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DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

RIN 0648- XB105

Takes of Marine Mammals Incidental to Specified Activities; Three Marine Geophysical Surveys in the Northeast Pacific Ocean, June through July, 2012

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

ACTION: Notice; issuance of three incidental take authorizations (ITA).

SUMMARY: In accordance with the Marine Mammal Protection Act (MMPA) regulations, notification is hereby given that we have issued three Incidental Harassment Authorizations to the Lamont-Doherty Earth Observatory (Observatory), a part of Columbia University, to take marine mammals, by Level B harassment, incidental to conducting three consecutive marine geophysical (seismic) surveys in the northeast Pacific Ocean, June through July, 2012.

DATES: Effective June 13 through July 25, 2012; July 1 through August 1, 2012; and July 12 through August 10, 2012.

ADDRESSES: A copy of the Incidental Harassment Authorizations and application are available by writing to P. Michael Payne, Chief, 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 here. A copy of the application containing a list of the references used in this document may be obtained by writing to the above address, telephoning the contact listed here (see FOR FURTHER

INFORMATION CONTACT) or visiting the internet at:

<http://www.nmfs.noaa.gov/pr/permits/incidental.htm#applications>.

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

SUPPLEMENTARY INFORMATION:

Background

Section 101(a)(5)(D) of the MMPA of 1972, as amended (16 U.S.C. 1361 et seq.), directs the Secretary of Commerce to authorize, upon request, the incidental, but not intentional, taking of small numbers of marine mammals of a species or population stock, by United States citizens who engage in a specified activity (other than commercial fishing) within a specified geographical region if: (1) we make certain findings; (2) the taking is limited to harassment; and (3) we provide a notice of a proposed authorization to the public for review.

We shall grant authorization for the incidental taking of small numbers of marine mammals if we find that the taking will have a negligible impact on the species or stock(s), and will not have an unmitigable adverse impact on the availability of the species or stock(s) for subsistence uses (where relevant). The authorization must set forth the permissible methods of taking; other means of effecting the least practicable adverse impact on the species or stock and its habitat; and requirements pertaining to the mitigation, monitoring and reporting of such takings. We have 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."

Section 101(a)(5)(D) of the MMPA established an expedited process by which citizens of the United States can apply for an authorization to incidentally take small numbers of marine mammals by harassment. Section 101(a)(5)(D) of the Act establishes a 45-day time limit for our review of an application followed by a 30-day public notice and comment period on any proposed authorizations for the incidental harassment of small numbers of marine mammals. Within 45 days of the close of the public comment period, we must either issue or deny the authorization and must publish a notice in the Federal Register within 30 days of our determination to issue or deny the authorization.

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].

The U.S. National Science Foundation (Foundation) has prepared an “Environmental Assessment and Finding of No Significant Impact Determination Pursuant to the National Environmental Policy Act, 42 U.S.C. 4321 et seq. and Executive Order 12114 Marine Seismic Surveys in the northeastern Pacific Ocean, 2012.” The Environmental Assessment incorporates an “Environmental Assessment of a Marine Geophysical Surveys by the R/V Marcus G. Langseth in the Northeastern Pacific Ocean, June-July 2012,” prepared by LGL Limited Environmental Research Associates, on behalf of the Foundation. We also issued a Biological Opinion under section 7 of the Endangered Species Act (ESA) to evaluate the effects of the survey and Incidental

Harassment Authorization on marine species listed as threatened or endangered. The Biological Opinion will be available online at:

<http://www.nmfs.noaa.gov/pr/consultations/opinions.htm>. The public can view documents cited in this notice by appointment, during regular business hours, at the aforementioned address.

Summary of Request

We received an application on January 27, 2012, from the Observatory for the taking by harassment, of small numbers of marine mammals, incidental to conducting three separate marine seismic surveys in the northeast Pacific Ocean. We determined the application complete and adequate on March 27, 2012. On May 2, 2012, we published a notice in the Federal Register (77 FR 25966) disclosing the effects on marine mammals, making preliminary determinations, and proposing to issue the Incidental Harassment Authorization. The notice initiated a 30 day public comment period.

The Observatory, with research funding from the Foundation, plans to conduct three research studies on the Juan de Fuca Plate, the Cascadia thrust zone, and the Cascadia subduction margin in waters off the Oregon and Washington coasts. The Observatory will conduct the first survey from June 14 through July 8, 2012, the second survey from July 4 through July 6, 2012, and the third survey from July 12 through July 23, 2012, for a total of 30 days of active seismic operations. Some minor deviation from these dates is possible, depending on logistics, weather conditions, and the need to repeat some lines if data quality is substandard. Therefore, the authorizations are effective from June 13, 2012 to July 25, 2012; July 1 to August 1, 2012; and July 12 to August 10, 2012, respectively.

The Observatory will use one source vessel, the R/V Marcus G. Langseth (Langseth), a seismic airgun array, a single hydrophone streamer, and ocean bottom seismometers to conduct the seismic surveys.

The surveys will provide data necessary to:

- Characterize the evolution and state of hydration of the Juan de Fuca plate at the Cascadia subduction zone;
- Provide information on the buried structures in the region; and
- Assess the location, physical state, fluid budget, and methane systems of the Juan de Fuca plate boundary and overlying crust.

The results of the three studies will provide background information for generating improved earthquake hazards analyses and a better understanding of the processes that control megathrust earthquakes, which are produced by a sudden slip along the boundary between a subducting and an overriding plate.

In addition to the operations of the seismic airgun array and hydrophone streamer, and the ocean bottom seismometers (seismometers), the Observatory intends to operate a multibeam echosounder and a sub-bottom profiler continuously throughout the surveys.

Acoustic stimuli (i.e., increased underwater sound) generated during the operation of the seismic airgun arrays, may have the potential to cause a short-term behavioral disturbance for marine mammals in the survey area. This is the principal means of marine mammal taking associated with these activities, and the Observatory has requested an authorization to take 26 species of marine mammals by Level B harassment. We do not expect that the use of the multibeam echosounder, the sub-bottom profiler, or the ocean bottom seismometers (seismometers) will result in the take of marine mammals

and will discuss our reasoning later in this notice. Also, we do not expect take to result from a collision with the Langseth because it is a single vessel moving at relatively slow speeds (4.6 knots (kts); 8.5 kilometers per hour (km/h); 5.3 miles per hour (mph)) during seismic acquisition within the survey, for a relatively short period of time. It is likely that any marine mammal would be able to avoid the vessel.

Description of the Specified Activities, Dates, Duration, and Specified Geographic Region

The notice for the proposed Incidental Harassment Authorization (77 FR 25966, May 2, 2012) contained a full description of the Observatory's planned activities. That notice describes the dates, locations, and operational details of the three surveys. The activities to be conducted have not changed between the proposed Incidental Harassment Authorization notice and this final notice announcing the issuance of the Incidental Harassment Authorization; therefore, only a short summary is provided here. For a more detailed description of the authorized action, including vessel and acoustic source specifications, the reader should refer to the notice of the proposed Incidental Harassment Authorization notice (77 FR 25966, May 2, 2012), the Incidental Harassment Authorization application, Environmental Assessment, and associated documents referenced above this section.

Juan de Fuca Plate Survey

The first seismic survey would begin on June 14, 2012, and end on July 8, 2012. The Langseth will depart from Astoria, Oregon on June 14, 2012, and transit to the survey area in the northeast Pacific Ocean in international waters and the Exclusive Economic Zones of the United States and Canada. The study area will encompass an

area bounded by approximately 43 to 48 degrees (°) North by approximately 124 to 130° East (see Figure 1 in the Observatory's Application #1). Water depths in the survey area range from approximately 50 to 3,000 meters (m) (164 feet [ft] to 1.7 nautical miles [nmi]). At the conclusion of the first survey, the Langseth would begin a second three-day seismic survey on July 5, 2012, in the same area.

