trackline that has the closest approach to the southeast Atlantic Ocean designated critical habitat is approximately 519 km (280.2 nmi) from the area. The North Atlantic right whale critical habitat in the northeast Atlantic Ocean can be found online at: http://www.nmfs.noaa.gov/pr/pdfs/criticalhabitat/n_rightwhale_ne.pdf. The North Atlantic right whale critical habitat in the southeast Atlantic Ocean can be found online at: http://www.nmfs.noaa.gov/pr/pdfs/criticalhabitat/n_rightwhale_se.pdf.

Furthermore, considering the conservation status for the North Atlantic right whale, the airguns will be shut-down immediately in the unlikely event that this species is observed, regardless of the distance from the Langseth. Ramp-up will only begin if the North Atlantic right whale has not been seen for 30 minutes.

Comment 17: NRDC et al. states that marine mammals densities are often correlated over medium to large scales with persistent oceanographic features, such as currents, productivity, and surface, temperature, as well as with concentrations in other marine species, such as other apex predators and fish. NMFS should use these other areas identifiable through habitat mapping for determining time-area restrictions.

Response: NMFS and USGS used SERDP SDSS model outputs to determine density data for marine mammals in the action area. The density data was used to estimate take numbers and potential impacts to marine mammals. The USGS EA considers current and other metocean

information as part of the analysis. For example the EA states that "the region is greatly influenced by a prominent ocean current system, the Gulf Stream. This is a powerful, warm, and swiftly flowing current that flows northward, generally along the shelf edge, carrying warm equatorial waters into the North Atlantic (Pickard and Emergy, 1990; Verity et al. 1993). Upwelling along the Atlantic coast is both wind-driven and a result of dynamic uplift (Shen et al., 2000; Lentz et al., 2003). In addition to the Gulf Stream, currents originating from the outflow of both the Chesapeake and Delaware Bays influence the surface circulation in the Mid-Atlantic bight. The Chesapeake Bay plume flows seaward from the mouth of the bay and then turns south to form a coastal jet that can extend as far as Cape Hatteras. Similarly, the Delaware Coastal Current begins in Delaware Bay and flows southward along the Delmarva Peninsula before entrained into the Chesapeake Bay plume." In addition, the maps of the seasonal distributions of the marine species shows the regions of higher productivity through the higher concentrations of animals. Correlating marine mammal densities with oceanographic features provides excellent insight into environmental analysis for the action area, but it did not lead to identifiable areas of concern that would lead NMFS to require and implement time-area restrictions in the IHA.

Comment 18: NRDC et al. state that NMFS should use these other areas identifiable through habitat mapping for determining time-area restrictions. Researchers have developed at least two predictive models to characterize densities of marine mammals in the area of interest: the NODE model produced by the Naval Facilities Engineering Command Atlantic, and the Duke Marine Lab model produced under contract with the Strategic Environmental Research and Development Program. Until Duke has produced its new cetacean density model, pursuant to NOAA's CetMap program, NRDC et al. state that NMFS should use these sources, which

represent best available science to identify important marine mammal habitat and ensure the least practicable impact.

Response: NMFS used the Navy's NODE model for determining the density data of marine mammal species (where it was available) and calculating estimated take numbers. USGS has indicated that they plan on avoiding banks, canyons, seamounts, and North Atlantic right whale critical habitat. NMFS was not able to identify any other important habitat areas of specific importance to marine mammals from this dataset that are appropriate for avoidance or time-area restrictions. Further, the seismic survey's planned tracklines, which are widespread over a large geographic area and designed for the specific objectives of this survey, combined with the transiting vessel and airgun array, make time-area restrictions and avoiding specific habitat areas impractical and likely would not provide significant reduction in potential impacts from underwater sound or sufficient conservation benefits for this specific project.

Comment 19: NRDC et al. states that the proposed IHA does not adequately consider, or fails to consider at all, a number of other reasonable measures that could significantly reduce take from the proposed activities.

Response: In order to issue an IHA under section 101(a)(5)(D) of the MMPA, NMFS must set forth the ''permissible methods of taking by harassment pursuant to such activity, and other means of effecting the least practicable impact on such species or stock and its habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance." NMFS' duty under this "least practicable impact" standard is to prescribe mitigation reasonably designed to minimize, to the extent practicable, any adverse population level impacts, as well as habitat impacts. While population-level impacts can be minimized only by reducing impacts on individual marine mammals, not all takes translate to population-level

impacts. NMFS' objective under the "least practicable impact" standard is to design mitigation targeting those impacts on individual marine mammals that are most likely to lead to adverse population-level effects. Based on NMFS' evaluation of the applicant's proposed measures, as well as other measures considered by NMFS or recommended by the public, NMFS has determined that the mitigation measures required by the IHA 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. NMFS provides responses to the mitigation measures suggested by NRDC et al., including survey design standards and review, use of an alternative multi-beam echosounder, sound source validation, alternate safety zone distances, real-time monitoring, and technology-based mitigation, in the following responses.

Comment 20: NRDC et al. state that NMFS should require that the airgun survey vessel use the lowest practicable source level, minimize horizontal propagation of the sound signal, and minimize the density of tracklines consistent with the purposes of the survey. NRDC et al. state that while cursory consideration is given to the source level, little explanation of the conclusion that a 36-airgun array is required is offered. NRDC et al. would note that, in the past, the California Coastal Commission has required USGS to reduce the size of its array for seismic hazards work, and to use alternative seismic technologies to reduce acoustic intensities during earthquake hazard surveys to their lowest practicable level.

Response: NMFS encourages all seismic surveys using airguns as a sound source to use the lowest practicable source level to achieve the purposes of the action. In order to fulfill the purpose of the seismic survey to establish the outer limits of the U.S. ECS, USGS must establish sediment thickness along the continental margin, which can be in excess of 8 to 10 km (4.3 to 5.4

nmi) in the Atlantic. The seismic survey therefore requires the use of large sources and low frequencies. For the planned seismic survey, the multi-channel streamer, augmented by widely spaced free-floating sonobuoys (acquiring data up to 30 km [16.2 nmi] from the ship) provides the ability to acquire oblique angles to better resolve sedimentary velocities and determine accurate sediment thicknesses. In considering survey design, the guidelines regarding Article 76 of the Law of the Sea Convention state "the low frequencies allow good penetration. The oblique angles allow the detection and measurement of velocity gradient zones as well as the more abrupt changes, which show up well on reflection profiles." The acquisition of refraction information from widely spaced sonobuoys provides an independent check on sediment thickness and the identification of basement which reduces uncertainty in determining the outer limit points of the ECS. The guidelines also state "the survey must be designed to prove the continuity of the sediments from each selected fixed point to the foot of the slope." The Langseth source size is appropriate for imaging sediment thickness where the sediments are thickest (near the foot of the slope) and also have the resolution to determine the base of the sediments to between five and ten percent error.

Regarding the comment about minimizing horizontal propagation of the sound signal, the configuration of the airgun array, as four adjacent linear arrays, causes the signals to constructively interfere in the vertical direction and destructively interfere in horizontal direction. This is evident in the elliptical shape of the modeled received signals presented in the EA.

Regarding the comment about minimizing the density tracks consistent with the purposes of the seismic survey, the tracks are designed to fulfill the requirements of Article 76 of the Law of the Sea Convention. Trackline spacing and coverage is specified in the treaty to be no more than 111.1 km (60 nmi) apart. However, the 111.1 km maximum is impractical unless the points

on the tracks are exactly orthogonal between tracks at 60 nmi spacing. Any deviation of points from orthogonal between adjacent tracks will result in a distance greater than 60 nmi between points, which will not satisfy the requirements of Article 76. Hence the tracks are generally planned to be 55.6 to 92.6 km (30 to 50 nmi) apart. The planned seismic survey is for two field seasons, the first (2014) as a reconnaissance in the area of interest and the second (2015) to finalize outer limit points after interpretation of the data from the first field program is completed. The guidelines also note that "…it is evident that…minimum data coverage could miss some important details of the morphology of the outer limit of the continental margin, and the resulting 1% line could only be a rough approximation of the true geological limit. Coastal states that suspect that such an approximation will be to their disadvantage will benefit from executing more comprehensive and detailed surveys. In general, the data coverage should reflect the complexity of the outer margin." The Atlantic margin is inferred to have geological complexity in the form of fracture zones, where the sediments could be thicker than in the intra-fracture zone regions. These fracture zones are the result of juxtaposing oceanic crust of different ages across ridge offsets during the spreading process. The 2014 part of the seismic survey (with lines parallel to the margin) is intended to identify the possible existence of fracture zones that are sub-perpendicular to the margin. If these fracture zones can be identified, the 2015 component of the seismic survey is to then collect seismic data along tracks that follow where the sediment is thickest and therefore the size of the U.S. ECS can be established.

Comment 21: NRDC et al. states that NMFS should require use of an alternative multi-beam echosounder to the one presently proposed.

Response: NMFS disagrees with NRDC et al.'s recommendation as we do not have the authority to require the IHA applicant or action proponent to choose a different multi-beam

echosounder system for the planned seismic survey. The multi-beam echosounder system that is currently installed on the Langseth is capable of mapping the seafloor in deep water and the characteristics of the system are well suited for meeting the research goals at the action area. It would not be practicable for the L-DEO and NSF to install a different multi-beam echosounder for the planned seismic survey. Also, the multi-beam planned to be used on this seismic survey is not operating in the same way as it was in Madagascar, the seismic survey is in deep water and will be far off the coast. NRDC et al. did not recommend a specific multi-beam echosounder to use as an alternative to the one currently installed on the vessel and planned to be operated during the seismic survey. The multi-beam echosounder that is currently installed on the Langseth was evaluated in the NSF/USGS PEIS and in USGS's EA, and has been used on over 25 research seismic surveys since 2008 without association to any marine mammal strandings.

Regarding the 2002 stranding in the Gulf of California, the multi-beam echosounder system was on a different vessel, the R/V Maurice Ewing (Ewing), and is no longer operated by L-DEO. Although NRDC et al. suggests that the multi-beam echosounder system or other acoustic sources on the Ewing may have been associated with the 2002 stranding of 2 beaked whales, as noted in Cox et al. (2006), "whether or not this survey caused the beaked whales to strand has been a matter of debate because of the small number of animals involved and a lack of knowledge regarding the temporal and spatial correlation between the animals and the sound source." As noted by Yoder (2002), there was no scientific linkage to the event with the Ewing's activities and the acoustic sources being used. Furthermore, Hildebrand (2006) has noted that "the settings for these stranding are strikingly consistent: an island or archipelago with deep water nearby, appropriate for beaked whale foraging habitat. The conditions for mass stranding may be optimized when the sound source transits a deep channel between two islands, such as in

the Bahamas, and apparently in the Madeira incident." The activities planned for the seismic survey are in remote deep water, far from any land mass and islands, and do not relate at all to the environmental scenarios noted by Hildebrand (2006).

Regarding the 2008 stranding event in Madagascar and the Final Report of the Independent Scientific Review Panel (ISRP) cited to by NRDC et al., see the response to comment 5. As described in more detail in the response to comment 14, the tracklines for the current seismic survey are planned to occur in deep water and will not be conducted in a manner that is likely to result in the "herding of sensitive species" into canyons and other similar areas. Given these conditions, NMFS does not anticipate mass strandings from use of the planned multi-beam echosounder.

Comment 22: NRDC et al. states that the proposed IHA does not adequately consider, or fails to consider at all, sound source validation. NRDC et al. states that NMFS should require USGS to validate the assumptions about propagation distances used to establish exclusion and buffer zones and calculate take (i.e., at minimum, the 160 dB and 180 dB isopleths). Sound source validation has been required of Arctic operators for several years, as part of their IHA compliance requirements, and has proven useful for establishing more accurate, in situ measurements of exclusion zones and for acquiring information on noise propagation.

Response: NMFS disagrees with NRDC et al.'s assessment that a sound source validation was not adequately considered or required. Regarding concerns about validating the assumptions about propagation distances used to establish buffer and exclusion zones and calculated take, measuring sound source isopleths requires specialized sensors that are either self-contained buoys (such as those used by Tolstoy et al., 2009), at the seafloor (such as those used by Thode et al., 2010), or deployed from a second ship, such as those used by Mosher et al.,

2009). Experiments with these instruments are non-trivial experiments in deep water and generally take several days of ship time (or two vessels) in order to establish shooting patterns, appropriate gain settings, and deployment/recovery of the instruments. L-DEO has demonstrated that in deep water, the propagation paths are simple and that the sound propagation models are conservative, i.e., they overestimate the distances to the Level A and B harassment isopleths (as demonstrated in Figures 11, 12 and 16 in the NSF/USGS PEIS Appendix H). Consequently, using the model parameters is a precautionary approach that saves considerable time and expense in conducting the seismic survey.

Sound source validation has been required in the Arctic for several years, these validation experiments are routinely done in the Arctic because the seismic work is undertaken on the continental shelf and inner shelf (i.e., in shallow water where acoustic propagation paths are affected by factors such as bathymetry and seafloor lithology that are not accounted for in the modeling). The IHA requirements in the Arctic are also different from those of the Atlantic because of bowhead whales' (Balaena mysticetus) use for subsistence in the Native Community. The IHA requirements for the instruments document the vocalizations of the bowhead whale before, during, and after the seismic surveys, to understand their impact on subsistence hunting, as well as to document the migrations of this species (see http://scripps.ucsd.edu/labs/athode/arctic-research/). These same considerations do not exist in the deep, offshore Atlantic study area.

As described in the NSF/USGS PEIS and USGS EA, the Langseth sound source has been calibrated in deep water and it was proven that the L-DEO model is robust and conservative for establishing buffer and exclusion zones for mitigation purposes and calculating take. Given that the planned seismic survey occurs entirely in deep water, further sound source validation is not

warranted.

Comment 23: NRDC et al. state that NMFS should reconsider the size (distance) of the safety zone. The proposed IHA proposes establishing a safety zone of 180 dB re 1 μPa (with a 500 m minimum around the airgun array). Gedamke et al. (2011) has put traditional means of estimating safety zones in doubt. NRDC et al. state that NMFS should consider establishing an exclusion zone for shut-downs for certain target species. Although time/area closures are a more effective means of reducing cumulative exposures of wildlife to disruptive and harmful sound, expanded exclusion zones have value minimizing disruptions, and potentially in reducing the risk of hearing loss and injury, outside the seasonal closure areas. Visual sighting of any individual North Atlantic right whale at any distance should trigger a shut-down; for other species, shut-downs should occur if aggregations are observed within the 160 dB isopleth around the sound source.

Response: NMFS disagrees with NRDC et al.'s recommendation that NMFS should reconsider the size (distance) of the exclusion zone. NMFS notes that the statement that the proposed IHA proposes establishing a safety zone of 180 dB re 1 μPa (with a 500 m minimum around the airgun array) is incorrect. NRDC et al. may be referring to BOEM/BSEE Joint NTL No. 2012-G02 (available online at: http://www.boem.gov/Regulations/Notices-To-Lessees/2012/2012-JOINT-G02-pdf.aspx), which requires an immediate shut-down of the airgun operations "within an estimated 500 m of the sound source array." The 180 dB exclusion zone for USGS's planned survey is 927 m for the 36-airgun array and 100 m for the single airgun. See the response to comment 31 for further information about the exclusion zone.

NNMFS also notes that the required mitigation measures already require shut-downs and/or power-downs for species of special concern. Considering the rarity and conservation

status for the North Atlantic right whale, the airguns will be shut-down immediately in the unlikely event that this species is observed, regardless of the distance from the Langseth. The airgun array shall not resume firing (with ramp-up) until 30 minutes after the last documented North Atlantic right whale visual sighting. Additionally, the mitigation measures state that concentrations of humpback, sei, fin, blue, and/or sperm whales will be avoided if possible (i.e., exposing concentrations of animals to 160 dB), and the array will be powered-down 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.).

Comment 24: NRDC et al. state that real-time monitoring effort in the proposed IHA is inadequate. NRDC et al. states that supplemental methods that have been used on certain other projects include hydrophone buoys and other platforms for acoustic monitoring, aerial surveys, shore-based monitoring, and the use of additional small vessels.

Response: NMFS has not included hydrophone buoys for acoustic monitoring, aerial surveys, shore-based monitoring, or the use of additional small/support vessels in the IHA as they are not considered practicable for USGS's seismic survey. Given that the seismic survey will be occurring in deep water and transiting long distances, it is not logistically practicable at this time to use moored platforms or moored hydrophones to assist in detecting the presence of marine mammals and potential impacts from the sound sources during the seismic survey. The planned seismic survey is generally taking place more than 200 km (108 nmi) from the U.S. coastline. This large distance renders shore-based monitoring ineffective and precludes aerial surveys by small airplanes or helicopters because of range limitations and safety issues. Also, the Langseth does not have a landing pad that would allow for helicopter monitoring from the

vessel. In certain situations, NMFS has recommended the use of additional support vessels to enhance PSO monitoring effort during seismic surveys. For this seismic survey, however, NMFS has not deemed it necessary to employ additional support vessels to monitor the buffer and exclusion zones due to the relatively small distances of the exclusion zones. An additional vessel would unnecessarily increase noise and emissions in the action area as well. The use of an additional contract vessel to supplement visual and acoustic monitoring is not necessary and will not be practicable as it would need to be capable of operating for the entire duration of the seismic survey without returning to shore which would add 10 to 30% to the cost of the project. Finally, the Langseth has limited maneuverability during airgun operations and cannot deploy or recover small vessels for activities such as hydrophone acoustic monitoring.

Comment 25: NRDC et al. states that the requirements with respect to PSOs are inconsistent with survey conventions and with prior studies of observer effectiveness. NRDC et al. state four hour work cycles are not appropriate and comment that NMFS offers no details about the training requirements of its vessel-based observers.