During this survey, the Langseth would deploy a 36-airgun array as an energy source, an 8-kilometer (km)-long (4.3 nmi-long) hydrophone streamer, and 46 seismometers.

The Observatory plans to discharge the airgun array along three long transect lines and three semi-circular arcs using the seismometers as the receivers and then repeat along the long transect lines in multichannel seismic mode using the 8-km streamer as the receiver (see Figure 1 in the Observatory's Application #1). Also, the Observatory will use one support vessel, the R/V Oceanus (Oceanus) to deploy 46 seismometers on the northern onshore-offshore line, retrieve the 46 seismometers from the northern line, and then deploy 39 seismometers on the southern onshore-offshore lines and retrieve them at the conclusion of the survey.

The first study (e.g., equipment testing, startup, line changes, repeat coverage of any areas, and equipment recovery) will require approximately 17 days to complete approximately 3,051 km (1,647.4 nmi) of transect lines. The total survey effort including contingency will consist of approximately 2,878 km (1,554 nmi) of transect lines in depths greater than 1,000 m (3,280.8 ft), 102 km (55.1 nmi) in depths 100 to 1,000 m (328 to 3,280 ft), and 71 km (38.3 nmi) in water depths less than 100 m (328 ft). The northern and southern onshore-offshore lines are 70 to 310 km (37.8 to 167.4 mi) and 15

to 450 km (8.1 to 243 mi) from shore, respectively.

Data acquisition will include approximately 408 hours of airgun operations (i.e., 17 days over 24 hours).

Cascadia Thrust Zone Survey

The second survey would begin on July 4, 2012, and end on July 6, 2012. The survey would take place in the U.S. Exclusive Economic Zone in waters off of the Oregon and Washington coasts. The study area will encompass an area bounded by approximately 43.5 to 47° North by approximately 124 to 125° East (see Figure 1 in the Observatory's Application #2). Water depths in the survey area range from approximately 50 to 1,000 m (164 ft to 3,280.8 ft). At the conclusion of this survey, the Langseth would return to Astoria, Oregon on July 8, 2012.

The Langseth would deploy a 36-airgun array as an energy source, 12 seismometers, and 48 seismometers (33 in Oregon and 15 in Washington) onshore (on land). The Observatory plans to use the Oceanus to deploy and retrieve the seismometers.

The Observatory plans to discharge the airgun array along a grid of lines off Oregon and along an onshore-offshore line off Washington (see Figure 1 in the Observatory's Application #2).

The study (e.g., equipment testing, startup, line changes, repeat coverage of any areas, and equipment recovery) will require approximately 3 days to complete approximately 793 km (492.7 mi) of transect lines. The total survey effort including contingency will consist of approximately 5 km (2.7 nmi) of transect lines in depths greater than 1,000 m, 501 km (270.5 mi) in depths 100 to 1,000 m (328 to 3,280 ft), and

287 km (155 nmi) in water depths less than 100 m (328 ft). The northern and southern legs of the onshore-offshore lines are 15 to 70 km (8.1 to 37.8 nmi) and 15 to 50 km (8.1 to 27 nmi) from shore, respectively. Data acquisition will include approximately 72 hours of airgun operations (i.e., 3 days over 24 hours).

Cascadia Subduction Margin Survey

The last seismic survey would begin on July 12, 2012, and end on July 23, 2012. The Langseth would depart from Astoria, Oregon on July 12, 2012, and transit to waters off of the Washington coast. The study area encompasses an area bounded by approximately 46.5 to 47.5 ° North by approximately 124.5 to 126° East (see Figure 1 in the Observatory's Application #3). Water depths in the survey area range from approximately 95 to 2,650 m (311.7 ft to 8,694.2 ft). At the conclusion of this survey, the Langseth would return to Astoria, Oregon.

The Langseth would deploy a 36-airgun array as an energy source and an 8-km-long (4.3 nmi-long) hydrophone streamer. The Observatory plans to discharge the airgun array along nine parallel lines that are spaced eight km apart. If time permits, the Langseth would survey an additional two lines perpendicular to the parallel lines (see Figure 1 in the Observatory's Application #3).

The study (e.g., equipment testing, startup, line changes, repeat coverage of any areas, and equipment recovery) will require approximately 10 days to complete approximately 1,147 km (619.3 nmi) of transect lines. The total survey effort including contingency will consist of approximately 785 km (423.9 nmi) of transect lines in depths greater than 1,000 m, 350 km (189 nmi) of transect lines in depths 100 to 1,000 m, and 12 km (6.5 mi) of transect lines in water depths less than 100 m. The survey area is 32 to

150 km (17.3 to 81 nmi) from shore. Data acquisition will include approximately 240 hours of airgun operations (i.e., 10 days over 24 hours).

Some minor deviation from these dates is possible, depending on logistics, weather conditions, and the need to repeat some lines if data quality is substandard. Therefore, the issued authorizations are effective from June 13 through July 25, 2012; July 1 through August 1, 2012; and July 12 through August 10, 2012.

Comments and Responses

A notice of preliminary determinations and proposed Incidental Harassment Authorization for the Observatory's three proposed seismic surveys was published in the Federal Register on May 2, 2012 (77 FR 25966). During the 30-day public comment period NMFS received comments from the Marine Mammal Commission (Commission).

The Commission's comments are available online at:

<http://www.nmfs.noaa.gov/pr/permits/incidental.htm>. On June 8 and 11, 2012, we received information and a letter, respectively, from the Orca Network regarding the seismic survey's potential impacts on endangered Southern Resident killer whales after the close of the public comment period. The Orca Network's letter is available online at:

<http://www.orcanetwork.org/news/seismicsurvey2012.html> and

<http://www.nmfs.noaa.gov/pr/permits/incidental.htm>. The Observatory has made changes and enhancements to the seismic survey plan since they were originally proposed, and additional monitoring and mitigation measures have been required in the Incidental Harassment Authorization. Following is a summary of the Commission's comments and our responses:

Comment 1: The Commission recommends that we require the Observatory to re-

estimate the proposed exclusion and buffer zones and associated takes of marine mammals using site-specific information – if the exclusion and buffer zones and numbers of takes are not re-estimated require the Observatory to provide a detailed justification explaining the rationale for (1) basing the exclusion and buffer zones for the proposed survey in the northeast Pacific Ocean on empirical data collected in the Gulf of Mexico or on modeling that relies on measurements from the Gulf of Mexico and (2) using simple ratios to adjust for tow depth and applying median values to estimate propagation in intermediate water depths rather than using empirical measurements.

Response: With respect to the Commission’s first point, based upon the best available information and our analysis of the likely effects of the specified activity on marine mammals and their habitat, we are satisfied that the data supplied by the Observatory are sufficient for us to conduct our analysis and support the determinations under the MMPA, ESA of 1973 (16 U.S.C. 1531 et seq.), and the National Environmental Policy Act (NEPA). The identified zones are appropriate for the survey and additional field measurements are not necessary at this time. Thus, for this survey, NMFS will not require the Observatory to re-estimate the proposed exclusion zones and buffer zones and associated number of marine mammal takes using operational and site-specific environmental parameters.

With respect to the Commission’s second point, the Observatory has modeled the exclusion and buffer zones in the action area based on the Observatory’s 2003 (Tolstoy et al., 2004) and 2007 to 2008 (Tolstoy et al., 2009) peer-reviewed, calibration studies in the northern Gulf of Mexico. Received levels have been modeled by the Observatory for a number of airgun configurations in relation to distance and direction from the airguns

(see Figure 3 of the Incidental Harassment Authorization applications). The Foundation's Environmental Assessment (see Appendix A) includes detailed information on the study, and their modeling process of the calibration experiment in shallow, intermediate, and deep water. The conclusions in Appendix A show that the Observatory's model represents the actual produced sound levels, particularly within the first few kilometers, where the predicted zone (i.e., exclusion zone) lie. At greater distances, local oceanographic variations begin to take effect, and the model tends to over predict.