Response: The general duties of PSOs required for seismic surveys is to visually observe the immediate environment for protected species whose detection (relative to a sound source) triggers the implementation of mitigation requirements, monitoring compliance with mitigation requirements, collecting data by defined protocols, preparing daily reports, and submitting reports to NMFS. During seismic operations, at least five PSOs (four Protected Species Visual Observers [PSVOs] and one Protected Species Acoustic Observer [PSAO]) will be based aboard the Langseth. USGS will appoint the PSOs with NMFS's concurrence. The PSOs aboard the Langseth are professional and experienced observers provided to USGS under contract to RPS and have been in place during seismic surveys since 2008. RPS's PSOs and PAM operators

complete in-house training. PSO candidates must pass a protected species identification test and a mitigation and monitoring practices exam with a minimum grade of 80%. The RPS training program includes, but is not limited to: background on protected species laws in the U.S. and worldwide, an introduction to seismic surveys (purpose, types, and equipment), potential impacts of underwater sound on protected species, protected species in the Gulf of Mexico and other regions, visual monitoring methods, acoustic monitoring methods, protected species detection in the field, implementation of mitigation measures (exclusion and buffer zones, ramp-ups, power-downs, shut-downs, delays, etc.), and data collection and report preparation. In November 2013, NMFS prepared and published, with input from BOEM and BSEE, a technical memorandum (tech memo) titled "National Standards for a Protected Species Observer and Data Management Program: A Model Using Geological and Geophysical Surveys" (Baker et al., 2013) that makes recommendations on establishing a training program, PSO eligibility and qualifications, as well as PSO evaluation during permit/authorization approval. The tech memo is available online at: http://www.nmfs.noaa.gov/pr/publications/techmemo/observers_nmfsopr49.pdf. NMFS's current practice is to deem PSO candidates as NMFS-approved or qualified on a case-by-case or project-by-project basis after review of their resume and/or curriculum vitae. USGS's PSOs have the necessary education and/or experience requirements and their training generally follows the standard components recommended in NMFS's tech memo.

Observations will take place during ongoing daytime operations and nighttime ramp-ups of the airguns. During the majority of seismic operations, two PSVOs will be on duty from the observation tower (i.e., the best available vantage point on the source vessel) to monitor marine mammals near the seismic vessel. Use of two simultaneous PSVOs will increase the effectiveness of detecting animals near the source vessel. However, during meal times and

bathroom breaks, it is sometimes difficult to have two PSVOs on effort, but at least one PSVO will be on duty. Regarding the comment about four-hour work shifts, the IHA states that PSVO shifts shall not exceed four hours, allowing shifts to be shorter. PSOs will rotate through visual watch and the PAM station (see next response) with breaks in between to avoid fatigue and increase the detection of marine mammals present in the area.

Comment 26: NRDC et al. states that NMFS only requires PAM as practicable with no further guidance on when monitoring is or isn't practicable. NRDC et al. state that it is unrealistic for one bioacoustician to monitor the PAM system 24 hours a day.

Response: The NSF/USGS PEIS identifies PAM as an important tool to augment visual observations (section 2.4.2). As described in the USGS EA, PAM would be monitored continuously during seismic operations. During the survey, at least four PSVOs and one expert biacoustician (i.e., PSAO) will be based aboard the Langseth. The IHA requires that an expert biacoustician design and set up the PAM system, be present to oversee the PAM, and available when technical issues occur during the survey. The PAM system will be monitored at all times, in shifts no longer than six hours, with the PSOs sharing the workload. Hence, PSOs will rotate through visual watch and the PAM station with breaks in between to avoid fatigue and increase the detection of marine mammals present in the area.

Comment 27: NRDC et al. state that the proposed IHA makes no consideration of limiting activities in low-visibility conditions or at night.

Response: NMFS disagrees with the commenters' assessment. The IHA does consider and address airgun operations during low-visibility and nighttime conditions. No initiation of airgun array operations is permitted from a shut-down position at night or during low-light hours (such as in dense fog or heavy rain) when the entire relevant exclusion zone cannot be effectively

monitored by the PSVO(s) on duty. However, survey operations may continue into night and low-light hours if the segment(s) of the survey is initiated when the entire relevant exclusion zones are visible and can be effectively monitored. Limiting or suspending the seismic survey in low visibility conditions or at night would significantly extend the duration of the seismic survey.

Comment 28: NRDC et al. states that NMFS should consider technology-based mitigation.

Response: While NMFS encourages the development of new or alternative technologies to reduce potential impacts to marine mammals from underwater sound, NMFS did not include a requirement in the IHA to use or test the use of new technologies during the USGS seismic survey as none are currently available or proposed to be used by USGS. As discussed in the NSF/USGS PEIS (Section 2.6), alternative technologies to airguns were considered but eliminated from further analysis as those technologies were not commercially viable. USGS, NSF, and L-DEO continue to closely monitor the development and progress of these types of systems; however, at this point and time, these systems are still not commercially available. Geo-Kinetics, mentioned by NRDC as a potentially viable option for marine vibroseis does not have a viable towable array and its current testing is limited to transition zone settings. Other possible vibroseis developments lack even prototypes to test. Similarly, engineering enhancements to airguns to reduce high frequencies are currently being developed by industry, however, at present, these airguns are still not commercially available. L-DEO has maintained contact and is in communication with a number of developers and companies to express a willingness to serve as a test-bed for any such new technologies. As noted in the NSF/USGS PEIS, should new technologies to conduct marine seismic surveys become available, USGS and

NSF would consider whether they would be effective tools to meet research goals (and assess any potential environmental impacts).

Of the various technologies cited in the 2009 Okeanos workshop report, few if any have reached operational viability. While the marine vibrator technology has been long discussed and evaluated, the technology is still unrealized commercially. According to Pramik (2013), the leading development effort by the Joint Industry Programme "has the goal of developing three competing designs within the next few years." Geo-Kinetics has recently announced a commercial product called AquaVib, but that product produces relatively low-power, and is intended for use in very shallow water depths in sensitive environments and the vicinity of pipelines or other infrastructure. The instrument is entirely unsuited to deep-water, long-offset reflection profiling. The BP North America staggered burst technique would have to be developed well beyond the patent stage to be remotely practicable and would require extensive modification and testing of the Langseth sound source and recording systems. None of the other technologies considered (i.e., gravity, electromagnetic, Deep Towed Acoustics/Geophysics System developed by the U.S. Navy [DTAGS], etc.) can produce the resolution or sub-seafloor penetration required to resolve sediment thickness and geologic structure at the requisite scales. Improving the streamer signal to noise through improved telemetry (e.g., fiber optic cable) while desirable, would involve replacing the Langseth streamers and acquisition units, requiring a major capital expenditure.

The multi-channel seismic reflection technique (augmented with refraction information) is the de facto standard for determining sediment thickness for the purposes of the Law of the Sea Convention. Sediment thickness cannot be determined by any other known methodology and cannot be deduced from modeling alone. Sediment thickness is one of two formulae that can

be used to establish the outer limits of the ECS. The guidelines developed related to Article 76 state "the Commission (on the Limits of the Continental Shelf) will regard the data provided by seismic reflection and seismic refraction surveys as the primary source of evidence for mapping and determining sediment thickness." Further, "[t]he Commission will regard multi-channel seismic data as the most authoritative source of evidence for the determination of sediment thickness."

Some nations have resurveyed their ECS regions for sediment thickness with additional seismic reflection data because the initial data collection and delineation of the outer limits of the ECS were not considered adequate and convincing. These coastal States include Russia in the Arctic, Brazil off their southern coast, the joint submission of France, Ireland, Spain, and United Kingdom in the Bay of Biscay, and Indonesia in the area northwest of Sumatra. Hence, sufficient seismic reflection and refraction data to substantiate the outer limits is a requirement of the ECS Article 76 process. Acquiring sufficient data to delineate the continental shelf of the U.S. is part of the overall survey design off the Atlantic margin.

Monitoring and Reporting

Comment 29: The Commission believes that NMFS misinterpreted its implementing regulations, which require that applicants include "the suggested means of accomplishing the necessary monitoring and reporting that will result in increased knowledge of the species, the level of taking or impacts on populations of marine mammals that are expected to be present while conducting activities, and suggested means of minimizing burdens by coordinating such reporting requirements with other schemes already applicable to persons conducting such activity." The Commission believes that monitoring and reporting requirements need to be sufficient to provide accurate information on the numbers of marine mammals being taken and

the manner in which they are taken, not merely better information on the qualitative nature of the impacts. The Commission continues to believe that appropriate g(0) and f(0) values are essential for making accurate estimates of the numbers of marine mammals taken during surveys. The Commission recommends that NMFS consult with the funding agency (e.g., USGS or NSF) and individual applicants (e.g., L-DEO, SIO, ASC 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.

Response: NMFS does not believe that we misinterpreted the MMPA implementing regulations in our previous response that the Commission references. In the sentence quoted by the Commission, if we assume that the phrase "increased knowledge of" does not modify "the level of taking," that the phrase it would read: "the suggested means of accomplishing the necessary monitoring and reporting that will result in…the level of taking or impacts on populations," which does not make sense. However, even putting the unclear grammatical issue aside, NMFS does not believe that an appropriate interpretation of the regulations suggests that the monitoring of an authorized entity must be able to quantify the exact number of takes that occurred during the action, but rather that the monitoring increase understanding of the level and effects of the action. In fact, the Commission's comment supports this interpretation. As noted by the Commission, section 101(a)(5)(D)(iv) requires that NMFS "modify, suspend, or revoke an authorization" if it finds, among other things, that the authorized taking is having more than a negligible impact or that more than small numbers of marine mammals are being taken. Both of these findings, negligible impact and small numbers, may be made using qualitative, or relative (to the stock abundance) information, and the sorts of qualitative, or more relative, information

collected during the wide variety of monitoring that is conducted pursuant to MMPA authorizations can either be used to provide broad support for the findings underlying the issuance of an IHA or can highlight red flags that might necessitate either a reconsideration of an issued IHA or a change in analyses in future authorizations. NMFS's previous response is included below for reference.

NMFS's 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 NMFS 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 L-DEO's monitoring plan, NMFS 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 a good idea. NMFS is continuing to examine this issue with USGS and NSF to develop ways to improve their post-survey take estimates. NMFS will consult with the Commission and NMFS scientists prior to finalizing these recommendations.

NMFS note that current monitoring measures for past and current IHAs for research seismic surveys require the collection of visual observation data by PSOs 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 along would result in any statistically robust conclusions for any particular species because of the small number of animals typically observed.

Acoustic Thresholds

Comment 30: NRDC et al. and COA state that the current NMFS 160 dB threshold for Level B harassment does not reflect the best available science and is not sufficiently conservative. NRDC et al. state that NMFS's use of a single, non-conservative, bright-line threshold for all species is contrary to recent science and is untenable. NRDC et al. state that in particular, the 160 dB threshold is non-conservative, since the scientific literature establishes that behavioral disruption can occur at substantially lower received levels for some species. NRDC et al. state that NMFS should employ a combination of specific thresholds for which sufficient species-specific data are available and generalized thresholds for all other species.

Response: NMFS's practice has been to apply the 160 dB received level threshold for underwater impulse sound levels to determine whether take by Level B harassment occurs. Specifically, NMFS 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 airgun operations. NMFS acknowledge there is more recent information bearing on behavioral reactions to seismic airguns, 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 merely replacing the existing threshold with a new one. NMFS discussed the science on this issue qualitatively in our analysis of potential effects to marine mammals in the Federal Register notice for the proposed IHA (79 FR 35642,

June 23, 2014). NMFS is currently developing revised acoustic guidelines for assessing the effects of anthropogenic sound on marine mammals. Until NMFS finalizes these guidelines (a process that includes internal agency review, public notice and comment, and peer review), NMFS will continue to rely on the existing criteria for Level A and Level B harassment shown in Table 3 of the notice for the proposed IHA (79 FR 35642, June 23, 2014).

As mentioned in the Federal Register notice for the proposed IHA (79 FR 35642, June 23, 2014), NMFS 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 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 an appropriate way to manage and regulate anthropogenic noise impacts on marine mammals until NMFS finalizes its acoustic guidelines.

Comment 31: COA and NRDC et al. assert that our preliminary determinations for Level A take and the likelihood of temporary and or permanent threshold shift do not consider the best available science. COA cites 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). NRDC et al. also cite Lucke et al. (2009).

Response: As explained in the notice of the proposed IHA (79 FR35642, June 23, 2014), USGS will be required to establish a 180 and 190 dB re 1 μPa exclusion zone for marine mammals before the two string airgun array or a single airgun array is in operation. NMFS expects that the required vessel-based visual monitoring of the exclusion zones is appropriate to implement mitigation measures to prevent Level A harassment. First, if the PSOs observe

marine mammals approaching the exclusion zone, USGS must shut-down or power-down seismic operations to ensure that the marine mammal does not approach the applicable exclusion radius. Second, if USGS detects a marine mammal outside the exclusion zone, and the animal, based on its position and the relative motion, is likely to enter the exclusion zone, USGS 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 the proposed IHA (79 FR35642, June 23, 2014) 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 USGS would implement the required shut-down and power-down mitigation measures to ensure that marine mammals do not approach the applicable exclusion zones for Level A harassment.

NMFS' current Level A thresholds, which identify levels above which PTS could be incurred, were designed to be precautionary in that they were based on levels were animals had incurred TTS. NMFS is currently working on finalizing Acoustic Guidance that will identify revised TTS and PTS thresholds that references the studies identified by COA and NRDC et al. In order to ensure the best possible product, the process for developing the revised thresholds includes both peer and public review (both of which have already occurred) and NMFS will begin applying the new thresholds once the peer and public input have been addressed and the Acoustic Guidance is finalized.

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 μPa^2 s after integrating exposure. NMFS currently uses 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, NMFS recognizes 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). NMFS considered this information in the notice of the proposed IHA (79 FR35642, June 23, 2014).

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's 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). NMFS notes that seismic sound is an impulsive source, and the context of the study is related to the effect of non-impulsive sounds on marine mammals.

NMFS 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 to 2,000 Hz at received levels 60 to 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).

NMFS acknowledges that PTS could occur if an animal experiences repeated exposures to TTS levels. 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, it 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).

NMFS 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 (40 to 50 dB) could cause synaptic level changes and delayed cochlear nerve degeneration in mice and guinea pigs, respectively. NMFS notes 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, however, 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 airgun. The airgun volume and operating pressure varied from 40 to 150 in^3 and 1,000 to 2,000 psi, respectively. After three years and 180 sessions, the authors observed no significant TTS at any test frequency, for any combinations of airgun 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.

Comment 32: COA requested that NMFS 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's 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 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 the notice of the proposed IHA (79 FR 35642, June 23, 2014) 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 Weir, 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 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 USGS's study area is well

away from any known breeding/calving grounds for low frequency cetaceans, 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). NMFS 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, NMFS expects short-term disturbance reactions that are confined to relatively small distances and durations (Thompson et al., 1998; Thompson et al., 2013), with no long-term effects on recruitment or survival.

Regarding the suggestion that blue whales "noticeably" changed course during the conduct of a seismic survey offshore Oregon, NMFS disagrees. NMFS considered the McDonald et al. (1995) paper in the notice for the proposed IHA (79 FR 35642, June 23, 2014). In brief, the study tracked three blue whales relative to a seismic survey with a 1,600 in^3 airgun array (smaller than the 6,600 in^3 airgun array USGS will be using). The whale started its call sequence within 15 km (8.1 nmi) 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 (5.4 nmi) (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 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 km (108 nmi) from the source. The recorded OAWRS produced 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 an MMPA take. Thus, to address COA's concerns related to the results of this study, NMFS again notes that the USGS's study area is well away from any known breeding/calving grounds for low frequency cetaceans, thereby reducing further the likelihood of causing an effect on marine mammals.

NMFS considered the McCauley et al. (1998) paper (along with McCauley et al., 2000) in the notice of the proposed IHA (79 FR 35642, June 23, 2014). 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 (37.8 nmi) 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 to 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. 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) in reference to NMFS's use of the current acoustic exposure criteria; please refer to our earlier response to COA.

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 for migrating individuals "…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 smaller or slightly larger than the 6,600 in^3 array configurations planned for use during this survey (e.g., 2,768 in^3, McCauley et al., 1998; 6,730 in^3, Bain and Williams, 2006). Thus, the USGS's 160-dB threshold radius may not reach the threshold distances reported in these studies.

Currently NMFS is in the process of revising its behavioral noise exposure criteria based on the best and most recent scientific information. NMFS will use these criteria to develop methodologies to predict behavioral responses of marine mammals exposed to sound associated with seismic surveys (primary source is airguns). 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 an appropriate way to manage and regulate anthropogenic noise impacts on marine mammals until NMFS finalizes its acoustic guidelines.

Comment 33: NRDC et al. states that the use of a multi-pulse standard for behavior harassment is non-conservative, since it does not take into account the spreading of seismic pulses over time beyond a certain distance from the airgun array. NMFS's Open Water Panel for the Arctic, has twice characterized the airgun array as a mixed impulsive/continuous noise source and has stated that NMFS should evaluate its impacts on that basis. NMFS should not ignore the science and analysis in a number of papers showing that seismic exploration in the Arctic, the east Atlantic, off Greenland, and off Australia has raised ambient noise levels at significant distances from the airgun array.

Response: Propagation is complex and the physical property of sounds change as they travel through the environment making if often difficult to predict exactly when an impulsive source becomes more continuous (i.e., loses physical properties associated with impulsive sounds, such as fast rise and high peak pressure). This is reason for classifying the behavioral thresholds based on characteristics at the source. However, it should be remembered that the 160 dB (rms) threshold for impulsive sounds was derived from data for mother-calf pairs of migrating gray whales (Malme et al. 1983, 1984) and bowhead whales (Richardson et al., 1985; Richardson et al., 1986) responding when specifically exposed to seismic airguns at distances farther from the source. Thus, the use of this threshold for behavioral response of marine mammals to seismic sources is appropriate (i.e., opposed to the 120 dB threshold which was based on responses to drilling and dredging activities). Furthermore, investigation of updated data since the derivation of the 160 dB threshold, indicates for the majority of behavioral responses associated with received levels below 160 dB are at distances fairly close to the source (less than 5 km) and have involved controlled playbacks to sources, which emphasizes that in addition to received level, other factors, like distance from the source or context of exposure are important considerations.

Comment 34: NRDC et al. states that NMFS must consider that even behavioral disturbance can amount to Level A take if it interferes with essential life functions through secondary effects (e.g., displacement from migration paths, risks of ship strike or predation). NRDC et al. state that NMFS must take into account the best available science and set lower thresholds for take by Level A harassment, which would lead to larger exclusion zones around the seismic survey.

Response: NMFS notes that Level B take has been defined previously in this document and specifically relates to behavioral disturbance, not the secondary effects the commenter notes. However, these secondary effects are very important and are considered in both the negligible impact analysis as well as qualitatively in the development of mitigation measures, via consideration of biologically important areas in the analysis and for time-area closures, or other important factors. Please see the response to comment 31 for a discussion of studies addressing PTS (Level A harassment).

Comment 35: NRDC et al. state that behavioral take thresholds for the impulsive component airgun noise should be based on peak pressure rather than on rms, or dual criteria based on both peak pressure and rms should be used. NRDC et al. state that alternatively, NMFS should use the most biologically conservative method for calculating rms, following Madsen (2005).

Response: NMFS disagrees that peak pressure is the appropriate metric associated with behavioral take. Peak pressure is more appropriate for injury associated with exposure at close distances to the source, not at distances where behavioral take is expected to occur (Southall et al., 2007). Finally, NMFS does rely on Madsen (2005) for calculating rms sound pressure (i.e., duration window associated with 90% energy).

Comment 36: NRDC et al. states that NMFS has failed to analyze masking effects or set thresholds for masking.

Response: Exposure to seismic sources has been shown to have impacts on marine mammal vocalizations with sometimes animals vocalizing more (e.g., Di Iorio and Clark, 2009) in the presence of these sources and sometimes less (e.g., Blackwell et al., 2013). Additionally, many species have short-term and long-term means of dealing with masking. However, the

energetic consequences of these adaptations are unknown. Recent published models have allowed the ability to better quantify the effects of masking on baleen whales for certain underwater sound sources, like shipping (e.g., change in communication space; Clark et al., 2009; Hatch et al., 2012). However, models for other sources have not been published. NMFS's notice of the proposed IHA (79 FR 35642, June 23, 2014) described the potential effects of the seismic survey on marine mammals, including masking. In general, NMFS expects the masking effects of airgun pulses to be minor, given the normally intermittent nature of the pulses and the fact that the acoustic footprint of the survey is only expected to overlay a low number of low-frequency hearing specialists and is not in any specifically identified biologically important areas.

NEPA Concerns

Comment 37: NRDC et al. submitted comments on the first stated purpose of the study, which is to identify the outer limits of the U.S. continental shelf, also referred to as the ECS as defined by Article 76 of the Convention of the Law of the Sea. NRDC et al. comment that the first stated purpose is concerning because of its implications for expanded oil and gas exploration in the region. NRDC et al. state that any consideration of this study, and in particular the cumulative impact of the assessment, must include consideration of the fact that this study's underlying purpose may be to increase the area of the Mid-Atlantic that is open to oil and gas exploration and drilling and, therefore, must include an analysis of longer-term related effects on marine species and habitat of the various sources of increased disruption and harm caused by an influx of oil and gas exploration and drilling in the region.

Response: NMFS has fully considered the purposes of the seismic survey, the first of which is to identify the outer limits of the U.S. ECS. NMFS disagrees with the commenter's

assessment of the underlying purpose of the study may be to increase the area of the Mid-Atlantic that is open to oil and gas exploration and drilling. The planned seismic survey is independent of oil and gas exploration, which is regulated by the Bureau of Ocean Energy Management. The EA prepared by USGS, which NMFS has adopted, provided detailed information about the first purpose of the study.

As explained in the previous notice for the proposed IHA (79 FR 35642, June 23, 2014), one purpose of the planned study is to define the seafloor and sub-seafloor that is part of the U.S. ECS. Only after the ECS is delineated can it be designated for conservation, management, resource exploitation, or other purposes. The planned project is part of an Interagency Task Force that has been in existence since 2007 to identify all the parts of the U.S. margins beyond 200 nmi where the U.S. can potentially exert its sovereign rights, whether that be for conservation, management, exploitation, or other purposes. Unless the ECS is delineated as part of the U.S., it could potentially be developed and utilized outside of the U.S. regulatory framework. The ultimate determination as to whether the outer limits of the ECS will be delineated as part of the continental shelf of the U.S. is partially dependent upon the data that would be collected on this seismic survey. The ECS program has investigated potential ECS in the Arctic, Atlantic, Gulf of Mexico, Bering Sea, Pacific West Coast, Gulf of Alaska, Central Pacific Line Islands, and Western Pacific (Marianas). Only the Arctic, Atlantic, Gulf of Mexico, and Bering Sea are likely to use the sediment thickness formula for defining the outer limits of the ECS.

The Atlantic margin is a priority for the U.S. ECS project. The Atlantic is probably the second largest region of ECS for the U.S. (second to the Arctic). The USGS participated in four field seasons of joint seismic-bathymetric work in the Arctic collaborative with the Geological

Survey of Canada as the first priority between 2008 and 2011. An opportunity to collect data for the ECS in the Pacific Ocean was possible in 2011, and at that time, data were collected in the Gulf of Alaska and the Bering Sea, two areas of potential U.S. ECS. Since 2011, the Atlantic has been the highest priority for gathering ECS-relevant seismic data, both for the ECS Interagency Task Force and the Coastal and Marine Geology Program of USGS.

The ECS project has teams that have been working in each region of the ECS for the U.S. since 2010. A preliminary assessment of existing data for the Atlantic margin was completed in 2012. Since that time, the final track line program has been proposed and modified per presentations to the ECS working group and the ECS seismic methodology team. This fiscal year (2014) is the first opportunity that both a ship and sufficient funding resources have been available for a field program in the Atlantic. Finishing data collection in 2015, would allow the Department of State sufficient time to complete the documentation of the outer limits of the ECS by the 2018 to 2019 deadline established in its 5-year program.

The planned activity is not related to oil and gas exploration and will not expand the area of the Mid-Atlantic that is open to oil and gas exploration and drilling. The BOEM Planning Areas examined in their final PEIS already extend to 350 nmi beyond the baselines of the U.S. (http://www.boem.gov/Special-Information-Notice-February-2014/). The tracklines for the USGS study do not extend beyond 350 nmi, which is the furthest outer limit distance that could be used to delineate the ECS. Hence the BOEM PEIS already includes any area would be potential ECS in the analysis, including in the cumulative effects analysis. It is therefore incorrect to assert that this seismic survey will expand the area of the Mid-Atlantic that is open to oil and gas exploration, and such, would be inappropriate to include any analysis to this effect in the cumulative effects assessment of the planned action.

Comment 38: NRDC et al. submitted comments on the second stated purpose of the study, which is to study the mass transport of sediments down the continental shelf as submarine landslides that may pose tsunamigenic (i.e., tsunami-related) hazards. NRDC et al. comment that there is little to substantiate the immediate need of the second stated purpose of the study. NRDC et al. comment that the draft EA offers no analysis of the ability to obtain information about sediment thickness and geologic structure by modeling or alternate means, no discussion of related survey data that may be available for extrapolation, nor any prediction of the actual risk to the Eastern Seaboard of a tsunami-related submarine landslide.

Response: NMFS first clarifies that the investigation of sediment thickness is related to the first purpose of the study, which is to establish the outer limits of the U.S. ECS. One of the criteria for defining the outer limits of the ECS under Article 76 involves measuring the thickness of the sediments beneath the seafloor but above the oceanic crust. The sediment thickness must be measured continuously from the foot of the continental slope seaward to a point where the outer limit point is identified. The established method for measuring sediment thickness is seismic reflection profiling (Kasuga et al., 2000). Other scientific methods (such as measurements of marine gravity and magnetic anomalies) may be used to augment the geologic interpretation, but the internationally accepted method for measuring sediment thickness is seismic reflection profiling. An extensive review of the existing database (Hutchinson and other, 2004) demonstrated that existing seismic-reflection data are entirely insufficient to meet the line-spacing or velocity control requirements specified in Article 76. As part of the study, USGS plans to identify the locations of fracture zones, where the sediments could be thicker than in the intra-fracture zone regions. These fracture zones are the result of juxtaposing oceanic crust of different ages across ridge offsets during the spreading process. The 2014 part of the program

(with lines parallel to the margin) is intended to identify the possible existence of fracture zones that are sub-perpendicular to the margin. If these fracture zones can be identified, the 2015 component of the seismic program is to then collect seismic data along tracks that follow where the sediment is thickest and therefore the size of the U.S. ECS can be established.

NMFS has fully considered the second purpose of the study, which is to study the sudden mass transport of sediments down the continental shelf as submarine landslides that may pose tsunamigenic (i.e., tsunami-related) hazards. The EA prepared by USGS, which NMFS adopted, provides detailed information about the second purpose of the study, including information about its immediate need, the availability and limitations of other data, and the risk to the Eastern Seaboard of a tsunami-related submarine landslide.

Since the 2004 Banda Aceh tsunami and the more recent 2010 Tohoku tsunami, the U.S. Nuclear Regulatory Agency has contracted with the USGS to evaluate tsunami hazards along the U.S. margins, because of the potential threat to, for example, nuclear power plants, coastal cities, industrial centers, and port facilities, including along the Atlantic. Other agencies such as FEMA offices in several coastal states and the City of Boston, Office of Emergency Management requested input and assessment from the USGS for their tsunami preparedness. Tsunamis on passive margins such as the Atlantic pose a challenge to regulators because these events are rare (i.e., low probability) but potentially devastating (i.e., high risk). The 1929 Grand Banks tsunami (Fine et al., 2005), measured and modeled overpressures on the New Jersey margin that can cause slope failure (Dugan et al., 2000), and evidence of enormous submarine landslides (such as the Cape Fear slide [Hornbach et al., 2007]) demonstrate that the Atlantic margin is not immune to the potential tsunamigenic hazard. As part of its research into submarine landslides, the USGS has utilized a multi-pronged approach, for example, analytic and numerical models

(Geist and Parsons, 2006; Geist et al., 2009), geomorphologic analysis (Chaytor et al., 2007; Twichell et al., 2009; Locat et al., 2010), regional assessments using existing data (ten Brink et al., 2009; ten Brink et al., 2014), geotechnical analysis (on-going), and laboratory studies (on-going). No single landslide, however, has been mapped from its origin (headwall on the continental slope) to its runout on the lower rise/abyssal plain, with supporting evidence to show the aggradational and structural relationships in the subsurface among the different parts of the composite landslide system. This lack of information prevents further modeling of the processes of these landslides and evaluating the potential tsunamigenic risks they have posed or could pose along the Atlantic margin. The proposed cruise offers the opportunity to study the vertical (depth) aspects of two major landslides on the U.S. margin, and therefore leverage federal resources across two scientific programs and projects (ECS and Natural Hazards). USGS is attempting to eliminate redundant seismic surveys by combing field work for two projects (ECS and Natural Hazards).

Comment 39: COA states that NMFS should prepare an Environmental Impact Statement (EIS), not an EA, to adequately consider the potentially significant impacts of the proposed action and full range of alternatives to the proposed action. COA also states that given that USGS's EA tiers to the NSF/USGS PEIS that was finalized in 2011, an updated EIS would provide information necessary to making an informed decision about the issuance of the IHA.

Response: In accordance with the National Environmental Policy Act (NEPA; 42 U.S.C. 4321 *et seq*.), USGS completed an EA titled, "Environmental Assessment for Seismic Reflection Scientific Research Surveys during 2014 and 2015 in Support of Mapping the U.S. Atlantic Seaboard Extended Continental Margin and Investigating Tsunami Hazards." The EA was prepared by RPS Evan-Hamilton, Inc., in association with YOLO Environmental, Inc.,

GeoSpatial Strategy Group, and Ecology and Environment, Inc. on behalf of USGS. The EA analyzes the impacts on the human environment of conducting a seismic survey in the northwest Atlantic Ocean off the U.S. Eastern Seaboard (i.e., the action for which USGS applied to NMFS for an IHA). It includes an evaluation of three alternatives:

(1) the proposed seismic survey and issuance of an associated IHA,

(2) a no action alternative (i.e., do not issue an IHA and do not conduct the seismic survey), and

(3) a corresponding seismic survey at an alternative time, along with issuance of an associated IHA.

The EA tiers to the NSF and USGS's 2011 "Programmatic Environmental Impact Statement/Overseas Environmental Impact Statement for Marine Seismic Research Funded by the National Science Foundation or Conducted by the U.S. Geological Survey" (NSF/USGS PEIS). The EA also incorporates by reference the following documents per 40 CFR 1502.21 and NOAA Administrative Order (NAO) 216-6 § 5.09(d): The NSF's "Environmental Analysis of a Marine Geophysical Survey by the R/V Marcus G. Langseth in the Northeast Atlantic Ocean, June–July 2013; the NSF's "Draft Environmental Assessment of a Marine Geophysical Survey by the R/V Marcus G. Langseth in the Atlantic Ocean off Cape Hatteras, September-October 2014"; and the Bureau of Ocean Energy Management's 2014 "Programmatic Environmental Impact Statement Atlantic Outer Continental Shelf (OCS) Proposed Geological and Geophysical Activities Mid-Atlantic and South Atlantic Planning Areas."

NMFS independently reviewed USGS's EA, and concluded that the impacts evaluated by USGS are substantially the same as the impacts of the alternatives considered in issuing an IHA under the MMPA for USGS's marine seismic survey in the northwest Atlantic Ocean off the

U.S. Eastern Seaboard during August to September 2014 and April to August 2015. In addition, NMFS evaluated USGS's EA and found that it includes all required components for adoption by NOAA, including sufficient evidence and analysis for determining whether to prepare an EIS or a Finding of No Significant Impact (FONSI), a brief discussion of need for the proposed action, a listing of the alternatives to the proposed action, a description of the affected environment, and a brief discussion of the environmental impacts of the proposed action and alternatives. Regarding the comment that the USGS EA tiers to the NSF/USGS PEIS that was finalized in 2011, NMFS notes that the USGS EA and the two NSF EAs incorporated by reference in the USGS EA incorporate site-specific and updated scientific information. As a result of this review, NMFS determined that it was not necessary to prepare a separate EA, Supplemental EA, or EIS to issue an IHA for USGS's proposed marine seismic survey, and adopted USGS's EA.

NOAA Administrative Order (NAO) 216-6 contains criteria for determining the significance of the impacts of a proposed action. In addition, the Council on Environmental Quality (CEQ) regulations at 40 CFR § 1508.27 state that the significance of an action should be analyzed both in terms of "context" and "intensity." NMFS evaluated the significance of this action based on the NAO 216-6 criteria and CEQ's context and intensity criteria. Based on this evaluation, NMFS determined that issuance of this IHA to USGS would not significantly impact the quality of the human environment and issued a FONSI. Accordingly, preparation of an EIS is not necessary. NMFS's determination and evaluation of the NAO 216-6 criteria and CEQ's context and intensity criteria are contained within the FONSI issued for this action.

Comment 40: COA states that the NEPA document must be made available for public review and comment. COA states that the public was not offered an opportunity to comment on the proposed project until the issuance of the proposed IHA on June 23, 2014.

Response: NMFS notes that USGS's draft EA was posted on the USGS website for a 30-day public comment period from May 20 to June 20, 2014. The draft EA was also posted on the NSF website. USGS received no public comment or inquiries on the draft EA during that period. NMFS also made the draft EA available to the public on the NMFS permit website (http://www.nfms.noaa.gov/per/permits/incidental.htm#applications) concurrently with the release of the Federal Register notice for the proposed IHA (79 FR 35642, June 23, 2014). NMFS shared comments on the draft EA received during the 30-day IHA comment period with USGS and NSF. USGS considered the public comments received during the 30-day IHA comment period in preparing the final IHA. NMFS also considered all public comments received in evaluating the sufficiency of the USGS EA and in preparing the final IHA.

Comment 41: COA states that the EA does not devote sufficient discussion to alternatives including alternative times of year and additional monitoring activities.

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.

The USGS EA addresses the potential environmental impacts of three choices available to us under section 101(a)(5)(D) of the MMPA, namely:

- The proposed seismic survey and the issuance of an associated IHA;
- A corresponding seismic survey at an alternative time, along with issuance of an associated IHA; or
- A no action alternative, with no issuance of an IHA and no seismic survey.

To warrant detailed evaluation as a reasonable alternative, an alternative must meet our purpose and need. In this case, an alternative meets the purpose and need if it satisfied the requirements under section 101(a)(5)(D) of the MMPA. Each alternative must also be feasible and reasonable in accordance with the President's Council on Environmental Quality regulations (40 CFR §§ 1500-1508). NMFS evaluated potential alternatives against these criteria.

NMFS disagrees with the commenter's assessment that the USGS EA did not sufficiently evaluate alternatives, including alternative times of year. The USGS EA considered, but rejected, conducting the seismic survey at a different time of the year, along with issuance of an associated IHA. Regarding seasonal distributions of marine mammals, the EA considers seasonal distributions through descriptions presented in Chapter 3. The EA concludes that "[m]ost marine mammal species are year-round residents in the North Atlantic, based on the number of OBIS sightings in the Study Area and adjacent waters, so altering the timing of the proposed project likely would result in no net benefits for those species" (see USGS EA section 4.4).

With respect to scheduling the survey during winter, the EA states that weather conditions in the Atlantic Ocean and ship schedules also constrain the possible time window of the seismic survey to May through September. Because of generally higher sea states in winter, winter is an unsafe time for conducting experiments when ship maneuverability is limited, as it is towing an 8 km long streamer. Scheduling the seismic survey in mid-summer when daylight hours are maximized and sea states are generally minimal facilitates observations and identifications of marine wildlife.

The EA concludes that the proposed dates for the cruise under the Preferred Alternative (August to September 2014 and April to August 2015) are the most suitable, from a logistical

perspective, for the Langseth, essential equipment and the participating scientists and personnel. The 2014 seismic survey is also scheduled so that the subsequent proposed seismic survey (GeoPRISMS/ENAM) on the Langseth scheduled from mid-September to early October does not interfere with North Atlantic right whale migrations. If the IHA is issued for another period, it could result in significant delay and disruption not only of the proposed seismic survey, but of subsequent studies that are planned on the Langseth for 2014, 2015, and beyond.

Regarding the mitigation and monitoring measures suggested by COA, NMFS determined that the measures were not feasible or already required. Pre-survey observations and post-survey monitoring are not feasible due to the length of the tracklines, the distance of the action area from shore, and the Langseth's schedule. With respect to aerial surveys, see the response to comment 23. With respect to exclusion zones and sound thresholds, see the responses to comments 31 to 36. With respect to activity during low light and nighttime conditions, see the response to comment 27. With respect to night vision technology, the IHA requires that PSVOs have access to night vision devices. For additional required mitigation measures, see the "Mitigation" section below. NMFS determined, based on the best available data, that the mitigation and monitoring measures required by the IHA are the most feasible and effective measures capable of implementation by USGS during the planned seismic survey.

Comment 42: COA states that in its discussion of the No Action alternative, the EA does not adequately qualify the benefits of the No Action alternative, in which the proposed action would not proceed and marine mammals would not be subject to harassment, in relation to the costs.

Response: Concerning the benefits of the No Action alternative, the EA addresses this concern in section 4.5, where it states that "the No Action alternative would result in no

disturbance to marine mammals or sea turtles attributable to the planned seismic survey." Concerning the costs of the No Action alternative, the EA states that the No Action alternative would not meet the purpose and need for the proposed activities. As stated in the EA, "[t]he U.S. would not be able to define the ECS and therefore not be able to exercise its sovereign rights over the seafloor and sub-seafloor because it would lack the data to determine the extent of its sovereign rights. Nor would USGS have an important data set to contribute to its accurate assessment of submarine landslide and tsunami hazards along the east coast" (USGS EA, section 4.5).