Because the modeling matches the observed measurement data, the authors concluded that those using the models to predict zones can continue to do so, including predicting exclusion zones and buffer zones around the vessel for various tow depths. At present, the Observatory's model does not account for site-specific environmental conditions, and the calibration study analysis of the model predicted that using site-specific information may actually estimate less conservative exclusion zones at greater distances.

While it is difficult to estimate exposures of marine mammals to acoustic stimuli, we are confident that the Observatory's approach to quantifying the exclusion and buffer zones uses the best available scientific information (as required by our regulations) and estimation methodologies. After considering this comment and evaluating the respective approaches for establishing exclusion and buffer zones, we have determined that the Observatory's approach and corresponding monitoring and mitigation measures will effect the least practicable impact on the affected marine mammal species or stocks.

Comment 2: The Commission recommends that we require the Observatory to re-

estimate the number of takes during the first survey (i.e., Juan de Fuca plate survey) by accounting for two passes over the three long transect lines, which should effectively double the estimated number of takes from a single survey pass of those lines.

Response: NMFS and the Observatory base the estimated number of takes on the number of individual animals that are exposed to sound levels greater than or equal to 160 dB (rms), and some animals may be exposed multiple times in a 24 hour period. In the context of a diel cycle, if multiple exposures occur to an individual within a 24 hour period, NMFS and the Observatory considered this as one take, for purposes of estimating the number takes by Level B harassment. The Observatory's calculated number of takes assumes that the animals are stationary, so two passes over the three long transect lines is affecting the same number of individuals twice. Because the animals are considered stationary, these calculated take numbers are likely overestimates, as animals are constantly moving in the real marine environment. The Observatory's use of these peer-reviewed, model-based, density estimates are the best available information to estimate density for the survey area and to estimate the number of authorized takes for the seismic surveys in the northeastern Pacific Ocean.

Comment 3: The Commission recommends that we prohibit an 8 minute pause following the sighting of a marine mammal in the exclusion zone and extend that pause to cover the maximum dive times of the species likely to be encountered prior to resuming airgun operations after both power-down and shut-down procedures.

Response: The Incidental Harassment Authorization specifies the conditions under which the Langseth will resume full-power operations of the airguns after a power-down or shut-down. During periods of active seismic operations, there are occasions

when the airguns need to be temporarily shut-down (e.g., due to equipment failure, maintenance, or shut-down) or when a power-down is necessary (e.g., when a marine mammal is seen entering or about to enter the exclusion zone) for less than 8 minutes.

Should the airguns be inactive or powered-down for more than 8 minutes, then the Observatory would follow the ramp-up procedures identified in the “Mitigation” section (discussed later in this document) where airguns will be re-started beginning with the smallest airgun in the array and increase in steps not to exceed 6 dB per 5 minutes over a total duration of approximately 30 minutes. We and the Foundation believe that the 8 minute period in question is an appropriate minimum amount of time to pass after which a ramp-up process should be followed. In these instances, should it be possible for the Observatory to reactivate the airguns without exceeding the eight minute period (e.g., equipment is fixed or a marine mammal is visually observed to have left the exclusion zone for the full source level), then the Observatory would reactivate the airguns to the full operating source level identified for the survey (in this case 6,600 in³) without need for initiating ramp-up procedures. In the event a marine mammal enters the exclusion zone and the Observatory initiates a power-down, and the Protected Species Observers do not visually observe the marine mammal leaving the exclusion zone, then the Observatory must wait 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) after the last sighting before initiating a 30-minute ramp-up. However, ramp-up will not occur as long as a marine mammal is detected within the exclusion zone, which provides more time for animals to leave the exclusion zone, and accounts for the position, swim speed, and heading of marine mammals within

the exclusion zone.

We recognize that several species of deep-diving cetaceans are capable of remaining underwater for more than 30 minutes (e.g., sperm whales and several species of beaked whales); however, for the following reasons we believe that 30 minutes is an adequate length for the monitoring period prior to the ramp-up of airguns:

(1) Because the Langseth is required to monitor before ramp-up of the airgun array, the time of monitoring prior to the start-up of any but the smallest array is effectively longer than 30 minutes (ramp-up will begin with the smallest airgun in the array and airguns will be added in sequence such that the source level of the array will increase in steps not exceeding approximately 6 dB per five minute period over a total duration of about 30 minutes);

(2) In many cases Protected Species Observers are observing during times when the Observatory is not operating the seismic airguns and would observe the area prior to the 30-minute observation period;

(3) The majority of the species that may be exposed do not stay underwater more than 30 minutes; and

(4) All else being equal and if deep-diving individuals happened to be in the area in the short time immediately prior to the pre-ramp-up monitoring, if an animal's maximum underwater dive time is 45 minutes, then there is only a one in three chance that the last random surfacing would occur prior to the beginning of the required 30 minute monitoring period and that the animal would not be seen during that 30-minute period.

Finally, seismic vessels are moving continuously (because of the long, towed

array and streamer) and we believe that unless the animal submerges and follows at the speed of the vessel (highly unlikely, especially when considering that a significant part of their movement is vertical [deep-diving]), the vessel will be far beyond the length of the exclusion zone within 30 minutes, and therefore it will be safe to start the airguns again.

Under the MMPA, incidental take authorizations must include means of effecting the least practicable impact on marine mammal species and their habitat. Monitoring and mitigation measures are designed to comply with this requirement. The effectiveness of monitoring is science-based, and monitoring and mitigation measures must be “practicable.” We believe that the framework for visual monitoring will: (1) be effective at spotting almost all species for which take is requested; and (2) that imposing additional requirements, such as those suggested by the Commission, would not meaningfully increase the effectiveness of observing marine mammals approaching or entering exclusion zones and thus further minimize the potential for take.

Comment 4: The Commission recommends that we provide additional justification for our preliminary determination that the proposed monitoring program will be sufficient to detect, with a high level of confidence, all marine mammals within or entering the identified exclusion and buffer zones – such justification should (1) identify those species that it believes can be detected with a high degree of confidence using visual monitoring only under the expected environmental conditions, (2) describe detection probability as a function of distance from the vessel, (3) describe changes in detection probability under various sea state and weather conditions and light levels, and (4) explain how close to the vessel marine mammals must be for observers to achieve high nighttime detection rates.

Response: We believe that the planned monitoring program will be sufficient to detect (using visual monitoring and passive acoustic monitoring), with reasonable certainty, marine mammals within or entering the identified exclusion zones. This monitoring, along with the required mitigation measures, will result in the least practicable impact on the affected species or stocks and will result in a negligible impact on the affected species or stocks of marine mammals. Also, NMFS expects some animals to avoid areas around the airgun array ensounded at the level of the exclusion zone.

We acknowledge that the detection probability for certain species of marine mammals varies depending on the animal's size and behavior, as well as sea state, weather conditions, and light levels. The detectability of marine mammals likely decreases in low light (i.e., darkness), higher Beaufort sea states and wind conditions, and poor weather (e.g., fog and/or rain). However, at present, we view the combination of visual monitoring and passive acoustic monitoring as the most effective monitoring and mitigation techniques available for detecting marine mammals within or entering the exclusion zone. The final monitoring and mitigation measures are the most effective and feasible measures, and we are not aware of any additional measures which could meaningfully increase the likelihood of detecting marine mammals in and around the exclusion zone. Further, public comment has not revealed any additional monitoring and mitigation measures that could be feasibly implemented to increase the effectiveness of detection.

The Foundation and Observatory are receptive to incorporating proven technologies and techniques to enhance the current monitoring and mitigation program. Until proven technological advances are made nighttime mitigation measures during

operations include combinations of the use of Protected Species Visual Observers for ramp-ups, passive acoustic monitoring, night vision devices provided to Protected Species Visual Observers, and continuous shooting of a mitigation airgun. Should the airgun array be powered-down the operation of a single airgun would continue to serve as a sound deterrent to marine mammals. In the event of a complete shut-down of the airgun array at night for mitigation or repairs, the Observatory suspends the data collection until 30 minutes after nautical twilight-dawn (when Protected Species Visual Observers are able to clear the exclusion zone). The Observatory will not activate the airguns until the entire exclusion zone is visible and free of marine mammals for at least 30 minutes.