Comment 43: NRDC et al. state that USGS fails to adequately assess cumulative impacts of the activity. NRDC et al. state that NMFS and USGS must analyze both auditory and behavioral impacts of repeated exposure to noise pollution on a population that may alter behavior. NRDC et al. also state that the cumulative impact analysis must include a full evaluation of the cumulative impacts of oil and gas seismic surveys planned for and anticipated in the Atlantic; the L-DEO seismic survey off New Jersey and other NSF or USGS planned seismic surveys; and military and testing sonar activities.

Response: NMFS disagrees with commenters' assessment. The USGS EA and the documents it incorporates analyze the effects of the seismic survey in light of other human activities in the study area, including the activities the commenters reference. The NSF/USGS PEIS, which the USGS EA tiers to, also analyzes the cumulative impacts of NSF-funded and USGS-conducted seismic surveys. The USGS EA, which NMFS adopted, concludes that the impacts of USGS's proposed seismic survey in the Atlantic Ocean are expected to be more than minor and short-term with no potential to contribute to cumulatively significant impacts. NMFS independently reviewed USGS's EA and concluded that the impacts evaluated by USGS are

substantially the same as the impacts of the alternatives considered in issuing an IHA, under the MMPA, for USGS's seismic survey. As explained in NMFS' FONSI, NMFS expect the following combination of activities to result in no more than minor and short-term impacts to marine mammals in the survey area in terms of overall disturbance effects: (1) NMFS's issuance of an IHA with prescribed mitigation and monitoring measures for the seismic survey; (2) past, present, and reasonably foreseeable future research in the northwest Atlantic Ocean off the Eastern Seaboard; (3) vessel traffic, noise, and collisions; (4) commercial and recreational fishing; (5) military activities; (6) oil and gas activities; and (7) submarine cable installation activities.

NMFS notes that section 4.1.2.3 of the NSF/USGS PEIS specifically addresses the cumulative impacts of repeated exposure to noise, including potential exposure to multiple NSF or USGS seismic surveys and potential exposure to NSF or USGS seismic surveys and other activities that produce underwater noise. It states that "no impacts are anticipated at the regional population level. The few, relatively short, localized NSF or USGS seismic surveys in the context of the ocean-region basis would not have more than a negligible cumulative effect on marine mammals at the individual or population level. Possible exceptions are local non-migratory populations or populations highly concentrated in one area at one of year (e.g., for breeding). However, the latter scenario would be mitigated by timing and locating proposed seismic surveys to avoid sensitive seasons and/or locations important to marine mammals, especially those that are ESA-listed." It further states that "there is no evidence that [short-term behavioral changes], whether considered alone or in succession, result in long-term adverse impacts to individuals or populations assuming important habitats or activities are not disturbed. Furthermore, long-migrating marine mammals in particular have undoubtedly been exposed to

many anthropogenic underwater sound activities for decades in all ocean basins. Many of these populations continue to grow despite a preponderance of anthropogenic marine activities that may have been documented to disturb some individuals behaviorally (e.g., Hildebrand, 2004)."

General Concerns

Comment 44: COA states that NMFS must take best available science and the precautionary principle into account.

Response: NMFS's determinations, in order to meet the requirements of section 101(a)(5)(D) of the MMPA, use peer-reviewed data that are based on the best available science regarding the biology of animals affected and the propagation of underwater sounds from sources during the seismic survey. This information is supported by USGS's IHA application and EA.

Comment 45: NRDC et al. state that USGS and NMFS fail to adequately assess impacts on the North Atlantic right whale. NRDC et al. also state that the seismic survey does not include any time-area closures to reduce impacts on North Atlantic right whales, nor does it provide any quantitative or even detailed qualitative analysis of masking effects or other cumulative, sub-lethal impacts on North Atlantic right whales.

Response: NMFS disagrees with the NRDC et al.'s comments and has adequately assessed impacts to the North Atlantic right whale. The seismic survey's tracklines avoid the northeast Atlantic Ocean designated critical habitat by approximately 190 km (102.6 nmi) and avoid the southeast Atlantic Ocean designated critical habitat by approximately 519 km (280.2 nmi). The probability of vessel and marine mammal interactions (e.g., ship strike) is highly unlikely due to the low density of right whales and other mysticetes in the survey area, as well as the Langseth's slow operational speed, which is typically 4.5 kts (8.5 km/hr, 5.3 mph). Outside

of airgun operations, the Langseth's cruising speed will be approximately 10 kts (18.5 km/hr, 11.5 mph), which is generally below the speed at which studies have noted reported increases of marine mammal injury or death (Laist et al., 2001). Responses 5, 21, and 36 provide responses to concerns about masking effects and the use of the multi-beam echosounder.

Considering the rarity and conservation status for the North Atlantic right whale, the airguns will be shut-down immediately in the unlikely event that this species is observed, regardless of the distance from the Langseth. The airgun array shall not resume firing (with ramp-up) until 30 minutes after the last documented North Atlantic right whale visual sighting. This mitigation measure is a requirement in the IHA issued to USGS.

Comment 46: NRDC et al. states that NMFS fails to analyze impacts on fish and other species of concern. NRDC et al. state that the proposed IHA assumes without support that effects on both fish and fisheries would be localized and minor. NRDC et al. urges NMFS to improve its analysis.

Response: NMFS disagrees with NRDC et al.'s assessment. NMFS adopted the USGS EA, which describes marine fish in section 3.7, EFH in section 3.8.2, and considers the impacts of the survey on fish, EFH and fisheries in sections 4.2.5 and 4.2.7. The USGS EA tiers to the NSF/USGS PEIS, which also analyzes the impacts of seismic surveys on fish. All of the studies cited by NRDC et al. regarding fish are cited in the NSF/USGS PEIS (Appendix D) together with numerous additional studies that document the limited and sometimes conflicting knowledge about the acoustic capabilities of fish and the effects of airgun sound on fish. The EA's conclusion that "the direct effects of the seismic survey and its noise may have minor effects on marine fisheries that are generally reversible, of limited duration, magnitude, and geographic extent when considering individual fish, and not measurable at the population level"

is well supported. NMFS also evaluated the impacts of the seismic survey on fish and invertebrates in the notice of the proposed IHA (79 FR 35642, June 23, 2014). NMFS included a detailed discussion of the potential effects of this action on marine mammal habitat, including physiological and behavioral effects on marine fish and invertebrates.

Comment 47: NRDC et al. states that USGS did not provide any meaningful analysis of the proposed action's impacts on essential fish habitat (EFH). NRDC et al. states that NMFS has a statutory obligation to consult on the impact of federal activities on EFH under the Magnuson-Stevens Fishery Conservation and Management Act (MSA). NRDC et al. states that the EFH consultation for the action is inadequate.

Response: NMFS disagrees with the commenters' assessment. As discussed in the response to comment 46, the NSF/USGS PEIS, the USGS EA, and other environmental assessment that the USGS EA incorporates identify EFH within the project area and evaluate the impacts of the seismic survey on EFH. USGS EA (see section 3.8.2) and the NSF/USGS PEIS (see section 3.3.2.1) discuss the seismic survey's impacts on EFH. In the site-specific EA, USGS determined that the seismic survey is restricted to the surface waters and thus there would be no physical contact or disturbance with EFH. NMFS adopted the USGS EA after evaluating it for sufficiency.

USGS requested a determination from the NMFS, Habitat Conservation Divisions of the Southeast Regional and Greater Atlantic Regional Fisheries Offices, whether the seismic survey required a formal consultation. In a letter dated June 20, 2014, NMFS stated that in accordance with the MSA, EFH has been identified and described in the EEZ portions of the study area by the New England, Mid-Atlantic and South Atlantic Fishery Management Councils and NMFS. The letter acknowledged that USGS and NSF, as the federal action agency for this action,

determined the proposed seismic survey may result in minor adverse impacts to water column habitats identified and described as EFH. NMFS stated that the Habitat Conservation Divisions in the Southeast Regional and Greater Atlantic Regional Fisheries Offices reviewed that analysis and the proposed mitigation measures contained in the NSF/USGS PEIS and the EA prepared for this action. Upon considering the design and nature of the seismic survey, NMFS had no EFH conservation recommendations to provide pursuant to section 305 (b)(2) of the MSA. NMFS stated additional research and monitoring is needed to gain a better understanding of the potential effects these activities may have on EFH, federally managed species, their prey and other NOAA trust resources, and recommended that this type of research should be a component of future NSF-funded seismic surveys. USGS agree that this is an area of needed research.

The issuance of an IHA and the mitigation and monitoring measures required by the IHA would not affect ocean and coastal habitat or EFH. Therefore, NMFS, Office of Protected Resources, Permits and Conservation Division has determined that an EFH consultation is not required.

Comment 48: NRDC et al. states that NMFS must fully comply with the ESA and develop a robust Biological Opinion based on the best available science. They state that NMFS should evaluate the impact of the seismic survey on new sea turtle and potential right whale critical habitat. They further urge NMFS to establish more stringent mitigation measures to protect ESA-listed species than are currently proposed by the IHA.

Response: Section 7(a)(2) of the ESA requires that each federal agency insure that any action authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of critical habitat of such species. Of the species of marine mammals that may

occur in the action area, several are listed as endangered under the ESA, including the North Atlantic right, humpback, sei, fin, blue, and sperm whales. Designated critical habitat for the Northwest Atlantic Ocean Distinct Population Segment of loggerhead sea turtles (Caretta caretta) also occur in the action area.

Under section 7 of the ESA, USGS initiated formal consultation with the NMFS, Office of Protected Resources, Endangered Species Act Interagency Cooperation Division, on this seismic survey. NMFS's Office of Protected Resources, Permits and Conservation Division, also initiated and engaged in formal consultation under section 7 of the ESA with NMFS's Office of Protected Resources, Endangered Species Act Interagency Cooperation Division, on the issuance of an IHA under section 101(a)(5)(D) of the MMPA for this activity. These two consultations were consolidated and addressed in a single Biological Opinion addressing the effects of the proposed actions on threatened and endangered species as well as designated critical habitat. The Biological Opinion concluded that both actions (i.e., the USGS seismic survey and NMFS's issuance of an IHA) are not likely to jeopardize the existence of cetaceans and sea turtles and would have no effect on critical habitat. NMFS's Office of Protected Resources, Endangered Species Act Interagency Cooperation Division relied on the best scientific and commercial data available in conducting its analysis.

Although critical habitat is designated for the North Atlantic right whale, no critical habitat for North Atlantic right whales occurs in the action area. The North Atlantic right whale critical habitat in the northeast Atlantic Ocean can be found online at: http://www.nmfs.noaa.gov/pr/pdfs/criticalhabitat/n_rightwhale_ne.pdf. The North Atlantic right whale critical habitat in the southeast Atlantic Ocean can be found online at: http://www.nmfs.noaa.gov/pr/pdfs/criticalhabitat/n_rightwhale_se.pdf. The survey trackline that

has the closest approach to the northeast Atlantic Ocean designated critical habitat is approximately 190 km (102.6 nmi) from the area. The trackline that has the closest approach to the southeast Atlantic Ocean designated critical habitat is approximately 519 km (280.2 nmi) from the area. The Biological Opinion considers the distribution, migration and movement, general habitat, and designated critical habitat of the North Atlantic right whale in its analysis.

NMFS's Office of Protected Resources, Permits and Conservation Division also considered the conservation status and habitat of ESA-listed marine mammals. Included in the IHA are special procedures for situations or species of concern (see "Mitigation" section below). If a North Atlantic right whale is visually sighted during the survey, the airgun array must be shut-down regardless of the distance of the animal(s) to the sound source. The array will not resume firing until 30 minutes after the last documented whale visual sighting. Concentrations of humpback, sei, fin, blue, and/or sperm whales will be avoided if possible (i.e., exposing concentrations of animals to 160 dB), and the array will be powered-down if necessary. For purposes of the 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.). NMFS's Office of Protected Resources, Endangered Species Act Interagency Cooperation Division issued an Incidental Take Statement (ITS) incorporating the requirements of the IHA as Terms and Conditions of the ITS. Compliance with the ITS is likewise a mandatory requirement of the IHA. NMFS's Office of Protected Resources, Permits and Conservation Division has determined that the mitigation measures required by the IHA provide the means of effecting the least practicable impact on species or stocks and their habitat, including ESA-listed species.

Comment 49: NRDC et al. states that the Coastal Zone Management Act (CZMA) requires that applicants for federal permits to conduct an activity affecting a natural resource of

the coastal zone of a state "shall provide in the application to the licensing or permitting agency a certification that the proposed activity complies with the enforceable policies of the state's approved program and that such activity will be conducted in a manner consistent with the program." NRDC et al. states that the marine mammals and fish that will be affected by the seismic survey are all "natural resources" protected by the coastal states' coastal management program, and that states should be given the opportunity to review the IHA for consistency with their coastal management programs.

Response: As the lead federal agency for the planned seismic survey, USGS considered whether the action would have effects on the coastal resources of any state along the U.S. Eastern Seaboard. As concluded in the USGS EA, any potential impacts from the seismic survey would mainly be to marine species in close proximity to the vessel and would be of a short duration and temporary in nature. Because the planned seismic survey will occur in deep water and long distances from the U.S. East Coast, USGS concluded the seismic survey would have no effect on coastal zone resources. The seismic survey would occur in approximately 2,000 to 5,000 m water depth, and most of the tracklines would occur beyond 463 to 648.2 km (250 to greater than 350 nmi) offshore. The closest approach to land will be approximately 170 km (92 nmi). USGS reviewed the Federal Consistency Listings for the states along the East Coast and determined that the action is not listed. USGS did not receive a request from any state for a consistency review of the unlisted activity. Therefore, it was concluded that USGS met all of the responsibilities under the CZMA. USGS and NSF also discussed the proposed seismic survey with the NOAA Office of Ocean and Coastal Resource Management (OCRM) to confirm the agencies responsibilities under CZMA for the planned unlisted activity.

Comment 50: One private citizen opposed the issuance of an IHA by NMFS and the

conduct of the seismic survey in the northwest Atlantic Ocean off the Eastern Seaboard, August to September 2014 and April to August 2015, by USGS. The commenter states that NMFS should protect marine life from harm.

Response: As described in detail in the notice for the proposed IHA (79 FR 35642, June 23, 2014), as well as in this document, NMFS does not believe that USGS's seismic survey would cause injury, serious injury, or mortality to marine mammals, and no take by injury, serious injury, or mortality is authorized. The required monitoring and mitigation measures that USGS will implement during the seismic survey will further reduce the potential impacts on marine mammals to the lowest levels practicable. NMFS anticipates only behavioral disturbance to occur during the conduct of the seismic survey.

Description of the Marine Mammals in the Specified Geographic Area of the Specified Activity

Forty-five species of marine mammal (37 cetaceans [whales, dolphins, and porpoises] including 30 odontocetes and 7 mysticetes, 7 pinnipeds [seals and sea lions], and 1 sirenian [manatees]) are known to occur in the western North Atlantic Ocean study area (Read et al., 2009; Waring et al., 2013). Of those 45 species of marine mammals, 34 cetaceans could be found or are likely to occur in the study area during the spring/summer/fall months. Several of these species are listed as endangered under the U.S. Endangered Species Act of 1973 (ESA; 16 U.S.C. 1531 et seq.), including the North Atlantic right (Eubalaena glacialis), humpback (Megaptera novaeangliae), sei (Balaenoptera borealis), fin (Balaenoptera physalus), blue (Balaenoptera musculus), and sperm (Physeter macrocephalus) whales. The white-beaked dolphin (Lagenorhynchus albirostris) generally occurs north of the of the planned study area and no take has been authorized. The harbor porpoise (Phocoena phocoena) usually occur in shallow nearshore waters, but occasionally travel over deep offshore waters. The four pinniped species

(harbor [Phoca vitulina], harp [Phoca groenlandica], gray [Halichoerus grypus], and hooded [Cystophora cristata] seals) are also considered coastal species (any sightings would be considered extralimital) and are not known to occur in the deep waters of the survey area. No pinnipeds are expected to be present in the planned study area, and not take has been authorized for pinnipeds. The West Indian manatee (Trichechus manatus latirostris) is listed as endangered under the ESA and is managed by the U.S. Fish and Wildlife Service and is not considered further in this IHA notice.

General information on the taxonomy, ecology, distribution, seasonality and movements, and acoustic capabilities of marine mammals are given in sections 3.6.1, 3.7.1, and 3.8.1 of the NSF/USGS PEIS. The general distribution of mysticetes, odontocetes, and pinnipeds in the North Atlantic Ocean is discussed in sections 3.6.3.4, 3.7.3.4, and 3.8.3.4 of the NSF/USGS PEIS, respectively. In addition, Section 3.1 of the "Atlantic OCS Proposed Geological and Geophysical Activities Mid-Atlantic and South Atlantic Planning Areas Draft Programmatic Environmental Impact Statement" (Bureau of Ocean Energy Management, 2012) reviews similar information for all marine mammals that may occur within the study area.

Various systematic surveys have been conducted throughout the western North Atlantic Ocean, including within sections of the study area. Records from the Ocean Biogeographic Information System (OBIS) database hosted by Rutgers University and Duke University (Read et al., 2009) were used as the main source of information. The database includes survey data collected during the Cetaceans and Turtle Assessment Program (CeTAP) conducted between 1978 and 1982 that consists of both aerial and vessel-based surveys between Cape Hatteras, North Carolina, and the Gulf of Maine. The database also includes survey data collected during the NMFS Northeast Fisheries Science Center and Southeast Fisheries Science Center stock

assessment surveys conducted in 2004 (surveys between Nova Scotia, Canada, and Florida).

No known current regional or stock abundance estimates are available in the study area of the northwest Atlantic Ocean for the Bryde's whale (Balaenoptera edeni), Fraser's (Lagenodelphis hosei), spinner (Stenella longirostris), and Clymene dolphin (Stenella clymene), and melon-headed (Peponocephala electra), pygmy killer (Feresa attenuata), false killer (Pseudorca crassidens), and killer whales (Orcinus orca). Although NMFS does not have current regional population or stock abundance estimates for these species in the northwest Atlantic Ocean, NMFS provides below general information about their global distribution and occurrence in the survey area.

Bryde's whales are distributed worldwide in tropical and sub-tropical waters. In the western North Atlantic Ocean, Bryde's whales are reported from off the southeastern U.S. and the southern West Indies to Cabo Frio, Brazil (Leatherwood and Reeves, 1983). No stock of Bryde's whales has been identified in U.S. waters of the Atlantic coast.

Fraser's dolphins are distributed worldwide in tropical waters and are assumed to be part of the cetacean fauna of the tropical western North Atlantic (Perrin et al., 1994). There are no abundance estimates for either the western North Atlantic or the northern Gulf of Mexico stocks. The western North Atlantic population is provisionally being considered a separate stock for management purposes, although there is currently no information to differentiate this stock from the northern Gulf of Mexico stock. The numbers of Fraser's dolphins off the U.S. or Canadian Atlantic coast are unknown, and seasonal abundance estimates are not available for this stock, since it was rarely seen in any surveys. The population size for Fraser's dolphins is unknown; however, about 289,000 animals occur in the eastern tropical Pacific Ocean (Jefferson et al., 2008).

Spinner dolphins are distributed in oceanic and coastal tropical waters (Leatherwood et al., 1976). This is presumably an offshore, deep-water species, and its distribution in the Atlantic is poorly known (Schmidly, 1981; Perrin and Gilpatrick, 1994). The western North Atlantic population of spinner dolphins is provisionally being considered a separate stock for management purposes, although there is currently no information to differentiate this stock from the northern Gulf of Mexico stock. The numbers of spinner dolphins off the U.S. or Canadian Atlantic coast are unknown, and seasonal abundance estimates are not available for this stock since it was rarely seen in any of the surveys.

The Clymene dolphin is endemic to tropical and sub-tropical waters of the Atlantic (Jefferson and Curry, 2003). The western North Atlantic population of Clymene dolphins is provisionally considered a separate stock for management purposes, although there is currently no information to differentiate this stock from the northern Gulf of Mexico stock. The numbers of Clymene dolphins off the U.S. or Canadian Atlantic coast are unknown, and seasonal abundance estimates are not available for this species since it was rarely seen in any surveys. The best abundance estimate for the Clymene dolphin in the western North Atlantic was 6,086 in 2003 and represents the first and only estimate to date for this species in the U.S. Atlantic EEZ; however this estimate is older than eight years and is deemed unreliable (Wade and Angliss, 1997; Mullin and Fulling, 2003).

The melon-headed whale is distributed worldwide in tropical to sub-tropical waters (Jefferson et al., 1994). The western North Atlantic population is provisionally being considered a separate stock from the northern Gulf of Mexico stock. The numbers of melon-headed whales off the U.S. or Canadian Atlantic coast are unknown, and seasonal abundance estimates are not available for this stock, since it was rarely seen in any surveys.

The pygmy killer whale is distributed worldwide in tropical to sub-tropical waters and is assumed to be part of the cetacean fauna of the tropical western North Atlantic (Jefferson et al., 1994). The western North Atlantic population of pygmy killer whales is provisionally being considered one stock for management purposes. The numbers of pygmy killer whales off the U.S. or Canadian Atlantic coast are unknown, and seasonal abundance estimates are not available for this stock, since it was rarely seen in any surveys.

The false killer whale is distributed worldwide throughout warm temperate and tropical oceans (Leatherwood and Reeves, 1983). No stock has been identified for false killer whales in U.S. waters off the Atlantic coast.

Killer whales are characterized as uncommon or rare in waters of the U.S. Atlantic EEZ (Katona et al., 1988). Their distribution, however, extends from the Arctic ice-edge to the West Indies, often in offshore and mid-ocean areas. The size of the western North Atlantic stock population off the eastern U.S. coast is unknown. No information on stock differentiation for the Atlantic Ocean population exists, although an analysis of vocalizations of killer whales from Iceland and Norway indicated that whales from these areas may represent different stocks (Moore et al., 1988). There are estimated to be at least approximately 92,500 killer whales worldwide (i.e., 80,000 south of Antarctic Convergence, 445 in Norway, 8,500 in eastern tropical Pacific Ocean, 1,500 in North America coastal waters, and 2,000 in Japanese waters) (Jefferson et al., 2008).

Table 3 (below) presents information on the abundance, distribution, population status, and conservation status of the species of marine mammals that may occur in the planned study area during August to September 2014 and April to August 2015.

Table 3. The habitat, occurrence, range, abundance, and conservation status of marine mammals that may occur in or near the seismic survey area in the northwest Atlantic Ocean off the Eastern Seaboard. (See text and Table 3 in USGS's IHA application for further details.)

Species	Habitat	Occurrence	Range in Atlantic Ocean	Population Estimate in the North Atlantic Region/Stock/Other[3]	ESA[1]	MMPA[2]
Mysticetes						
North Atlantic right whale (Eubalaena glacialis)	Pelagic, shelf and coastal	Regular	Canada to Florida	455/455 (Western Atlantic stock)	EN	D
Humpback whale (Megaptera novaeangliae)	Mainly nearshore, banks	Regular	Canada to Caribbean	11,600[4]/823 (Gulf of Maine stock)	EN	D
Minke whale (Balaenoptera acutorostrata)	Pelagic and coastal	Regular	Arctic to Caribbean	138,000[5]/20,741 (Canadian East Coast stock)	NL	NC
Bryde's whale (Balaenoptera edeni)	Coastal, offshore	Rare	40º North to 40º South	NA/NA/33 (Northern Gulf of Mexico stock)/ 20,000 to 30,000[16] (North Pacific Ocean)	NL	NC
Sei whale (Balaenoptera borealis)	Primarily offshore, pelagic	Rare	Canada to New Jersey	10,300[6]/357 (Nova Scotia stock)	EN	D
Fin whale (Balaenoptera physalus)	Continental slope, pelagic	Regular	Canada to North Carolina	26,500[7]/3,522 (Western North Atlantic stock)	EN	D
Blue whale (Balaenoptera musculus)	Pelagic, shelf, coastal	Rare	Arctic to Florida	855[8]/NA (Western North Atlantic stock, 440 minimum)	EN	D
Odontocetes						
Sperm whale (Physeter macrocephalus)	Pelagic, slope, canyons, deep sea	Regular	Canada to Caribbean	13,190[9]/2,288 (North Atlantic stock)	EN	D
Pygmy sperm whale (Kogia breviceps)	Deep waters off shelf	Rare	Massachusetts to Florida	NA/3,785 (Western North Atlantic stock)	NL	NC
Dwarf sperm whale (Kogia sima)	Deep waters off shelf	Rare	Massachusetts to Florida		NL	NC
Cuvier's beaked whale (Ziphius cavirostris)	Pelagic, slope, canyons	Rare	Canada to Caribbean	NA/6,532 (Western North Atlantic stock)	NL	NC
Northern bottlenose whale (Hyperoodon ampullatus)	Pelagic	Rare	Arctic to New Jersey	40,000[10]/NA (Western North Atlantic stock)	NL	NC

True's beaked whale (Mesoplodon mirus)	Pelagic, slope, canyons	Rare	Canada to Bahamas	NA/7,092 (Western North Atlantic stock)	NL	NC
Gervais' beaked whale (Mesoplodon europaeus)	Pelagic, slope, canyons	Rare	Canada to Florida		NL	NC
Sowerby's beaked whale (Mesoplodon bidens)	Pelagic, slope, canyons	Rare	Canada to Florida		NL	NC
Blainville's beaked whale (Mesoplodon densirostris)	Pelagic, slope, canyons	Rare	Canada to Florida		NL	NC
Bottlenose dolphin (Tursiops truncatus)	Coastal, oceanic, shelf break	Regular	Canada to Florida	NA/77,532 (Western North Atlantic Offshore stock)	NL	NC
Atlantic white-sided dolphin (Lagenorhynchus acutus)	Shelf and slope	Regular	Greenland to North Carolina	10,000 to 100,000s[11]/48,819 (Western North Atlantic stock)	NL	NC
White-beaked dolphin (Lagenorhynchus albirostris)	Shelf, offshore	Rare	Cape Cod to Canada and Europe	7,800[16] (North Sea)/2,003 (Western North Atlantic stock)	NL	NC
Fraser's dolphin (Lagenodelphis hosei)	Shelf and slope	Rare	North Carolina to Florida	NA/NA (Western North Atlantic stock)/ 289,000[16] (eastern tropical Pacific Ocean)	NL	NC
Atlantic spotted dolphin (Stenella frontalis)	Shelf, offshore	Regular	Massachusetts to Caribbean	NA/44,715 (Western North Atlantic stock)	NL	NC
Pantropical spotted dolphin (Stenella attenuata)	Coastal, shelf, slope	Regular	Massachusetts to Florida	NA/3,333 (Western North Atlantic stock)	NL	NC
Striped dolphin (Stenella coeruleoalba)	Off continental shelf, convergence zones, upwelling	Regular	Canada to Caribbean	NA/54,807 (Western North Atlantic stock)	NL	NC
Spinner dolphin (Stenella longirostris)	Mainly nearshore	Rare	Maine to Caribbean	NA/NA (Western North Atlantic stock)/11,441 (Northern Gulf of Mexico stock)/ 1,250,000[16] (eastern tropical Pacific Ocean)	NL	NC
Clymene dolphin (Stenella clymene)	Coastal, shelf, slope	Rare	North Carolina to Florida	NA/NA (Western North Atlantic stock - 6,086 in 2003)/129 (Northern Gulf of	NL	NC

				Mexico stock)		
Short-beaked common dolphin (Delphinus delphis)	Shelf, pelagic, seamounts	Regular	Canada to Georgia	NA/173,486 (Western North Atlantic stock)	NL	NC
Rough-toothed dolphin (Steno bredanensis)	Pelagic	Rare	New Jersey to Florida	NA/271 (Western North Atlantic stock)	NL	NC
Risso's dolphin (Grampus griseus)	Shelf, slope, seamounts	Regular	Canada to Florida	NA/18,250 (Western North Atlantic stock)	NL	NC
Melon-headed whale (Peponocephala electra)	Deep waters off shelf	Rare	North Carolina to Florida	NA/NA (Western North Atlantic stock)/2,235 (Northern Gulf of Mexico stock)/ 45,000[16] (eastern tropical Pacific Ocean)	NL	NC
Pygmy killer whale (Feresa attenuata)	Pelagic	Rare	NA	NA/NA (Western North Atlantic stock)/152 (Northern Gulf of Mexico stock)/ 39,000[16] (eastern tropical Pacific Ocean)	NL	NC
False killer whale (Pseudorca crassidens)	Pelagic	Rare	NA	NA/NA/777 in 2003-2004 (Northern Gulf of Mexico stock)	NL	NC
Killer whale (Orcinus orca)	Pelagic, shelf, coastal	Rare	Arctic to Caribbean	NA/NA (Western North Atlantic stock)/28 (Northern Gulf of Mexico stock)/ At least ~92,500[16] Worldwide	NL	NC
Short-finned pilot whale (Globicephala macrorhynchus)	Mostly pelagic, high relief	Regular	Massachusetts to Florida	780,000[12]/21,515 short-finned pilot whale 26,535 long-finned pilot whale (Western North Atlantic stock)	NL	NC
Long-finned pilot whale (Globicephala melas)	Mostly pelagic	Regular	Canada to South Carolina		NL	NC
Harbor porpoise (Phocoena phocoena)	Shelf, coastal, pelagic	Rare	Canada to North Carolina	~500,000[13]/79,883 (Gulf of Maine/Bay of Fundy stock)	NL	NC
Pinnipeds						
Harbor seal (Phoca vitulina concolor)	Coastal	Rare	Canada to North Carolina	NA/70,142 (Western North Atlantic stock)	NL	NC
Gray seal (Halichoerus grypus)	Coastal, pelagic	Rare	Canada to North Carolina	NA/NA (Western North Atlantic stock, 348,999 minimum in 2012)	NL	NC
Harp seal (Phoca groenlandica)	Ice whelpers, pelagic	Rare	Canada to New Jersey	8.6 to 9.6 million[14]/NA (Western North Atlantic stock, 8.3	NL	NC

				million in 2012)		
Hooded seal (Cystophora cristata)	Ice whelpers, pelagic	Rare	Canada to Caribbean	600,000/NA (Western North Atlantic stock, 592,100 in 2007)	NL	NC

NA = Not available or not assessed.
[1] U.S. Endangered Species Act: EN = Endangered, T = Threatened, DL = Delisted, NL = Not listed.
[2] U.S. Marine Mammal Protection Act: D = Depleted, NC = Not Classified.
[3] NMFS Marine Mammal Stock Assessment Reports.
[4] Best estimate for western North Atlantic 1992 to 1993 (IWC, 2014).
[5] Best estimate for North Atlantic 2002 to 2007 (IWC, 2014).
[6] Estimate for the Northeast Atlantic in 1989 (Cattanach et al., 1993).
[7] Best estimate for North Atlantic 2007 (IWC, 2014) .
[8] Central and Northeast Atlantic 2001 (Pike et al., 2009).
[9] North Atlantic (Whitehead, 2002).
[10] Eastern North Atlantic (NAMMCO, 1995).
[11] North Atlantic (Reeves et al., 1999).
[12] *Globicephala* spp. combined, Central and Eastern North Atlantic (IWC, 2014).
[13] North Atlantic (Jefferson et al., 2008).
[14] Northwest Atlantic (DFO, 2012).
[15] Northwest Atlantic (Andersen et al., 2009).
[16] Jefferson et al. (2008).

Further detailed information regarding the biology, distribution, seasonality, life history, and occurrence of these marine mammal species in the study area can be found in sections 3 and 4 of USGS's IHA application. NMFS has reviewed these data and determined them to be the best available scientific information for the purposes of the IHA.

Potential Effects of the Specified Activity on Marine Mammals

This section includes a summary and discussion of the ways that the types of stressors associated with the specified activity (e.g., seismic airgun operation, vessel movement, gear deployment) have been observed to impact marine mammals. This discussion may also include reactions that we consider to rise to the level of a take and those that we do not consider to rise to the level of take (for example, with acoustics), we may include a discussion of studies that showed animals not reacting at all to sound or exhibiting barely measureable avoidance). This section is intended as a background of potential effects and does not consider either the specific manner in which this activity would be carried out or the mitigation that would be implemented, and how either of those would shape the anticipated impacts from this specific activity. The "Estimated Take by Incidental Harassment" section later in this document will include a quantitative analysis of the number of individuals that are expected to be taken by this activity. The "Negligible Impact Analysis" section will include the analysis of how this specific activity would impact marine mammals and will consider the content of this section, the "Estimated Take by Incidental Harassment" section, the "Mitigation" section, and the "Anticipated Effects on Marine Mammal Habitat" section 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.

When considering the influence of various kinds of sound on the marine environment, it

is necessary to understand that different kinds of marine life are sensitive to different frequencies of sound. Based on available behavioral data, audiograms have been derived using auditory evoked potentials, anatomical modeling, and other data, Southall et al. (2007) designate "functional hearing groups" for marine mammals and estimate the lower and upper frequencies of functional hearing groups" for marine mammals and estimate the lower and upper frequencies of functional hearing of the groups. The functional groups and the associated frequencies are indicated below (though animals are less sensitive to sounds at the outer edge of their functional range and most sensitive to sounds of frequencies within a smaller range somewhere in the middle of their functional hearing range):

- Low-frequency cetaceans (13 species of mysticetes): functional hearing is estimated to occur between approximately 7 Hz and 30 kHz;
- Mid-frequency cetaceans (32 species of dolphins, six species of larger toothed whales, and 19 species of beaked and bottlenose whales): functional hearing is estimated to occur between approximately 150 Hz and 160 kHz;
- High-frequency cetaceans (eight species of true porpoises, six species of river dolphins, Kogia spp., the franciscana [Pontoporia blainvillei], and four species of cephalorhynchids): functional hearing is estimated to occur between approximately 200 Hz and 180 kHz; and
- Phocid pinnipeds in water: functional hearing is estimated to occur between approximately 75 Hz and 100 kHz;
- Otariid pinnipeds in water: functional hearing is estimated to occur between approximately 100 Hz and 40 kHz.

As mentioned previously in this document, 34 marine mammal species (34 cetacean) are

likely to occur in the seismic survey area. Of the 34 cetacean species likely to occur in USGS's action area, 7 are classified as low-frequency cetaceans (i.e., North Atlantic right, humpback, minke, Bryde's, sei, fin, and blue whale), 24 are classified as mid-frequency cetaceans (i.e., sperm, Cuvier's, True's, Gervais', Sowerby's, Blainville's, Northern bottlenose, melon-headed, pygmy killer, false killer, killer, short-finned, and long-finned whale, bottlenose, Atlantic white-sided, Fraser's, Atlantic spotted, pantropical spotted, striped, spinner, Clymene, short-beaked common, rough-toothed, and Risso's dolphin), and 3 are classified as high-frequency cetaceans (i.e., pygmy sperm and dwarf sperm whale and harbor porpoise) (Southall et al., 2007). A species' functional hearing group is a consideration when we analyze the effects of exposure to sound on marine mammals.

Acoustic stimuli generated by the operation of the airguns, which introduce sound into the marine environment, may have the potential to cause Level B harassment of marine mammals in the survey area. The effects of sounds from airgun operations might include one or more of the following: tolerance, masking (of natural sounds including inter- and intra-specific calls), behavioral disturbance, temporary or permanent hearing impairment, or non-auditory physical or physiological effects (Richardson et al., 1995; Gordon et al., 2004; Nowacek et al., 2007; Southall et al., 2007; Wright et al., 2007; Tyack, 2009). Permanent hearing impairment, in the unlikely event that it occurred, would constitute injury, but temporary threshold shift (TTS) is not an injury (Southall et al., 2007). Although the possibility cannot be entirely excluded, it is unlikely that the planned project would result in any cases of temporary or permanent hearing impairment, or any significant non-auditory physical or physiological effects. Based on the available data and studies described here, some behavioral disturbance is expected, but NMFS expects the disturbance to be localized and short-term. NMFS described the range of potential

effects from the specified activity in the notice of the proposed IHA (79 FR 35642, June 23, 2014). A more comprehensive review of these issues can be found in the NSF/USGS PEIS (2011), USGS's "Environmental Assessment for Seismic Reflection Scientific Research Surveys during 2014 and 2014 in Support of Mapping the U.S. Atlantic Seaboard Extended Continental Margin and Investigating Tsunami Hazards" and L-DEO's "Draft Environmental Assessment of a Marine Geophysical Survey by the R/V Marcus G. Langseth in the Atlantic Ocean off Cape Hatteras, September to October 2014."

The notice of the proposed IHA (79 FR 35642, June 23, 2014) included a discussion of the effects of sounds from airguns on mysticetes and odontocetes including tolerance, masking, behavioral disturbance, hearing impairment, and other non-auditory physical effects. NMFS refers the reader to USGS's IHA application and EA for additional information on the behavioral reactions (or lack thereof) by all types of marine mammals to seismic vessels.