In cooperation with us, the Observatory will be conducting efficacy experiments of night vision devices during a future Langseth cruise. In addition, in response to a recommendation from us, the Observatory is evaluating the use of forward-looking thermal imaging cameras to supplement nighttime monitoring and mitigation practices. During other low-power seismic and seafloor mapping surveys throughout the world, the Observatory successfully used these devices while conducting nighttime seismic operations.

Comment 5: The Commission recommends that we consult with the funding agency (i.e., the Foundation) and individual applicants (i.e., the Observatory and U.S. Geological Survey) to develop, validate, and implement a monitoring program that provides a scientifically sound, reasonably accurate assessment of the types of marine mammal taking and the number of marine mammals taken.

Response: Several studies have reported on the abundance and distribution of

marine mammals inhabiting the Pacific Ocean, and the Observatory has incorporated these data into their analyses used to predict marine mammal take in their Incidental Harassment Authorization applications. We believe that the Observatory's approach for estimating abundance in the survey areas (prior to the survey) is the best available approach.

There will be periods of transit time during the cruise, and Protected Species Observers will be on watch prior to and after the seismic portions of the surveys, in addition to during the surveys. The collection of this visual observational data by Protected Species Observers may contribute to baseline data on marine mammals (presence/absence) and provide some generalized support for estimated take numbers, but it is unlikely that the information gathered from these cruises alone would result in any statistically robust conclusions for any particular species because of the small number of animals typically observed.

We acknowledge the Commission's recommendations and are open to further coordination with the Commission, Foundation (the vessel owner), and the Observatory (the ship operator on behalf of the Foundation), to develop, validate, and implement a monitoring program that will provide or contribute towards a more scientifically sound and reasonably accurate assessment of the types of marine mammal taking and the number of marine mammals taken. However, the cruise's primary focus is marine seismic research, and the surveys may be operationally limited due to considerations such as location, time, fuel, services, and other resources.

Comment 6: The Commission recommends that we require the Observatory to (1) report the number of marine mammals that were detected acoustically and for which a

power-down or shut-down of the airguns was initiated, (2) specify if such animals also were detected visually, (3) compare the results from the two monitoring methods (visual versus acoustic) to help identify their respective strengths and weaknesses, and (4) use that information to improve mitigation and monitoring methods.

Response: The Incidental Harassment Authorization requires that Protected Species Acoustic Observers on the Langseth do and record the following when a marine mammal is detected by passive acoustic monitoring:

(i) Notify the on-duty Protected Species Visual Observer(s) immediately of a vocalizing marine mammal so a power-down or shut-down can be initiated, if required:

(ii) Enter the information regarding the vocalization into a database. The data to be entered include an acoustic encounter identification number, whether it was linked with a visual sighting, data, 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.

We acknowledge the Commission's request for a comparison between the Observatory's visual and acoustic monitoring programs, and we will work with the Foundation (the vessel owner) and the Observatory (the ship operator on behalf of the Foundation) to analyze the results of the two monitoring methods to help identify their respective strengths and weaknesses. The results of our analyses may provide information to improve mitigation and monitoring for future seismic surveys.

The Observatory reports on the number of acoustic detections made by the

passive acoustic monitoring system within the post-cruise monitoring reports as required by the Incidental Harassment Authorization. The report also includes a description of any acoustic detections that were concurrent with visual sightings, which allows for a comparison of acoustic and visual detection methods for each cruise. The post-cruise monitoring reports also include the following information: total operations effort in daylight (hours), total operation effort at night (hours), total number of hours of visual observations conducted, total number of sightings, and total number of hours of acoustic detections conducted.

LGL Ltd., Environmental Research Associates (LGL), a contractor for the Observatory, has processed sighting and density data, and their publications can be viewed online at:

http://www.lgl.com/index.php?option=con_content&view=article&id=69&Itemid=162&lang=en. Post-cruise monitoring reports are currently available on our MMPA Incidental Take Program website (see ADDRESSES) and on the Foundation's website (<http://www.nsf.gov/geo/oce/envcomp/index.jsp>) should there be interest in further analysis of this data by the public.

Comment 7: The Commission recommends that we work with the Foundation to analyze those data collected during ramp-up procedures to help determine the effectiveness of those procedures as a mitigation measure for seismic surveys.

Response: We acknowledge the Commission's request for an analysis of ramp-ups and will work with the Foundation and the Observatory to help identify the effectiveness of the mitigation measure for seismic surveys. The Incidental Harassment Authorization requires that Protected Species Observers on the Langseth make

observations for 30 minutes prior to ramp-up, during all ramp-ups, and during all daytime seismic operations and record the following information when a marine mammal is sighted:

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

(ii) Time, location, heading, speed, activity of the vessel (including number of airguns operating and whether in state of ramp-up or shut-down), Beaufort wind force and sea state, visibility, and sun glare.

One of the primary purposes of monitoring is to result in “increased knowledge of the species” and the effectiveness of required monitoring and mitigation measures. The effectiveness of ramp-up as a mitigation measure and marine mammal reaction to ramp-up would be useful information in this regard. We require the Foundation and the Observatory to gather all data that could potentially provide information regarding the effectiveness of ramp-up as a mitigation measure in its monitoring report. However, considering the low numbers of marine mammal sightings and low number of ramp-ups, it is unlikely that the information will result in any statistically robust conclusions for this particular seismic survey. Over the long term, these requirements may provide information regarding the effectiveness of ramp-up as a mitigation measure, provided Protected Species Observers detect animals during ramp-up.

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

Thirty-one marine mammal species under our jurisdiction may occur in the survey areas, including 19 odontocetes (toothed cetaceans), seven mysticetes (baleen whales), and five species of pinniped during June through July, 2012. Six of these species and two stocks are listed as endangered under the ESA, including the blue (Balaenoptera musculus), fin (Balaenoptera physalus), humpback (Megaptera novaeangliae), north Pacific right (Eubalaena japonica), sei (Balaenoptera borealis), and sperm (Physeter macrocephalus) whales; the southern resident stock of killer (Orcinus orca) whales; and the eastern U.S. stock of the Steller sea lion (Eumetopias jubatus).

The U.S. Fish and Wildlife Service manages the northern sea otter (Enhydra lutis) (listed under the ESA). Because this species is not under our jurisdiction, we do not consider this species further in this notice.

Based on available data, the Observatory does not expect to encounter five of the 31 species in the survey areas because of their rare and/or extralimital occurrence in the survey areas. They include the: the North Pacific right, false killer (Pseudorca crassidens), and short-finned pilot (Globicephala macrorhynchus) whales; the California sea lion (Zalophus californianus); and the bottlenose dolphin (Tursiops truncatus). Accordingly, we did not consider these species in greater detail, and the authorization only addresses take for 26 species: six mysticetes, 16 odontocetes, and four pinnipeds.

Of these 26 species, the most common marine mammals in the survey area will be the: harbor porpoise (Phocoena phocoena), Dall's porpoise (Phocoenoides dalli), northern fur seal (Callorhinus ursinus), and northern elephant seal (Mirounga angustirostris).

Table 1 presents information on the abundance, distribution, and conservation

status of the marine mammals that may occur in the proposed survey area June through July, 2012.

Table 1. Habitat, abundance, density, and ESA status of marine mammals that may occur in or near the seismic survey areas in the northeast Pacific Ocean. [See text and Tables 2 and 3 in the Observatory’s applications and the Foundation’s Environmental Assessment for further details.]