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 fish and invertebrates in the notice of the proposed IHA (79 FR 35642, June 23, 2014). The seismic survey will not result in any permanent impacts on habitats used by the marine mammals in the study area, including the food sources they use (i.e., fish and invertebrates), and there will be no physical damage to any habitat. While NMFS anticipates that the specified activity may result in marine mammals avoiding certain areas due to temporary ensonification, this impact to habitat is temporary and reversible, which was considered in further detail in the notice of the proposed IHA (79 FR 35642, June 23, 2014). The main impact associated with the activity will be temporarily elevated noise levels and the associated direct effects on marine mammals.

Mitigation

In order to issue an Incidental Take Authorization (ITA) under section 101(a)(5)(D) of the MMPA, NMFS must set forth the permissible methods of taking pursuant to such activity, and other means of effecting the least practicable impact on such marine mammal species or stock and its habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance, and the availability of such species or stock for taking for certain subsistence uses (where relevant). NMFS's duty under this "least practicable impact" standard is to prescribe mitigation reasonably designed to minimize, to the extent practicable, any adverse population level impacts, as well as habitat impacts. While population-level impacts can be minimized only by reducing impacts on individual marine mammals, not all takes translate to population-level impacts. NMFS's objective under the "least practicable impact" standard is to design mitigation targeting those impacts on individual marine mammals that are most likely to lead to adverse population-level effects.

USGS has reviewed the following source documents and has incorporated a suite of appropriate mitigation measures into their project description.

(1) Protocols used during previous NSF and USGS-funded seismic research cruises as approved by NMFS and detailed in the NSF/USGS PEIS;

(2) Previous IHA applications and IHAs approved and authorized by NMFS; and

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

To reduce the potential for disturbance from acoustic stimuli associated with the planned activities, USGS and/or its designees shall implement the following mitigation measures for marine mammals:

(1) Planning Phase;

(2) Exclusion zones around the airgun(s);

(3) Power-down procedures;

(4) Shut-down procedures;

(5) Ramp-up procedures; and

(6) Special procedures for situations or species of concern.

Planning Phase – Mitigation of potential impacts from the planned activities began during the planning phases of the planned activities. USGS considered whether the research objectives could be met with a smaller source than the full, 36-airgun array (6,600 in^3) used on the Langseth, and determined that the standard 36-airgun array with a total volume of approximately 6,600 in^3 was appropriate. USGS also worked with L-DEO and NSF to identify potential time periods to carry out the survey taking into consideration key factors such as environmental conditions (i.e., the seasonal presence of marine mammals and other protected species), weather conditions, equipment, and optimal timing for other seismic surveys using the Langseth. Most marine mammal species are expected to occur in the study area year-round, so altering the timing of the planned project from spring and summer months likely would result in no net benefits for those species.

Exclusion Zones – USGS use radii to designate exclusion and buffer zones and to estimate take for marine mammals. Table 4 (see below) shows the distances at which one would expect marine mammal exposures to received sound levels (160 and 180/190 dB) from the 36 airgun array and a single airgun. (The 180 dB and 190 dB level shut-down criteria are applicable to cetaceans and pinnipeds, respectively, as specified by NMFS [2000].) USGS used these levels to establish the exclusion and buffer zones.

Table 4**.** Measured (array) or predicted (single airgun) distances to which sound levels ≥ 190, 180, and 160 dB re 1 µPa (rms) could be received in deep water during the seismic survey in the northwest Atlantic Ocean off the Eastern Seaboard, August to September 2014 and April to August 2015.

Sound Source and Volume	Tow Depth (m)	Water Depth (m)	Predicted RMS Radii Distances (m)		
			190 dB	180 dB	160 dB
Single Bolt airgun (40 in^3)	9	>1,000 m	13 m (42.7 ft) *100 m will be used for pinnipeds as well as cetaceans*	100 m (328.1 ft)	388 m (1,273 ft)
36 airguns (6,600 in^3)	9	>1,000 m	286 m (938.3 ft)	927 m (3,041.3 ft)	5,780 m (18,963.3 ft)

PSVO's will be based aboard the seismic source vessel and would watch for marine mammals near the vessel during daytime airgun operations and during any ramp-ups of the airguns at night (see the "Vessel-Based Visual Monitoring" section for a more detailed description of the PSVOs). If the PSVO 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 shut-down if necessary (see "Shut-down Procedures"). Table 4 (see above) summarizes the calculated distances at which sound levels (160, 180 and 190 dB [rms]) are expected to be received from the 36 airgun array and the single airgun operating in deep water depths. Received sound levels have been calculated by USGS, in relation to distance and direction from the airguns, for the 36 airgun array and for the single 1900LL 40 in^3 airgun, which would be used during power-downs.

Power-down Procedures – A power-down involves decreasing the number of airguns in use to one airgun, such that the radius of the 180 dB or 190 dB zone is decreased to the extent that the observed marine mammal(s) are no longer in or about to enter the exclusion zone for the

full airgun array. During a power-down for mitigation, USGS would operate one small airgun. The continued operation of one airgun is intended to (a) alert marine mammals to the presence of the seismic vessel in the area; and (b) retain the option of initiating a ramp-up to full operations under poor visibility conditions. In contrast, a shut-down occurs when all airgun activity is suspended.

If the PSVO detects a marine mammal outside the exclusion zone that is likely to enter the exclusion zone, USGS will power-down the airguns to reduce the size of the 180 dB or 190 dB exclusion zone before the animal is within the exclusion zone. Likewise, if a mammal is already within the exclusion zone, when first detected USGS would power-down the airguns immediately. During a power-down of the airgun array, USGS would operate the single 40 in^3 airgun, which has a smaller exclusion zone. If the PSVO detects a marine mammal within or near the smaller exclusion zone around that single airgun (see Table 4), USGS will shut-down the airgun (see "Shut-Down Procedures").

Resuming Airgun Operations After a Power-down - Following a power-down, the Langseth will not resume full airgun activity until the marine mammal has cleared the 180 or 190 dB exclusion zone (see Table 4). The PSVO will consider the animal to have cleared the exclusion zone if:

- The PSVO has visually observed the animal leave the exclusion zone, or
- A PSVO 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 vessel has transited outside the original 180 dB or 190 dB exclusion zone after a 10 minute wait period.

The Langseth crew will 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 will 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).

Because the vessel would have transited away from the vicinity of the original sighting during the 10 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) will not meaningfully increase the effectiveness of observing marine mammals approaching or entering the exclusion zone for the full source level and will not further minimize the potential for take. The Langseth's PSVOs will continually monitor the exclusion zone for the full source level while the mitigation airgun is firing. On average, PSVOs can observe to the horizon (10 km or 5.4 nmi) from the height of the Langseth's observation deck and should be able to state with a reasonable degree of confidence whether a marine mammal will be encountered within this distance before resuming airgun operations at full-power.

Shut-down Procedures - USGS will shut-down the operating airgun(s) if a marine mammal is seen within or approaching the exclusion zone for the single airgun. USGS will implement a shut-down:

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

(2) If an animal is initially seen within the exclusion zone of the single airgun when more than one airgun (typically the full airgun array) is operating (and it is not practical or adequate to reduce exposure to less than 180 dB [rms] or 190 dB [rms]).

Considering the conservation status for the North Atlantic right whale, the airguns will be shut-down immediately in the unlikely event that this species is observed, regardless of the distance from the Langseth. Ramp-up will only begin if the North Atlantic right whale has not been seen for 30 minutes.

Resuming Airgun Operations After a Shut-down - Following a shut-down in excess of 10 minutes, the Langseth crew would initiate a ramp-up with the smallest airgun in the array (40 in^3). The crew will 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 PSVOs will monitor the exclusion zone, and if they sight a marine mammal, the Langseth crew will implement a power-down or shut-down as though the full airgun array were operational.

During periods of active seismic operations, there are occasions when the Langseth crew will 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 will follow ramp-up procedures for a shut-down described earlier and the PSVOs will monitor the full exclusion zone and will implement a power-down or shut-down if necessary.

If the full exclusion zone is not visible to the PSVO for at least 30 minutes prior to the start of operations in either daylight or nighttime, the Langseth crew will 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 will not ramp-up the

airgun array from a complete shut-down at night or during poor visibility conditions (i.e., in thick fog), because the outer part of the zone for that array will not be visible during those conditions.

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

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. USGS will follow a ramp-up procedure when the airgun array begins operating after a 10 minute period without airgun operations or when a power-down or shut-down has exceeded that period. USGS and L-DEO have used similar periods (approximately 8 to 10 minutes) during previous USGS and L-DEO seismic surveys.

Ramp-up will begin with the smallest airgun in the array (40 in^3). Airguns will be added 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 (i.e., the time it takes to achieve full operation of the airgun array). During ramp-up, the PSVOs will monitor the exclusion zone, and if marine mammals are sighted, USGS will 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, USGS will 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 airgun array will not be ramped-up from a complete shut-down at night or during poor visibility conditions (i.e., in thick fog), because the outer part of the exclusion zone for that array will not be visible during those conditions. If one airgun has operated during a power-down period, ramp-up to full power will be permissible at night or in poor visibility, on the assumption that marine mammals will be alerted to the approaching seismic vessel by the sounds from the single airgun and could move away. USGS will not initiate a ramp-up of the airguns if a marine mammal is sighted within or near the applicable exclusion zones.

Use of a Small-Volume Airgun during Turns and Maintenance

For short-duration equipment maintenance activities, USGS will employ the use of a small-volume airgun (i.e., 40 in^3 "mitigation airgun") to deter marine mammals from being within the immediate area of the seismic operations. The mitigation airgun will be operated at approximately one shot per minute and will not be operated for longer than three hours in duration. The seismic survey's tracklines are continuous around turns and no mitigation airgun would be necessary. For longer-duration equipment maintenance or repair activities (greater than three hours), USGS will shut-down the seismic equipment and not involve using the mitigation airgun.

During brief transits (e.g., less than three hours), one mitigation airgun will continue operating. The ramp-up procedure will still be followed when increasing the source levels from one airgun to the full airgun array. However, keeping one airgun firing will avoid the prohibition

of a "cold start" during darkness or other periods of poor visibility. Through use of this approach, seismic operations may resume without the 30 minute observation period of the full exclusion zone required for a "cold start," and without ramp-up if operating with the mitigation airgun for under 10 minutes, or with ramp-up if operating with the mitigation airgun over 10 minutes. PSOs will be on duty whenever the airguns are firing during daylight, during the 30 minute periods prior to ramp-ups.

Special Procedures for Situations or Species of Concern - It is unlikely that a North Atlantic right whale will be encountered during the seismic survey, but if so, the airguns will be shut-down immediately if one is visually sighted at any distance from the vessel because of its rarity and conservation status. The airgun array shall not resume firing (with ramp-up) until 30 minutes after the last documented North Atlantic right whale visual sighting. Concentrations of humpback, sei, fin, blue, and/or sperm whales will be avoided if possible (i.e., exposing concentrations of animals to 160 dB), and the array will be powered-down 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.).

Mitigation Conclusions

NMFS has carefully evaluated the applicant's mitigation measures and has considered a range of other measures in the context of ensuring that NMFS prescribes the means of effecting the least practicable impact on the affected marine mammal species or stocks and their habitat. NMFS's evaluation of potential measures included consideration of the following factors in relation to one another:

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

(2) The proven or likely efficacy of the specific measure to minimize adverse impacts as planned; and

(3) The practicability of the measure for applicant implementation including consideration of personnel safety, practicality of implementation, and impact on the effectiveness of the activity.

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 below:

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

(2) A reduction in the numbers of marine mammals (total number of number at biologically important time or location) exposed to received levels of airgun operations, or other activities expected 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 received levels of airgun operations, or other activities expected 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 received levels of airgun operations, or other activities expected 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 of 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 NMFS's evaluation of the applicant's measures, as well as other measures considered by NMFS or recommended by the public, NMFS has determined that the required 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 and Reporting

In order to issue an ITA 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 ITAs must include the suggested means of accomplishing the necessary monitoring and reporting that would result in increased knowledge of the species and of the level of taking or impacts on populations of marine mammals that are expected to be present in the action area. USGS submitted a marine mammal monitoring plan as part of the IHA application. It can be found in Section 13 of the IHA application. The plan may be modified or supplemented 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 in general to generate more data to contribute to the analyses mentioned below;

(2) An increase in our understanding of how many marine mammals are likely to be exposed to levels of seismic airguns that we associate with specific adverse effects, such as behavioral harassment, TTS or PTS;

(3) An increase in our understanding of how marine mammals respond to stimuli expected to result in take and how 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:

- Behavioral observations in the presence of stimuli compared to observations in the absence of stimuli (need to be able to accurately predict received level, distance from source, and other pertinent information);
- Physiological measurements in the presence of stimuli compared to observations in the absence of stimuli (need to be able to accurately predict receive level, distance from the source, and other pertinent information);
- 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

USGS will conduct marine mammal monitoring during the seismic survey, in order to implement the mitigation measures that require real-time monitoring, and to satisfy the anticipated monitoring requirements of the IHA. USGS's "Monitoring Plan" is described below this section. The monitoring work described here has been planned as a self-contained project independent of any other related monitoring projects that may be occurring simultaneously in the same region. USGS is prepared to discuss coordination of its monitoring program with any related work that might be done by other groups insofar as this is practical and desirable.

Vessel-based Visual Monitoring

USGS's PSVOs will be based aboard the seismic source vessel and will watch for marine mammals near the vessel during daytime airgun operations and during any ramp-ups of the airguns at night. PSVOs will also watch for marine mammals near the seismic vessel for at least 30 minutes prior to the start of airgun operations after an extended shut-down (i.e., greater than approximately 10 minutes for this cruise). When feasible, PSVOs will conduct observations during daytime periods when the seismic system is not operating (such as during transits) for comparison of sighting rates and behavior with and without airgun operations and between acquisition periods. Based on PSVO observations, the airguns will be powered-down or shut-down when marine mammals are observed within or about to enter a designated exclusion zone.

During seismic operations in the northwest Atlantic Ocean off the Eastern Seaboard, at least five PSOs (four PSVOs and one Protected Species Acoustic Observer [PSAO]) will be based aboard the Langseth. USGS will appoint the PSOs with NMFS's concurrence. Observations will take place during ongoing daytime operations and nighttime ramp-ups of the airguns. During the majority of seismic operations, two PSVOs will be on duty from the observation tower (i.e., the best available vantage point on the source vessel) to monitor marine

mammals near the seismic vessel. Use of two simultaneous PSVOs will increase the effectiveness of detecting animals near the source vessel. However, during meal times and bathroom breaks, it is sometimes difficult to have two PSVOs on effort, but at least one PSVO will be on duty. PSVO(s) will be on duty in shifts no longer than 4 hours in duration.

Two PSVOs will be on visual watch during all daytime ramp-ups of the seismic airguns. A third PSAO will monitor the PAM equipment 24 hours a day to detect vocalizing marine mammals present in the action area. In summary, a typical daytime cruise will have scheduled two PSVOs on duty from the observation tower, and a third PSAO on PAM. Other ship's crew will also be instructed to assist in detecting marine mammals and implementing mitigation requirements (if practical). Before the start of the seismic survey, the crew will be given additional instruction on how to do so.

The Langseth is a suitable platform for marine mammal observations. When stationed on the observation platform, the eye level will be approximately 21.5 m (70.5 ft) above sea level, and the PSVOs will have a good view around the entire vessel. During daytime, the PSVO(s) will 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 or low-light conditions, night vision devices (monoculars) and a forward looking infrared (FLIR) camera will be available, when required. Laser range-finding binoculars (Leica LRF 1200 laser rangefinder or equivalent) will be available to assist with distance estimation. Those are useful in training observers to estimate distances visually, but are generally not useful in measuring distances to animals directly; that is done primarily with the reticles in the binoculars.

When marine mammals are detected within or about to enter the designated exclusion zone, the airguns will immediately be powered-down or shut-down if necessary. The PSVO(s)

will continue to maintain watch to determine when the animal(s) are outside the exclusion zone by visual confirmation. Airgun operations will not resume until the animal is confirmed to have left the exclusion 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).

Vessel-based Passive Acoustic Monitoring

Vessel-based, towed PAM will complement the visual 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. PAM can be used in addition to visual observations to improve detection, identification, and localization of cetaceans. The PAM system will serve to alert visual observers (if on duty) when vocalizing cetaceans are detected. It is only useful when marine mammals call, but it does not depend on good visibility. It will be monitored in real-time so that the PSVOs can be advised when cetaceans are acoustically detected.

The PAM system consists of both hardware (i.e., hydrophones) and software (i.e., Pamguard). The "wet end" of the system consists of a towed hydrophone array that is 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 is attached to the free end of the cable, and the cable is typically towed at depths 20 m (65.6 ft) or less. The array would be deployed from a winch located on the back deck. A deck cable will connect from the winch to the main computer laboratory where the acoustic station, signal conditioning, and processing system would be located. The acoustic signals received by the hydrophones are amplified, digitized, and

then processed by the Pamguard software. The PAM system, which has a configuration of 4 hydrophones, can detect a frequency bandwidth of 10 Hz to 200 kHz.

One PSAO, an expert bioacoustician (in addition to the four PSVOs) with primary responsibility for PAM, would be onboard the Langseth. The expert bioacoustician will design and set up the PAM system and be present to operate, oversee, and troubleshoot any technical problems with the PAM system during the planned survey. The towed hydrophones will ideally be monitored by a PSO 24 hours per day while within the seismic survey area during airgun operations, and during most periods when the Langseth is underway while the airguns are not operating. PSOs will take turns rotating on visual watch and on the PAM system. However, PAM may not be possible if damage occurs to the array or back-up systems during operations. The primary PAM 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 PSO will 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 PSAO monitoring the acoustical data would be on shift for no greater than six hours at a time. All PSOs are expected to rotate through the PAM position, although the expert PSAO (most experienced) will be on PAM duty more frequently.

When a vocalization is detected while visual observations (during daylight) are in progress, the PSAO will contact the PSVO immediately, to alert him/her to the presence of cetaceans (if they have not already been seen), and to allow a power-down or shut-down to be initiated, if required. When bearings (primary and mirror-image) to calling cetacean(s) are determined, the bearings would be relayed to the PSVO(s) to help him/her sight the calling

animal. During non-daylight hours, when a cetacean is detected by acoustic monitoring and may be close to the source vessel, the Langseth crew will be notified immediately so that the proper mitigation measure may be implemented.

The information regarding the call will be entered into a database. Data entry will 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. The acoustic detection can also be recorded for further analysis.

PSO Data and Documentation

PSVOs will record data to estimate the numbers of marine mammals exposed to various received sound levels and to document apparent disturbance reactions or lack thereof. Data would be used to estimate numbers of animals potentially 'taken' by harassment. 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 appropriate exclusion zone. Observations will also be made during daytime periods when the Langseth is underway without seismic operations. There will also be opportunities to collect baseline biological data during the transits to, from, and through the study area.

When a sighting is made, the following information about the sighting will be recorded:

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, Beaufort sea state and wind force, visibility, and sun glare.

The data listed under (2) will also be recorded 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.

All observations and ramp-ups, power-downs, or shut-downs will be recorded in a standardized format. The PSVOs will record this information onto datasheets. During periods between watches and periods when operations are suspended, those data will be entered into a laptop computer running a custom electronic database. The accuracy of the data entry will be verified by computerized data validity checks as the data are entered and by subsequent manual checking of the database. These procedures will allow initial summaries of data to be prepared 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 shut-down).

2. Information needed to estimate the number of marine mammals potentially taken by harassment, which must be reported to NMFS.

3. Data on the occurrence, distribution, and activities of marine mammals in the area where the seismic study is conducted.

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

5. Data on the behavior and movement patterns of marine mammals seen at times with and without seismic activity.

Reporting

USGS will submit a comprehensive report to NMFS and NSF within 90 days after the end of phase 1 in 2014 and another comprehensive report to NMFS and NSF within 90 days after the end of phase 2 in 2015 for the cruise. The report will describe the operations that were conducted and sightings of marine mammals within the vicinity of the operations. The report will provide full documentation of methods, results, and interpretation pertaining to all monitoring. The 90-day report will summarize the dates and locations of seismic operations, and all marine mammal sightings (i.e., dates, times, locations, activities, associated seismic survey activities, and associated PAM detections). The report will minimally include:

- Summaries of monitoring effort – total hours, total distances, and distribution of marine mammals through the study period accounting for Beaufort sea state and wind force, and other factors affecting visibility and detectability of marine mammals;
- Analyses of the effects of various factors influencing detectability of marine mammals including Beaufort sea state and wind force, number of PSOs, and fog/glare;
- Species composition, occurrence, and distribution of marine mammals sightings including date, water depth, numbers, age/size/gender, and group sizes; and analyses of the effects of seismic operations;
- Sighting rates of marine mammals during periods with and without airgun activities (and other variables that could affect detectability);
- Initial sighting distances versus airgun activity state;
- Closest point of approach versus airgun activity state;

- Observed behaviors and types of movements versus airgun activity state;
- Numbers of sightings/individuals seen versus airgun activity state; and
- Distribution around the source vessel versus airgun activity state.

The report will also include estimates of the number and nature of exposures that could result in "takes" of marine mammals by harassment or in other ways. After the report is considered final, it will be publicly available on the NMFS, USGS, and NSF websites at: http://www.nmfs.noaa.gov/pr/permits/incidental.htm#iha, http://woodshole.er.usgs.gov/project-pages/environmental_compliance/index.html, and http://www.nsf.gov/geo/oce/encomp/index.jsp.

Reporting Prohibited Take - 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), the USGS shall immediately cease the specified activities and immediately report the incident to the Incidental Take Program Supervisor, Permits and Conservation Division, Office of Protected Resources, NMFS, at 301-427-8401 and/or by e-mail to Jolie.Harrison@noaa.gov and Howard.Goldstein@noaa.gov, the NMFS Greater Atlantic Region Marine Mammal Stranding Network at 866-755-6622 (Mendy.Garron@noaa.gov), and the NMFS Southeast Region Marine Mammal Stranding Network at 877-433-8299 (Blair.Mase@noaa.gov and Erin.Fougeres@noaa.gov). 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 used 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 animal(s) involved;
- Fate of the animal(s); and
- Photographs or video footage of the animal(s) (if equipment is available).

USGS shall not resume its activities until NMFS is able to review the circumstances of the prohibited take. NMFS shall work with USGS to determine what is necessary to minimize the likelihood of further prohibited take and ensure MMPA compliance. The USGS may not resume their activities until notified by NMFS via letter, e-mail, or telephone.

Reporting an Injured or Dead Marine Mammal with an Unknown Cause of Death - In the event that USGS discovers an injured or dead marine mammal, and the lead PSO 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 NMFS describes in the next paragraph), the USGS would immediately report the incident to the Incidental Take Program Supervisor, Permits and Conservation Division, Office of Protected Resources, at 301-427-8401 and/or by email to Jolie.Harrison@noaa.gov and Howard.Goldstein@noaa.gov, the NMFS Greater Atlantic Region Marine Mammal Stranding Network (866-755-6622) and/or by e-mail to the Greater Atlantic Regional Stranding Coordinator (Mendy.Garron@noaa.gov), and the NMFS Southeast Region Marine Mammal Stranding Network (877-433-8299) and/or by e-mail to the Southeast Regional

Stranding Coordinator (Blair.Mase@noaa.gov) and Southeast Regional Stranding Program Administrator (Erin.Fougeres@noaa.gov). 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 will work with the USGS to determine whether modifications in the activities are appropriate.

Reporting an Injured or Dead Marine Mammal Not Related to the Activities - In the event that USGS discovers an injured or dead marine mammal, and the lead PSO 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), the USGS will report the incident to the Incidental Take Program Supervisor, Permits and Conservation Division, Office or Protected Resources, at 301-427-8401 and/or by email to Jolie.Harrison@noaa.gov and Howard.Goldstein@noaa.gov, the NMFS Greater Atlantic Region Marine Mammal Stranding Network (866-755-6622), and/or by e-mail to the Greater Atlantic Regional Stranding Coordinator (Mendy.Garron@noaa.gov), and the NMFS Southeast Region Marine Mammal Stranding Network (877-433-8299), and/or by e-mail to the Southeast Regional Stranding Coordinator (Blair.Mase@noaa.gov) and Southeast Regional Stranding Program Administrator (Erin.Fougeres@noaa.gov), within 24 hours of the discovery. The USGS will provide photographs or video footage (if available) or other documentation of the stranded animal sighting to NMFS and the Marine Mammal Stranding Network. Activities may continue while NMFS reviews the circumstances of the incident.

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].

Table 5. NMFS's current underwater acoustic exposure criteria:

Impulsive (Non-Explosive) Sound		
Criterion	Criterion Definition	Threshold
Level A harassment (injury)	Permanent threshold shift (PTS) (Any level above that which is known to cause TTS)	180 dB re 1 µPa-m (root means square [rms]) (cetaceans) 190 dB re 1 µPa-m (rms) (pinnipeds)
Level B harassment	Behavioral disruption (for impulsive noise)	160 dB re 1 µPa-m (rms)
Level B harassment	Behavioral disruption (for continuous noise)	120 dB re 1 µPa-m (rms)

Level B harassment is anticipated and authorized as a result of the marine seismic survey in the northwest Atlantic Ocean off the Eastern Seaboard. Acoustic stimuli (i.e., increased underwater sound) generated during the operation of the seismic airgun array are expected to result in the behavioral disturbance of some marine mammals. There is no evidence that the planned activities for which USGS seeks the IHA could result in injury, serious injury, or mortality. The required mitigation and monitoring measures will minimize any potential risk for injury, serious injury, or mortality.

The following sections describe USGS's methods to estimate take by incidental harassment and present the applicant's and NMFS's estimates of the numbers of marine mammals that could be affected during the seismic project in the northwest Atlantic Ocean. The estimates are based on a consideration of the number of marine mammals that could be harassed by seismic operations with the 36 airgun array to be used. The length of the planned 2D seismic survey area in 2014 is approximately 3,165 km (1,704 nmi) and in 2015 is approximately 3,115 km (1,682 nmi) in the U.S. ECS region of the Eastern Seaboard in the Atlantic Ocean, as

depicted in Figure 1 of the IHA application. For estimating take and other calculations, the 2015 tracklines are assumed to be identical in length to the 2014 tracklines (even though they are slightly shorter).

NMFS and USGS assumes that, during simultaneous operations of the airgun array and the other sources, any marine mammals close enough to be affected by the multi-beam echosounder and sub-bottom profiler will already be affected by the airguns. However, whether or not the airguns are operating simultaneously with the other sources, marine mammals are expected to exhibit no more than short-term and inconsequential responses to the multi-beam echosounder and sub-bottom profiler given their characteristics (e.g., narrow, downward-directed beam) and other considerations described previously in the notice of the proposed IHA (79 FR 35642, June 23, 2014). Such reactions are not considered to constitute "taking" (NMFS, 2001). Therefore, NMFS and USGS provided no additional allowance for animals that could be affected by sound sources other than airguns and NMFS has not authorized take from these other sound sources.

Density estimates for marine mammals within the vicinity of the planned study area are limited. Density data for species found along the East Coast of the U.S. generally extend slightly outside of the U.S. EEZ. The study area, however, is well beyond the U.S. EEZ, and is well off the continental shelf break. The planned survey lines for the 2014 survey are located in the far eastern portion of the study area, primarily within the area where little to no density data are currently available. It was determined that the best available information for density data (for those species where density data existed) of species located off the U.S. East Coast was housed at the Strategic Environmental and Development Program (SERDP)/National Aeronautics and Space Administration (NASA)/NOAA Marine Animal Model Mapper and OBIS-SEAMAP

database. Within this database, the model outputs for all four seasons from the U.S. Department of the Navy Operating Area (OPAREA) Density Estimates (NODE) for the Northeast OPAREA and Southeast OPAREA (Department of the Navy 2007a, 2007b) were used to determine the mean density (animals per square kilometer) for 19 of the 34 marine mammals with the potential to occur in the study area. Those species include fin, minke, Atlantic spotted, bottlenose, long-finned and short-finned pilot, pantropical spotted, Risso's, short-beaked common, striped, sperm, rough-toothed, dwarf and pygmy sperm, Sowerby's, Blainville's, Gervais', True's, and Cuvier's beaked whales. Within the NODE document, the density calculations and models both took into account detection probability (f[0]) and availability (g[0]) biases. Model outputs for each season are available in the database. The data from the NODE summer density models, which include the months of June, July, and August, were used as the 2014 survey is planned to take place between late August and early September. Of the seasonal NODE density models available, it is expected that the summer models are the most accurate and robust as the survey data used to create all of the models were obtained during summer months. The models for the winter, spring, and fall are derived from the data collected during the summer surveys, and therefore are expected to be less representative of actual species density during those seasons.

For species for which densities were unavailable as described above, but for which there were Ocean Biogeographic Information System (OBIS) sightings within or adjacent to the planned study area, NMFS has included an authorized take for the mean group size for the species. Generally, to quantify this coverage, NMFS assumed that USGS could potentially encounter one group of each species during each of the seismic survey legs (recognizing that interannual variation and the potential presence of ephemeral features could drive differing encounter possibilities in the two legs), and NMFS thinks it is reasonable to use the average

(mean) groups size (weighted by effort and rounded up) to estimate the take from these potential encounters. The mean group size were determined based on data reported from the Cetacean and Turtle Assessment Program (CeTAP) surveys (CeTAP, 1982) and the Atlantic Marine Assessment Program for Protected Species (AMAPPS) surveys in 2010, 2011, 2012, and 2013. Because we believe it is unlikely, we do not think it is necessary to assume that the largest group size will be encountered. PSOs based on the vessel will record data to estimate the numbers of marine mammals exposed to various received sound levels and to document apparent disturbance reactions or lack thereof. Data would be used to estimate numbers of animals potentially "taken" by harassment. If the estimated numbers of animals potentially "taken" by harassment approach or exceed the number of authorized takes, USGS will have to re-initiate consultation with NMFS under the MMPA and/or ESA.

The estimated numbers of individuals potentially exposed to sound during the planned 2014 to 2015 survey are presented below and are based on the 160 dB (rms) criterion currently used for all cetaceans and pinnipeds. It is assumed that marine mammals exposed to airgun sounds that strong could change their behavior sufficiently to be considered "taken by harassment." Table 6 shows the density estimates calculated as described above and the estimates of the number of different individual marine mammals that potentially could be exposed to greater than or equal to 160 dB (rms) during the seismic survey if no animals moved away from the survey vessel. The authorized take is given in the middle (fourth from the left) column of Table 6.

With respect to the take authorized for North Atlantic right whales, NMFS's Office of Protected Resources, Permits and Conservation Division, \ formally consulted under section 7 of the ESA with NMFS's Office of Protected Resources, Endangered Species Act Interagency

Cooperation Division, on the issuance of an IHA under section 101(a)(5)(D) of the MMPA for this activity. NMFS's Office of Protected Resources, Endangered Species Act Interagency Cooperation Division issued a Biological Opinion and ITS that included 3 takes of North Atlantic right whales. To comply with the ITS, NMFS's Office of Protected Resources, Permits and Conservation Division has also authorized 3 takes of North Atlantic right whales incidental to USGS's seismic survey.

It should be noted that unlike previous USGS, NSF, and L-DEO seismic surveys aboard the Langseth, the planned survey would be conducted as almost one continuous line. Therefore, the ensonified area for the seismic survey does not include a contingency factor (typically increased 25% to accommodate turns, lines that may need to be repeated, equipment testing, etc.) in line-kilometers. As typical during offshore ship surveys, inclement weather and equipment malfunctions are likely to cause delays and may limit the number of useful line-kilometers of seismic operations that can be undertaken. Also, any marine mammal sightings within or near the designated exclusion zones will result in a power-down and/or shut-down of seismic operations as a mitigation measure. Thus, the following estimates of the numbers of marine mammals potentially exposed to 160 dB (rms) sounds are precautionary and probably overestimate the actual numbers of marine mammals that could be involved. These estimates assume that there will be no weather, equipment, or mitigation delays, which is highly unlikely.

The number of different individuals that could be exposed to airgun sounds with received levels greater than or equal to 160 dB (rms) on one or more occasions can be estimated by considering the total marine area that will be within the 160 dB (rms) radius around the operating seismic source on at least one occasion, along with the expected density of animals in the area. The number of possible exposures (including repeated exposures of the same individuals) can be

estimated by considering the total marine area that will be within the 160 dB radius around the operating airguns. In many seismic surveys, this total marine area includes overlap, as seismic surveys are often conducted in parallel survey lines where the ensonified areas of each survey line would overlap. The planned tracklines in 2014 and 2015 will not have overlap as the individual line segments do not run parallel to each other. The entire survey could be considered one continual survey line with slight turns (no more than 120 degrees) between each line segment. During the planned seismic survey, the vessel would continue on the extensive survey line path, not staying within a smaller defined area as most seismic surveys often do. The numbers of different individuals potentially exposed to greater than or equal to 160 dB (rms) were calculated by multiplying the expected species density (for those marine mammal species that had density data available) times the total anticipated area to be ensonified to that level during airgun operations (3,165 km of survey lines). The total area expected to be ensonified was determined by multiplying the total trackline distance (3,165 km times the width of the swath of the 160 dB buffer zone (2 times 5.78 km). Using this approach, a total of 36,600 km^2 (10,671 nmi^2) will fall within the 160 dB isopleth throughout the planned survey in 2014. The planned survey in 2015 is expected to ensonify an almost identical area (to within 2%); therefore, the same ensonified area of 36,600 km^2 (10,671 nmi^2) was used for calculation purposes since the number of estimated takes would be very similar for each of the two years. The number of estimated takes for the planned survey in 2015 may need to be seasonally adjusted if the activity takes place in the late spring or early summer. Because it is uncertain at this time whether the 2015 survey will be scheduled in the spring (April and May) or summer (June, July, and August) months, estimated takes were calculated for both seasons. For purposes of conservatively estimating the number of takes, the higher density (for spring or summer) was used for each

species since it is not known at this time which season the 2015 planned survey will take place in the April to August 2015 timeframe. If the 2015 survey occurred in the spring rather than summer, the density data suggests that takes will likely be higher for only the humpback whale, beaked whales, and bottlenose dolphin, and takes will likely be fewer for nine species (i.e., sperm whale, short-finned and long-finned pilot whales, Atlantic spotted, pantropical spotted, striped, Clymene, short-beaked common, and Risso's dolphin), and unchanged for the remaining species.

Table 6. Estimated densities of marine mammal species and estimates of numbers of marine mammals exposed to sound levels ≥160 dB during USGS's seismic survey in the northwest Atlantic Ocean off the Eastern Seaboard, August to September 2014 and April to August 2015.