Species	Habitat	Regional Abundance ⁴	ESA ¹	MMPA ²	Density (#/1,000 km ²) ³
Mysticetes					
North Pacific right whale (<i>Eubalaena japonica</i>)	Pelagic and coastal	31 ⁴	EN	D	0
Gray whale (<i>Eschrichtius robustus</i>)	Coastal, shallow shelf	19,126 ⁵	DL (Eastern stock) EN (Western stock)	NC (Eastern stock) D (Western stock)	3.21
Humpback whale (<i>Megaptera novaeangliae</i>)	Mainly nearshore, banks	20,800 ⁶	EN	D	0.81
Minke whale (<i>Balaenoptera acutorostrata</i>)	Pelagic and coastal	9,000 ⁷	NL	NC	0.46
Sei whale (<i>Balaenoptera borealis</i>)	Primarily offshore, pelagic	12,620 ⁸	EN	D	0.16
Fin whale (<i>Balaenoptera physalus</i>)	Continental slope, pelagic	13,620 to 18,680 ⁹	EN	D	1.29
Blue whale (<i>Balaenoptera musculus</i>)	Pelagic, shelf, coastal	2,597	EN	D	0.18
Odontocetes					
Sperm whale (<i>Physeter macrocephalus</i>)	Pelagic, deep sea	24,000 ¹⁰	EN	D	1.02
Pygmy sperm whale (<i>Kogia breviceps</i>)	Deep waters off the shelf	NA	NL	NC	0.71
Dwarf sperm whale (<i>Kogia sima</i>)	Deep waters off the shelf	NA	NL	NC	0.71
Cuvier’s beaked whale (<i>Ziphius cavirostris</i>)	Pelagic	2,143	NL	NC	0.43
Baird’s beaked whale (<i>Berardius bairdii</i>)	Pelagic	907	NL	NC	1.18
Blainville’s beaked whale (<i>Mesoplodon densirostris</i>)	Pelagic	1,024 ¹¹	NL	NC	1.75
Hubb’s beaked whale (<i>Mesoplodon carlhubbsi</i>)	Slope, offshore	1,024 ¹¹	NL	NC	1.75

Stejneger's beaked whale (<i>Mesoplodon stejnegeri</i>)	Slope, offshore	1,024 ¹¹	NL	NC	1.75
Bottlenose dolphin (<i>Tursiops truncatus</i>)	Coastal, oceanic, shelf break	1,006 ¹²	NL	NC D - Western North Atlantic coastal	0
Striped dolphin (<i>Stenella coeruleoalba</i>)	Off continental shelf	10,908	NL	NC	0.04
Short-beaked common dolphin (<i>Delphinus delphis</i>)	Shelf, pelagic, seamounts	411,211	NL	NC	10.28
Pacific white-sided dolphin (<i>Lagenorhynchus obliquidens</i>)	Offshore, slope	26,930	NL	NC	34.91
Northern right whale dolphin (<i>Lissodelphis borealis</i>)	Slope, offshore waters	8,334	NL	NC	12.88
Risso's dolphin (<i>Grampus griseus</i>)	Deep water, seamounts	6,272	NL	NC	11.19
False killer whale (<i>Pseudorca crassidens</i>)	Pelagic	NA	NL Proposed EN - insular Hawaiian	NC	0
Killer whale (<i>Orcinus orca</i>)	Pelagic, shelf, coastal	2,250 to 2,700	NL EN - Southern resident ¹³	NC D - Southern resident, AT1 transient	1.66
Short-finned pilot whale (<i>Globicephala macrorhynchus</i>)	Pelagic, shelf coastal	760	NL	NC	0
Harbor porpoise (<i>Phocoena phocoena</i>)	Coastal and inland waters	55,255 ¹³	NL	NC	632.4
Dall's porpoise (<i>Phocoenoides dalli</i>)	Shelf, slope, offshore	42,000	NL	NC	83.82
Pinnipeds					
Northern fur seal (<i>Callorhinus ursinus</i>)	Pelagic, offshore	653,171 ⁵	NL	NC D – Pribilof Island, Eastern Pacific stock	83.62
California sea lion (<i>Zalophus californianus</i>)	Coastal, shelf	296,750	NL	NC	0
Steller sea lion (<i>Eumetopias jubatus</i>)	Coastal, shelf	58,334 to 72,223 ⁵	T – Eastern stock EN – Western	D	13.12

			stock		
Pacific harbor seal (<i>Phoca vitulina richardsi</i>)	Coastal	24,732 ¹⁴	NL	NC	292.3
Northern elephant seal (<i>Mirounga angustirostris</i>)	Coastal, pelagic in migration	124,000 ¹⁵	NL	NC	45.81

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 Density estimate as listed in Table 3 of the applications.

⁴ Bering Sea (Wade *et al.*, 2010).

⁵ Eastern North Pacific (Allen and Angliss, 2011).

⁶ North Pacific (Barlow *et al.*, 2009).

⁷ North Pacific (Wada, 1976).

⁸ North Pacific (Tillman, 1977).

⁹ North Pacific (Ohsumi and Wada, 1974).

¹⁰ Eastern Temperate North Pacific (Whitehead, 2002a).

¹¹ All *Mesoplodon* spp.

¹² Offshore stock (Carretta *et al.*, 2011a).

¹³ Eastern North Pacific Southern Resident Stock of killer whales is listed an EN under ESA.

¹⁴ Northern Oregon/Washington Coast and Northern California/Southern Oregon stocks.

¹⁵ Oregon/Washington Coastal Stock (Carretta *et al.*, 2011a).

Refer to sections III and IV of the Observatory's applications for detailed information regarding the abundance and distribution, population status, and life history and behavior of these species and their occurrence in the project area. The applications also present how the Observatory calculated the estimated densities for the marine mammals in the survey area. We have reviewed these data and determined them to be the best available scientific information for the purposes of the Incidental Harassment Authorizations.

Potential Effects 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, behavioral disturbance, temporary or permanent impairment, or non-auditory physical or physiological effects (Richardson et al., 1995; Gordon et al., 2004; Nowacek et al., 2007; Southall et al., 2007). Permanent hearing impairment, in the unlikely event that it occurred, would constitute injury, but temporary threshold shift is not an injury (Southall et al., 2007). Although we cannot exclude the possibility entirely, it is unlikely that the 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 in this document, we expect some behavioral disturbance, but we expect the disturbance to be localized.

The notice of the proposed Incidental Harassment Authorization (77 FR 25966, May 2, 2012) included a discussion of the effects of sound from airguns on mysticetes,

odontocetes, and pinnipeds including tolerance, masking, behavioral disturbance, hearing impairment, and other non-auditory physical effects. We refer the reader to that document, as well as the Observatory's applications, and Environmental Assessment for additional information on the behavioral reactions (or lack thereof) by all types of marine mammals to seismic surveys.

Anticipated Effects on Marine Mammal Habitat, Fish, Fisheries and Invertebrates

We included a detailed discussion of the potential effects of this action on marine mammal habitat, including physiological and behavioral effects on marine fish, fisheries, and invertebrates in the notice of the proposed Incidental Harassment Authorization (77 FR 25966, May 2, 2012). While we anticipate 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 we considered in further detail in the notice of the proposed Incidental Harassment Authorization (77 FR 25966, May 2, 2012) as behavioral modification. The main impact associated with the activity will be temporarily elevated noise levels and the associated direct effects on marine mammals.

Recent work by Andre et al. (2011) purports to present the first morphological and ultrastructural evidence of massive acoustic trauma (i.e., permanent and substantial alterations of statocyst sensory hair cells) in four cephalopod species subjected to low-frequency sound. The cephalopods, primarily cuttlefish, were exposed to continuous 40 to 400 Hz sinusoidal wave sweeps (100% duty cycle and 1 s sweep period) for two hour while captive in relatively small tanks (one 2,000 liter [L 2 m³] and one 200 L [0.2 m³] tank). The received SPL was reported as 175±5 dB re 1 µPa, with peak levels at 175 dB re 1 µPa. As in the McCauley et al. (2003) paper on sensory hair cell damage in pink

snapper as a result of exposure to seismic sound (described in the notice of the proposed Incidental Harassment Authorization), the cephalopods were subjected to higher sound levels than they would be under natural conditions, and they were unable to swim away from the sound source.

Mitigation

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

The Observatory has based the mitigation measures which they will implement during the seismic survey, on the following:

- (1) Protocols used during previous seismic research cruises as approved by us;
- (2) Previous Incidental Harassment Authorization applications and authorizations that we have approved and authorized; and
- (3) Recommended best practices in Richardson et al. (1995), Pierson et al. (1998), and Weir and Dolman (2007).

To reduce the potential for disturbance from acoustic stimuli associated with the activities, the Observatory and/or its designees is required to implement the following mitigation measures for marine mammals:

- (1) Exclusion zones;
- (2) Power-down procedures;
- (3) Shut-down procedures;

(4) Ramp-up procedures; and

(5) Additional measures for species of concern.

Exclusion Zones – The Observatory uses safety radii to designate exclusion zones and to estimate take for marine mammals. Table 2 (presented earlier in this document) shows the distances at which one would expect to receive three sound levels (160-, 180-, and 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). The Observatory used these levels to establish the exclusion zones.

If the Protected Species Visual Observer detects marine mammal(s) within or about to enter the appropriate exclusion zone, the Langseth crew will immediately power-down the airgun array, or perform a shut-down if necessary (see Shut-down Procedures).

Table 2 summarizes the predicted distances at which sound levels (160, 180, and 190 dB [rms]) are expected to be received from the airgun array operating in shallow, intermediate, and deep water depths.

Table 2. Distances to which sound levels ≥ 190 , 180, and 160 dB re 1 μPa (rms) could be received in shallow, intermediate, and deep water during the three seismic surveys in the northeastern Pacific Ocean, June to July, 2012. Distances are based on model results provided by the Observatory.

Source and Volume (in ³)	Tow Depth (m)	Water Depth (m)	Predicted RMS Radii Distances ² (m)		
			160 dB	180 dB	190 dB
Single Bolt airgun (40 in ³)	6-15 ¹	Deep (> 1,000)	385	40	
		Intermediate (100 to 1,000)	578	60	12
		Shallow (< 100)	1,050	296	18
36-Airgun Array (6,600 in ³)	9	Deep (> 1,000)			150
		Intermediate (100 to 1,000)	3,850	940	
		Shallow (< 100)	12,200	1,540	400
36-Airgun Array (6,600 in ³)	12	Deep (> 1,000)	20,550	2,140	550
		Intermediate (100 to 1,000)			680
		Shallow (< 100)	4,400	1,100	460
36-Airgun Array (6,600 in ³)	15	Deep (> 1,000)	13,935	1,810	615
		Intermediate (100 to 1,000)	23,470	2,250	770
		Shallow (< 100)			
36-Airgun Array (6,600 in ³)	15	Deep (> 1,000)	4,490	1,200	520
		Intermediate (100 to 1,000)	15,650	1,975	690
		Shallow (< 100)	26,350	2,750	865

¹ For a single airgun, the tow depth has minimal effect on the maximum near-field output and the shape of the frequency spectrum for the single airgun; thus, the predicted exclusion zones are essentially the same at different tow depths.

² The Observatory has based the radii for the array on data in Tolstoy *et al.* (2009) and has corrected for tow depth using modeled results. They have based the predicted radii for a single airgun upon their model (see Figure 3 in application #1).

Power-down Procedures – A power-down involves decreasing the number of airguns in use such that the radius of the 180-dB (or 190-dB) zone is smaller to the extent that marine mammals are no longer within or about to enter the exclusion zone. A power-down of the airgun array can also occur when the vessel is moving from one seismic line to another. During a power-down for mitigation, the Observatory will operate one airgun (40 in³). The continued operation of one airgun is intended to alert marine mammals to the presence of the seismic vessel in the area. In contrast, a shut-down occurs when the Langseth suspends all airgun activity.

If the Protected Species Observer detects a marine mammal outside the exclusion zone and the animal is likely to enter the zone, the crew will power-down the airguns to reduce the size of the 180-dB exclusion zone before the animal enters that zone.

Likewise, if a mammal is already within the zone when first detected, the crew will power-down the airguns immediately. During a power-down of the airgun array, the crew will operate a single 40-in³ airgun which has a smaller exclusion zone. If the Protected Species Observer detects a marine mammal within or near the smaller exclusion zone around the airgun (Table 2), the crew will shut-down the single airgun (see next section).

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

(1) If an animal enters the exclusion zone of the single airgun after the crew 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.

Considering the conservation status for endangered North Pacific right whales and Southern Resident killer whales, the Langseth crew will shut-down the airgun(s) immediately in the unlikely event that these species are visually sighted and/or acoustically detected, regardless of the distance from the vessel. Ramp-up will only begin if the animals have not been visually sighted or acoustically detected for 30 minutes.

Resuming Airgun Operations after a Power-down

Following a power-down, the Langseth crew will not resume full airgun activity until the marine mammal has cleared the 180-dB exclusion zone (see Table 2). The Protected Species Observers will consider the animal to have cleared the exclusion zone if:

- The observer has visually observed the animal leave the exclusion zone; or
- An observer has not sighted the animal within the exclusion zone for 15 minutes for species with shorter dive durations (i.e., small odontocetes or pinnipeds), or 30 minutes for species with longer dive durations (i.e., mysticetes and large odontocetes, including sperm, pygmy sperm, dwarf sperm, and beaked whales); or
- The vessel has transited outside the original 180-dB exclusion zone after an 8-minute wait period. This period is based on the 180-dB exclusion zone for the 36-airgun array (940 m) towed at a depth of 9 m (29.5 ft) in relation to the average speed of the Langseth while operating the airguns (8.5 km/h; 5.3 mph).

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 has transited 1.13 km (0.61 nmi) away from the vicinity of the original sighting during the 8-minute period, implementing ramp-up procedures for the full array after an extended power-down (i.e., transiting for an additional 35 minutes from the location of initial sighting) would not meaningfully increase the effectiveness of observing marine mammals approaching or entering the exclusion zone for the full source level and would not further minimize the potential for take. The Langseth's Protected Species Observers are continually monitoring the exclusion zone for the full source level while the mitigation airgun is firing. On average, Protected Species Observers 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 would be encountered within this distance before resuming airgun operations at full power.

Resuming Airgun Operations after a Shut-down

Following a shut-down, the Langseth crew will initiate a ramp-up with the smallest airgun in the array (40-in³). The crew will turn on additional airguns in a sequence such that the source level of the array will increase in steps not exceeding 6 dB per five-minute period over a total duration of approximately 30 minutes. During ramp-up, the Protected Species Observers will monitor the exclusion zone, and if he/she sights

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 Protected Species Observers 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 Protected Species Observer 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-in³ 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 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 a ramp-up of the airguns if a marine mammal is sighted within or near the applicable exclusion zones during the day or close to the vessel at night.

Additional Mitigation Measures for Species of Concern

The Observatory will communicate with NMFS Northwest Fisheries Science Center (Brad.Hanson@noaa.gov, 206-300-0282), NMFS Northwest Regional Office (Lynne.Barre@noaa.gov, 206-718-3807 or Brent.Norberg@noaa.gov, 206-526-6550), The Whale Museum (hotline@whalemuseum.org, 1-800-562-8832), Orca Network (info@orcانetwork.org, 1-866-672-2638), and/or other sources for near real-time reporting of the whereabouts of Southern Resident killer whales.