Species	Density Spring/Summer (#/km^2)[1] *Mean Group Size*	Calculated Take Authorization 2014/2015[i.e., Estimated Number of Individuals Exposed to Sound Levels ≥160 dB re 1 µPa][2]	Authorized Take for 2014/2015(includes increase to average group size)[3]	Abundance (Regional Population/Stock)[4]	Approximate Percentage of Estimated of Regional Population/Stock 2014 to 2015 for Authorized Take (Stock Pro-rated for 80% Outside EEZ in 2014 and 90% Outside U.S. EEZ in 2015)[5]	Population Trend[6]
Mysticetes						
North Atlantic right whale	NA *3*	0/0	3 + 3 = 6 *MMPA Proposed IHA* (1 or 2) + (1 or 2) = 3 *Authorized to Comply with ESA ITS*	455/455	0.66/0.66 (0.44)	Increasing
Humpback whale	0.0010170/0 *3*	0/38	3 + 38 = 41	11,600/823	0.35/4.98 (0.61)	Increasing
Minke whale	0.0000350/ 0.0000360	2/2	2 + 2= 4	138,000/20,741	0.0014/0.0096 (<0.01)	NA
Bryde's whale	NA *3*	0/0	3 + 3 = 6	NA/NA	NA/NA (NA)	NA
Sei whale	NA *3*	0/0	3 + 3 = 6	10,300/357	0.06/1.68 (0.56)	NA
Fin whale	0.000060/ 0.000061	3/3	3 + 3 = 6	26,500/3,522	0.02/0.17 (0.06)	NA
Blue whale	NA *1*	0/0	1 + 1 = 2	855/NA (440 minimum)	0.23/0.45 (0.45)	NA
Odontocetes						
Sperm whale	0.0019050/ 0.0022510	83/83	83 + 83 = 166	13,190/2,288	1.26/7.26 (1.14)	NA
Pygmy sperm whale	0.0008850/ 0.008970	33/33	33 + 33 = 66	NA/3,785	NA/1.74 (0.29)	NA
Dwarf sperm whale	0.0008850/ 0.0008970	33/33	33 + 33 = 66	NA/3,785	NA/1.74 (0.29)	NA
Northern bottlenose whale	NA *2*	0/0	2 + 2 = 4	40,000/NA	0.01/NA (NA)	NA

Cuvier's beaked whale	0.0021370/ 0.0022870	84/84	84 + 84 = 168	NA/6,532	NA/1.29 (0.4)	NA
Mesoplodon spp. (i.e., True's, Gervais', Sowerby's, and Blainville's beaked whale				NA/7,092	NA/2.37 (0.37)	NA
Bottlenose dolphin	0.0069560/ 0.0066470	244/255	244 + 255 = 499	NA/77,532	NA/0.64 (0.1)	NA
Atlantic white-sided dolphin	NA *33*	0/0	33 + 33 = 66	10,000 to 100,000s/48,819	0.66/0.14 (0.02)	NA
Fraser's dolphin	NA *100*	0/0	100 + 100 = 200	NA/NA	NA/NA (NA)	NA
Atlantic spotted dolphin	0.0285700/ 0.0288400	1,056/1,056	1,056 + 1,056 = 2,112	NA/44,715	NA/4.72 (0.71)	NA
Pantropical spotted dolphin	0.0194900/ 0.0197600	724/724	724 + 724 = 1,448	NA/3,333	NA/43.44 (6.54)	NA
Striped dolphin	0.1330000/ 0.1343000	4,916/4,916	4,916 + 4,916 = 9,832	NA/54,807	NA/17.94 (2.69)	NA
Spinner dolphin	NA *65*	0/0	65 + 65 = 130	NA/NA	NA/NA (NA)	NA
Clymene dolphin	0.0093110/0 *52*	0/341	52 + 341 = 393	NA/NA	NA/NA (NA)	NA
Short-beaked common dolphin	0.0053940/ 0.0055320	203/203	203 + 203 = 406	NA/173,486	NA/0.23 (0.04)	NA
Rough-toothed dolphin	0.004200/ 0.0004260	16/16	16 + 16 = 32	NA/271	NA/11.81 (2.21)	NA
Risso's dolphin	0.0092150/ 0.0093180	342/342	342 + 342 = 684	NA/18,250	NA/3.75 (0.57)	NA
Melon-headed whale	NA *100*	0/0	100 + 100 = 200	NA/NA	NA/NA (NA)	NA
Pygmy killer whale	NA *25*	0/0	25 + 25 = 50	NA/NA	NA/NA (NA)	NA
False killer whale	NA *15*	0/0	15 + 15 = 30	NA/NA	NA/NA (NA)	NA
Killer whale	NA *6*	0/0	6 + 6 = 12	NA/NA	NA/NA (NA)	NA
Short-finned pilot whale	0.0108000/ 0.0190400	697/697	697 + 697 = 1,394	780,000/21,515	0.18/6.48 (0.98)	NA
Long-	0.0108000/	697/697	697 + 697 =	780,000/26,535	0.18/5.25	NA

finned pilot whale	0.0190400		1,394		(0.79)	
Harbor porpoise	NA *4*	0/0	4 + 4 = 8	500,000/79,883	0.002/0.01 (<0.01)	NA
Pinnipeds						
Harbor seal	NA	0/0	0 + 0 = 0	NA/70,142	NA/NA	NA
Gray seal	NA	0/0	0 + 0 = 0	NA/NA(348,999 minimum 2012)	NA/NA	Increasing
Harp seal	NA	0/0	0 + 0 = 0	8.6 to 9.6 million/NA (8.3 million in 2012)	NA/NA	NA
Hooded seal	NA	0/0	0 + 0 = 0	600,000/NA (592,100 minimum in 2007)	NA/NA	NA

NA = Not available or not assessed.
[1] OBIS-SERDP-Navy NODE 2007a and 2007b (for those species where density data is available).
[2] Calculated take is estimated density multiplied by the 160 dB ensonified area.
[3] Requested take authorization was increased to group size for species for which densities were not available but that have been sighted near the survey area (CeTAP, 1984).
[4] Stock sizes are best populations from NMFS Stock Assessment Reports where available (see Table 3 in above).
[5] Requested takes expressed as percentages of the larger regional population and NMFS Stock Assessment Reports, where available.
[6] Based on NMFS Stock Assessment Reports.

Applying the approach described above, approximately 36,600 km^2 will be within the 160 dB isopleth on one or more occasions during the planned survey in 2014. The planned survey in 2015 is expected to ensonify an almost identical area (to within 2%); therefore an ensonified area of 36,600 km^2 was used for the planned surveys in 2014 and 2015. Because this approach does not allow for turnover in the marine mammal populations in the area during the course of the survey, the actual number of individuals exposed may be underestimated, although the conservative (i.e., probably overestimated) line-kilometer distances used to calculate the area may offset this. Also, the approach assumes that no cetaceans will move away or toward the trackline as the Langseth approaches in response to increasing sound levels before the levels reach 160 dB (rms). Another way of interpreting the estimates that follow is that they represent the number of individuals that are expected (in the absence of a seismic program) to occur in the waters that will be exposed to greater than or equal to 160 dB (rms).

Encouraging and Coordinating Research

USGS will coordinate the planned marine mammal monitoring program associated with the seismic survey with other parties that may have interest in this area and specified activity. USGS will coordinate with applicable U.S. agencies (e.g., NMFS), and will comply with their requirements.

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

Section 101(a)(5)(D) of the MMPA also requires NMFS to determine that the authorization will not have an unmitigable adverse effect on the availability of marine mammal species or stocks for subsistence use. There are no relevant subsistence uses of marine mammals implicated by this action. Therefore, NMFS has determined that the total taking of affected species or stocks will not have an unmitigable adverse impact on the availability of such species

or stocks for taking for subsistence purposes.

Analyses 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). A negligible impact finding is based on the lack of likely adverse effects on annual rates of recruitment or survival (i.e., population-level effects). An estimate of the number of Level B harassment 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, and effects on habitat.

In making a negligible impact determination, NMFS evaluated factors such as:

(1) The number of anticipated injuries, serious injuries, or mortalities;

(2) The number, nature, and intensity, and duration of Level B harassment (all relatively limited); and

(3) The context in which the takes occur (i.e., impacts to areas of significance, impacts to local populations, and cumulative impacts when taking into account successive/contemporaneous actions when added to baseline data);

(4) 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);

(5) Impacts on habitat affecting rates of recruitment/survival; and

(6) The effectiveness of monitoring and mitigation measures.

As described above and based on the following factors, the specified activities associated with the marine seismic survey are not likely to cause PTS, or other non-auditory injury, serious injury, or death. The factors include:

(1) The likelihood that, given sufficient notice through relatively slow ship speed, marine mammals are expected to move away from a noise source that is annoying prior to its becoming potentially injurious;

(2) 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;

(3) The potential for temporary or permanent hearing impairment is relatively low and will likely be avoided through the implementation of the required monitoring and mitigation measures (including power-down and shut-down measures); and

(4) The likelihood that marine mammal detection ability by trained PSOs is high at close proximity to the vessel.

Table 6 of this document outlines the number of authorized Level B harassment takes that are anticipated as a result of these activities. The type of Level B (behavioral) harassment that could result from the action are described in the "Potential Effects of the Specified Activity on Marine Mammals" section above, and include tolerance, masking, behavioral disturbance, TTS, PTS, and non-auditory or physiological effects. Level B (behavioral harassment occurs at the level of the individual(s) and does not assume any resulting population-level consequences. For the marine mammal species that may occur within the action area, there are no known designated

or important feeding and/or reproductive areas. Many animals perform vital functions, such as feeding, resting, traveling, and socializing, on a diel cycle (i.e., 24 hr 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 seismic operations are anticipated to occur on consecutive days, the estimated duration of the survey will last no more than a total of 36 days (a 17 to 18 day leg in August to September 2014 and a 17 to 18 day leg in April to August 2015). Additionally, the seismic survey will be increasing sound levels in the marine environment in a relatively small area surrounding the vessel (compared to the range of the animals). The seismic surveys will not take place in areas of significance for marine mammal feeding, resting, breeding, or calving and will not adversely impact marine mammal habitat. Furthermore, the vessel will be constantly travelling over distances, and some animals may only be exposed to and harassed by sound for less than a day.

NMFS's practice has been to apply the 160 dB re 1 μPa (rms) received level threshold for underwater impulse sound levels to determine whether take by Level B harassment occurs. Southall et al. (2007) provide a severity scale for ranking observed behavioral responses of both free-ranging marine mammals and laboratory subjects to various types of anthropogenic sound (see Table 4 in Southall et al. [2007]). NMFS has determined, provided that the aforementioned mitigation and monitoring measures are implemented, the impact of conducting a marine seismic survey in the northwest Atlantic Ocean off of the Eastern Seaboard, August to September 2014 and April to August 2015, may result, at worst, in a modification in behavior and/or low-level physiological effects (Level B harassment) of certain species of marine mammals. No injuries,

serious injuries, or mortalities are anticipated to occur as a result of USGS's planned marine seismic survey, and none are authorized by NMFS.

While behavioral modifications, including temporarily vacating the area during the operation of the airgun(s), may be made by these species to avoid the resultant acoustic disturbance, the availability of alternate areas within these areas for species and the short and sporadic duration of the research activities, have led NMFS to determine that the taking by Level B harassment from the specified activity will have a negligible impact on the affected species in the specified geographic region. Due to the nature, degree, and context of Level B (behavioral) harassment anticipated and described (see "Potential Effects on Marine Mammals" section above) in this notice, the activity is not expected to impact rates of annual recruitment or survival for any affected species or stock, particularly given the NMFS and the applicant's plan to implement mitigation and monitoring measures that will minimize impacts to marine mammals. NMFS has issued IHAs for marine mammal take for similar types of research seismic surveys for over 10 years and required similar mitigation and monitoring measures. In no case have the submitted monitoring reports suggested that marine mammal impacts have exceeded those anticipated in our analysis under the MMPA.

Based on the analysis contained herein of the likely effects of the specified activity on marine mammals and their habitat, and taking into consideration the implementation of the required monitoring and mitigation measures, NMFS finds that the total marine mammal take from USGS's marine seismic survey will have a negligible impact on the affected marine mammal species or stocks.

Small Numbers

As mentioned previously, NMFS estimates that 34 species of marine mammals under its jurisdiction could be potentially affected by Level B harassment over the course of the IHA. The population estimates for the marine mammal species or stocks that may be taken by Level B harassment are provided in Table 6 of this document. No takes of pinnipeds are expected due to a lack of species observations within the study area, the great distance offshore, and the deep water depths of the study area. It should be noted that the stock populations for each marine mammal species in the NMFS Stock Assessment Reports are generally for species populations in U.S. waters, which may underestimate actual population sizes for species that have ranges that will include waters outside the U.S. EEZ.

NMFS makes it small numbers determination based on the number of marine mammals that would be taken relative to the populations of the affected species or stocks. NMFS's take estimates for the current survey are based on a consideration of the number of marine mammals that could be harassed by seismic operations with the entire seismic survey area, both within and outside of the U.S. EEZ. Given that the take estimates were calculated for the entire survey area, NMFS concludes that a portion of the authorized takes would take place within the U.S. EEZ and the remainder would take place outside of the U.S. EEZ. To make our small numbers determination for U.S. EEZ stocks, we therefore apportioned 10 to 20% of the authorized take to the U.S. EEZ, given that approximately 80% of the survey tracklines in 2014 and approximately 90% of the survey tracklines in 2015 are outside of the U.S. EEZ. See Table 6 for the small number calculations of the U.S. EEZ stock with abundance data based on this apportionment. All of the takes that NMFS expects to occur within the U.S. EEZ represent a small number relative the affected U.S. EEZ stocks.

As described above, approximately 80% of the survey tracklines in 2014 and

approximately 90% of the survey tracklines in 2015 are within International Waters (i.e., the high seas) and are outside of the U.S. EEZ; therefore, the regional population is more applicable for NMFS's small numbers determinations, as most of the ensonified area and estimated takes are further than 200 nmi from the U.S. coastline. Regional abundance data exists for 12 species that could be affected by the survey. See Table 6 for the small number calculations of the species with regional abundance data. The take authorized for these species represents a small number relative to the affected regional populations.

For the remaining species for which NMFS has U.S. EEZ stock abundance data but no regional abundance data, NMFS concludes that if the total authorized take represents a small number of the U.S. EEZ stock (also calculated in Table 6), it will also represent a small number of the greater regional population, based on the larger and wider ranging populations expected in the high seas. This conclusion is supported by the fact that, for the species with both regional and stock-specific abundance populations, the regional abundance is on the order of five to twenty times higher than the abundance of the stock. For the pantropical spotted dolphin, the total authorized take would represent more than 43% of the U.S. EEZ stock. However, as noted in Table 6, the take expected to occur in the U.S. EEZ represents approximately 6.5% of the affected U.S. EEZ stock. The remainder of the takes would occur outside the U.S EEZ. Although no regional abundance estimate exists for the pantropical spotted dolphin, it is one of the most abundant cetaceans on the globe and occurs in all tropical to warm temperate waters between 40^{o} N and S (Folkens 2002). Therefore, we are confident that the authorized take represents a small number compared to the greater regional Atlantic pantropical spotted dolphin population that occurs outside of the U.S. EEZ. No known current regional population or stock abundance estimates for the northwest Atlantic Ocean are available for the eight remaining

species under NMFS's jurisdiction that could potentially be affected by Level B harassment over the course of the IHA. These species include the Bryde's whale, Fraser's, spinner, and Clymene dolphins, and the melon-headed, pygmy killer, false killer, and killer whales. Bryde's whales are distributed worldwide in tropical and sub-tropical waters and their occurrence in the study area is rare. In the western North Atlantic Ocean, Bryde's whales are reported from off the southeastern U.S. and southern West Indies to Cabo Frio, Brazil (Leatherwood and Reeves, 1983). Fraser's dolphins are distributed worldwide in tropical waters and their occurrence in the study area is rare. Spinner dolphins are found in all tropical and sub-tropical oceans and their occurrence in the study area is rare. Melon-headed whales are distributed worldwide in tropical to sub-tropical waters and their occurrence in the study area is rare. The pygmy killer whale is distributed worldwide in tropical to sub-tropical waters and their occurrence in the study area is rare. The false killer whale is distributed worldwide throughout warm temperate and tropical oceans and their occurrence in the study area is rare. Killer whales are characterized as uncommon or rare in waters of the U.S. Atlantic EEZ (Katona et al., 1988). Their distribution extends from the Arctic ice-edge to the West Indies, often in offshore and mid-ocean areas. There are estimated to be at least approximately 92,500 killer whales worldwide.

The Clymene dolphin is endemic to tropical and sub-tropical waters of the Atlantic, including the Caribbean Sea and Gulf of Mexico (Jefferson and Curry, 2003; Jefferson et al., 2008). This species prefer warm waters and records extend from southern Brazil and Angola and north to Mauritania and New Jersey off the U.S. east coast (Jefferson et al., 2008). Their occurrence in the study area is rare. The abundance estimate for the Clymene dolphin in the western North Atlantic was 6,086 in 2003; this estimate is older than eight years and is considered unreliable (Wade and Angliss, 1997; Mullin and Fulling, 2003). However, this

abundance estimate is the first and only estimate to date for this species in the U.S. Atlantic EEZ and represents the best abundance estimate.

These eight species did not have density model outputs within the SERDP/NASA/NOAA and OBIS-SEAMAP database. However, limited OBIS-SEAMAP sightings data exist for these species within or adjacent to the action area. As explained above, even where the limited number of sightings suggests that density is very low and encounters are less likely, for any species with OBIS-SEAMAP sightings data within or adjacent to the action area, NMFS believes it is wise to include coverage for potential takes. Generally, to quantify this coverage, NMFS assumed that USGS could potentially encounter one group of each species during each of the seismic survey legs (recognizing that interannual variation and the potential presence of ephemeral features could drive differing encounter possibilities in the two legs), and NMFS thinks it is reasonable to use the average (mean) groups size (weighted by effort and rounded up) to estimate the take from these potential encounters. Therefore, even though we do not have abundance data for these species, because of the limited sightings and low probability of encountering them, we have predicted take of no more than two individual groups of each of these species of animals during the two legs of the survey. Qualitatively, given what is known about cetacean biology and the range of these species, two groups as a portion of the total population abundance within or without of the U.S. EEZ would be considered small for all eight species.

Endangered Species Act

Of the species of marine mammals that may occur in the survey area, several are listed as endangered under the ESA, including the North Atlantic right, humpback, sei, fin, blue, and sperm whales. Under section 7 of the ESA, USGS has initiated formal consultation with the

NMFS, Office of Protected Resources, Endangered Species Act Interagency Cooperation Division, on this seismic survey. NMFS's Office of Protected Resources, Permits and Conservation Division, has initiated and engaged in formal consultation under section 7 of the ESA with NMFS's Office of Protected Resources, Endangered Species Act Interagency Cooperation Division, on the issuance of an IHA under section 101(a)(5)(D) of the MMPA for this activity. These two consultations were consolidated and addressed in a single Biological Opinion addressing the direct and indirect effects of these independent actions. In August 2014, NMFS's Office of Protected Resources, Endangered Species Act Interagency Cooperation Division issued a Biological Opinion and concluded that both actions (i.e., the USGS seismic survey and NMFS's issuance of an IHA) are not likely to jeopardize the existence of cetaceans and sea turtles and would have no effect on critical habitat. NMFS's Office of Protected Resources, Endangered Species Act Interagency Cooperation Division also issued an Incidental Take Statement (ITS) incorporating the requirements of the IHA as Terms and Conditions of the ITS

National Environmental Policy Act

USGS provided NMFS with an "Environmental Assessment for Seismic Reflection Scientific Research Surveys During 2014 and 2015 in Support of Mapping the U.S. Atlantic Seaboard Extended Continental Margin and Investigating Tsunami Hazards," (EA) prepared by RPS Evan-Hamilton, Inc., in association with YOLO Environmental, Inc., GeoSpatial Strategy Group, and Ecology and Environment, Inc., on behalf of USGS. The EA analyzes the direct, indirect, and cumulative environmental impacts of the specified activities on marine mammals including those listed as threatened or endangered under the ESA. NMFS, after review and evaluation of the USGS EA for consistency with the regulations published by the Council of

Environmental Quality (CEQ) and NOAA Administrative Order 216-6, Environmental Review Procedures for Implementing the National Environmental Policy Act, adopted the EA. After considering the EA, the information in the IHA application, Biological Opinion, and the Federal Register notice, as well as public comments, NMFS has determined that the issuance of the IHA is not likely to result in significant impacts on the human environment and has prepared a Finding of No Significant Impact (FONSI). An Environmental Impact Statement is not required and will not be prepared for the action.

Authorization

NMFS has issued an IHA to the USGS for conducting a marine seismic survey in the northwest Atlantic Ocean off the Eastern Seaboard, provided the previously mentioned mitigation, monitoring, and reporting requirements are incorporated.

Dated: August 22, 2014

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

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