For the Cascadia Thrust Zone Northern Area Survey and the Cascadia Subduction Zone Survey:

- The Observatory will conduct a pre-survey beginning on July 11 (2 days before seismic operations commence) using the support vessel M/V Northern Light (Northern Light) or equivalent with three Protected Species Observers onboard for purposes of monitoring for the presence of marine mammals (particularly focusing attention to Southern Resident killer whales). The pre-survey will begin upon leaving port and during transit to the Northern Trehu line. The support vessel will then begin a zig-zag transect of the 160 dB buffer zone around the Trehu North line to either side of the Trehu North line from inshore to offshore remaining on the shelf looking for marine mammals. When the Langseth is ready to begin the seismic survey, the support vessel Northern Light will monitor north of the Langseth approximately 5 km away in the same zig-zag fashion as the pre-survey to monitor the 160 dB exclusion zone around the Langseth when the ship begins the survey on the continental shelf.

- To the maximum extent practicable, utilize a portable hydrophone from the support vessel Northern Light to listen for and determine the presence of vocalizing marine mammals and assist with visual detections.

- Conduct seismic operations according to relevant sightings of marine mammals from the Langseth and the support vessel Northern Light. For example, if high densities of marine mammals, including Southern Resident killer whales, are sighted in the northern region of the seismic survey area then seismic operations will begin in the southern region of the study area.

We have carefully evaluated the applicant's mitigation measures and have considered a range of other measures in the context of ensuring that we have prescribed the means of effecting the least practicable impact on the affected marine mammal species or stocks and their habitat. Our 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, we expect that the successful implementation of the measure would 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.

Based on our evaluation of the Observatory's measures, as well as other measures considered by us or recommended by the public, we have determined that the mitigation measures provide the means of effecting the least practicable impacts 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 Incidental Take Authorization for an activity, section 101(a)(5)(D) of the MMPA states that we must set forth "requirements pertaining to the

monitoring and reporting of such taking.” The Marine Mammal Protection Act’s implementing regulations at 50 CFR 216.104 (a)(13) indicate that requests for an authorization must include the suggested means of accomplishing the necessary monitoring and reporting that will result in increased knowledge of the species and the level of taking or impacts on populations of marine mammals expected to be present in the action area.

Monitoring

The Observatory will sponsor marine mammal monitoring during the present project, in order to implement the mitigation measures that require real-time monitoring, and to satisfy the monitoring requirements of the Incidental Harassment Authorizations. We describe the Observatory’s Monitoring Plan below this section. The Observatory has planned the monitoring work as a self-contained project independent of any other related monitoring projects that may occur in the same regions at the same time. Further, the Observatory would discuss coordination of its monitoring program with any other related work by other groups working in the same area, if practical.

Vessel-based Visual Monitoring

The Observatory will position Protected Species Visual Observers aboard the seismic source vessel to watch for marine mammals near the vessel during daytime airgun operations and during any start-ups at night. Protected Species Visual Observers 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 eight minutes for this cruise). When feasible, the Protected Species Visual Observers will conduct observations during daytime periods when the seismic system is

not operating for comparison of sighting rates and behavior with and without airgun operations and between acquisition periods. Based on the observations, the Langseth will power-down or shut-down the airguns when marine mammals are observed within or about to enter a designated exclusion zone which is a region in which a possibility exists of adverse effects on animal hearing or other physical effects.

During seismic operations, at least four Protected Species Observers (Protected Species Visual Observer and/or Protected Species Acoustic Observer) will be aboard the Langseth. The Observatory will appoint the Protected Species Observers with our concurrence. They will conduct observations during ongoing daytime operations and nighttime ramp-ups of the airgun array. During the majority of seismic operations, two Protected Species Observers will be on duty from the observation tower to monitor marine mammals near the seismic vessel. Using two Protected Species Observers will increase the effectiveness of detecting animals near the source vessel. However, during mealtimes and bathroom breaks, it is sometimes difficult to have two Protected Species Observers on effort, but at least one observer will be on watch during bathroom breaks and mealtimes. Protected Species Observers will be on duty in shifts of no longer than four hours in duration.

Two Protected Species Observers will also be on visual watch during all nighttime ramp-ups of the seismic airguns. A third Protected Species Acoustic Observer will monitor the passive acoustic monitoring equipment 24 hours a day to detect vocalizing marine mammals present in the action area. In summary, a typical daytime cruise would have scheduled two Protected Species Observers (visual) on duty from the observation tower, and a Protected Species Observer (acoustic) on the passive acoustic

monitoring system. Before the start of the seismic survey, the Observatory will instruct the vessel's crew to assist in detecting marine mammals and implementing mitigation requirements.

The Langseth is a suitable platform for marine mammal observations. When stationed on the observation platform, the eye level will be approximately 21.5 m (70.5 ft) above sea level, and the Protected Species Visual Observer will have a good view around the entire vessel. During daytime, the observers 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. 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 the Protected Species Observers see marine mammals within or about to enter the designated exclusion zone, the Langseth will immediately power-down or shut-down the airguns if necessary. The Protected Species Visual Observer(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 Protected Species Observer has confirmed that the animal has left the zone, or if not observed after 15 minutes for species with shorter dive durations (small odontocetes and pinnipeds) or 30 minutes for species with longer dive durations (mysticetes and large odontocetes, including sperm, pygmy sperm, dwarf sperm, killer, and beaked whales).

Passive Acoustic Monitoring

Passive acoustic monitoring 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. Acoustical monitoring can be used in conjunction with visual observations to improve detection, identification, and localization of cetaceans. The acoustic monitoring will serve to alert visual observers (if on duty) when vocalizing cetaceans are detected. It is only useful when marine mammals call, but it can be effective either by day or by night, and does not depend on good visibility. The Protected Species Acoustic Observer will monitor the system in real time so that he/she can advise the visual observers if they acoustically detect cetaceans. When the Protected Species Acoustic Observer determines the bearing (primary and mirror-image) to calling cetacean(s), he/she will alert the Protected Species Visual Observer to help him/her sight the calling animal(s).

The passive acoustic monitoring system consists of hardware (i.e., hydrophones) and software. The “wet end” of the system consists of a towed hydrophone array 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 less than 20 m (65.6 ft). The Langseth crew will deploy the array from a winch located on the back deck. A deck cable will connect the tow cable to the electronics unit in the main computer lab where the acoustic station, signal conditioning, and processing system will be located. The acoustic signals received by the hydrophones are amplified, digitized, and then processed

by the Pamguard software. The system can detect marine mammal vocalizations at frequencies up to 250 kHz.

As described earlier in this document, one Protected Species Acoustic Observer, an expert bioacoustician with primary responsibility for the passive acoustic monitoring system will be aboard the Langseth in addition to the four Protected Species Visual Observers. The Protected Species Acoustic Observer will monitor the towed hydrophones 24 hours per day during airgun operations and during most periods when the Langseth is underway while the airguns are not operating. However, passive acoustic monitoring may not be possible if damage occurs to both the primary and back-up hydrophone arrays during operations. The primary passive acoustic monitoring streamer on the Langseth is a digital hydrophone streamer. Should the digital streamer fail, back-up systems should include an analog spare streamer and a hull-mounted hydrophone.

One Protected Species Acoustic Observer 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 Protected Species Acoustic Observer monitoring the acoustical data will be on shift for one to six hours at a time. The other Protected Species Observers will rotate as a Protected Species Acoustic Observer, although the expert acoustician will be on passive acoustic monitoring duty more frequently.

When the Protected Species Acoustic Observer detects a vocalization while visual observations are in progress, the Protected Species Acoustic Observer on duty will contact the Protected Species Visual Observer immediately, to alert him/her to the

presence of cetaceans (if they have not already been seen), so that the vessel's crew can initiate a power-down or shut-down, if required. The Protected Species Acoustic Observer will enter the information regarding the call 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.

Protected Species Observer Data and Documentation

Observers 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. They will use the data to estimate numbers of animals potentially 'taken' by harassment (as defined in the MMPA). They will also provide information needed to order a power-down or shut-down of the airguns when a marine mammal is within or near the exclusion zone. Observations will also be made during daytime periods when the Langseth is underway without seismic operations (i.e., transits to, from, and through the study area) to collect baseline biological data.

When a Protected Species Observer makes a sighting, they will record the following information:

1. Species, group size, age/size/sex categories (if determinable), behavior when first sighted and after initial sighting, heading (if consistent), bearing and distance from

seismic vessel, sighting cue, apparent reaction to the airguns or vessel (e.g., none, avoidance, approach, paralleling, etc.), and behavioral pace.

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

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

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

Results from the vessel-based observations will provide the following information:

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 the Observatory must report to the Office of Protected Resources.
3. Data on the occurrence, distribution, and activities of marine mammals and turtles in the area where the Observatory will conduct the seismic study.

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

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

Reporting

The Observatory will submit a report to us and to the Foundation within 90 days after the end of the cruise. The report will describe the operations that were conducted and sightings of marine mammals near 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 (dates, times, locations, activities, associated seismic survey activities). 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 our and the Foundation’s websites.

In the unanticipated event that the specified activity clearly causes the take of a marine mammal in a manner prohibited by the Incidental Harassment Authorization, such as an injury (Level A harassment), serious injury, or mortality (e.g., ship-strike, gear interaction, and/or entanglement), the Observatory 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 email to Jolie.Harrison@noaa.gov, Jeannine.Cody@noaa.gov, and Howard.Goldstein@noaa.gov; and to the Northwest Regional Stranding

Coordinator at 206-526-6550 (Brent.Norberg@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 use in the 24 hours preceding the incident;
- Water depth;
- Environmental conditions (e.g., wind speed and direction, Beaufort sea state, cloud cover, and visibility);
- Description of all marine mammal observations in the 24 hours preceding the incident;
- Species identification or description of the animal(s) involved;
- Fate of the animal(s); and
- Photographs or video footage of the animal(s) (if equipment is available).

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

In the event that the Observatory discovers an injured or dead marine mammal, and the lead Protected Species Visual Observer determines that the cause of the injury or death is unknown and the death is relatively recent (i.e., in less than a moderate state of

decomposition as we describe in the next paragraph), the Observatory will 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, Jeannine.Cody@noaa.gov, and Howard.Goldstein@noaa.gov and to the Northwest Regional Stranding Coordinator at 206-526-6550 (Brent.Norberg@noaa.gov). The report must include the same information identified in the paragraph above this section. Activities may continue while we review the circumstances of the incident. We will work with the Observatory to determine whether modifications in the activities are appropriate.

In the event that the Observatory discovers an injured or dead marine mammal, and the lead Protected Species Observer determines that the injury or death is not associated with or related to the authorized activities (e.g., previously wounded animal, carcass with moderate to advanced decomposition, or scavenger damage), the Observatory will 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, Jeannine.Cody@noaa.gov and Howard.Goldstein@noaa.gov and the Northwest Regional Stranding Coordinator at 206-526-6550 (Brent.Norberg@noaa.gov), within 24 hours of the discovery. The Observatory will provide photographs or video footage (if available) or other documentation of the stranded animal sighting to us.

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].

We anticipate and authorize take by Level B harassment only for the marine seismic surveys in the northeastern Pacific Ocean. Acoustic stimuli (i.e., increased underwater sound) generated during the operation of the seismic airgun array may have the potential to cause marine mammals in the survey area to be exposed to sounds at or greater than 160 dB or cause temporary, short-term changes in behavior. There is no evidence that the Observatory's planned activities could result in injury, serious injury or mortality within the specified geographic area for which we have issued the requested authorization. Take by injury, serious injury, or mortality is thus neither anticipated nor authorized. We have determined that the required mitigation and monitoring measures will minimize any potential risk for injury, serious injury, or mortality.

The following sections describe the Observatory's methods to estimate take by incidental harassment and present their estimates of the numbers of marine mammals that could be affected during the seismic program. The Observatory's estimates assume that marine mammals exposed to airgun sounds greater than or equal to 160 dB might change their behavior sufficiently for us to consider them as taken by harassment. They have based their estimates on the number of marine mammals that could be disturbed appreciably by operations with the 36-airgun array during approximately 4,991 km (2,694.2 nmi) of transect lines in the northeastern Pacific Ocean.

We assume that during simultaneous operations of the airgun array and the other

sources, any marine mammals close enough to be affected by the multibeam echosounder and sub-bottom profiler would already be affected by the airguns. However, whether or not the airguns are operating simultaneously with the other sources, we expect that the marine mammals would exhibit no more than short-term and inconsequential responses to the multibeam echosounder and profiler given their characteristics (e.g., narrow downward-directed beam) and other considerations described previously. Based on the best available information, we do not consider that these reactions constitute a “take” (NMFS, 2001). Therefore, the Observatory did not provide any additional allowance for animals that could be affected by sound sources other than the airguns.

Ensonified Area Calculations - Because the Observatory assumes that the Langseth may need to repeat some tracklines, accommodate the turning of the vessel, address equipment malfunctions, or conduct equipment testing to complete the survey; they have increased the number of line-kilometers for the seismic operations by 25 percent (i.e., contingency lines).

The Observatory calculated the expected ensonified area by entering the planned survey lines (including the 25 percent contingency lines) into a Map-Info Geographic Information System (system). The Observatory used the system to draw a 160-dB radius (see Table 2) around the operating airgun array (i.e., the ensonified area) around each seismic line. This first calculation is the area excluding overlap.

Depending on the spacing of the transect lines within the ensonified area, the Observatory may also calculate areas of transit overlap. For example, if the ratio of transit overlap is 1.5 times the area excluding overlap, then a marine mammal that stayed within the area during the entire survey could be exposed to acoustic stimuli

approximately two times. However, it is unlikely that a particular animal would stay in the area during the entire survey. For the Juan de Fuca survey, the transit lines are closely spaced together and the ratio of transect overlap is 1.7 greater than the area excluding overlapping transect lines. For the Cascadia Thrust Zone survey the ratio is 2.8, and for the Cascadia Subduction Margin survey the ratio is 2.0 times the area excluding overlap. Table 3 presents the area calculations for each survey. Refer to the Incidental Harassment Authorization application and Environmental Assessment for additional information.

Table 3. Ensonified area calculations for three seismic surveys in the northeast Pacific Ocean, during June to July, 2012.

Survey	Area Excluding Overlap (km ²)	Area with Contingency Lines (km ²)	Transect Line Spacing	Overlap Ratio (km ²)
Juan de Fuca Plate	18,471	23,089	Closely spaced	1.7
Cascadia Thrust Zone	11,448	14,310	Closely spaced	2.8
Cascadia Subduction Margin	11,387	14,234	Closely spaced	2.0

Density Information— The Observatory calculated the density data for 26 species reported off the Oregon and Washington coasts in the northeastern Pacific Ocean using the following data sources:

- Pooled results of the 1991 to 2008 NMFS Southwest Fishery Science Center ship surveys as synthesized by Barlow and Forney (2007) and Barlow (2010) for all species except the gray whale and harbor porpoise.
 - Abundance estimates for gray whales that remain between Oregon and British Columbia in summer and the within area out to 43 km (23.2 mi) from shore in the U.S.
- Navy’s Keyport Range Complex Extension Environmental Impact Statement/Overseas

Environmental Impact Statement (DoN, 2010); and

- The population estimate for the Northern Oregon/Washington Coast stock of harbor porpoises from the Pacific Marine Mammal Stock Assessments 2010 Report (Carretta et al., 2010).

For the pooled results of the 1991 to 2008 NMFS Southwest Fishery Science Center ship surveys, the Observatory has corrected the densities for trackline detectability probability bias and availability bias. Trackline detectability probability bias is associated with diminishing sightability with increasing lateral distance from the track line [$f(0)$]. Availability bias refers to the fact that there is less than a 100 percent probability of sighting an animal that is present along the survey track line, and it is measured by $g(0)$.

Exposure Calculations - The Observatory calculated the number of different individuals that could be exposed to airgun sounds with received levels greater than or equal to 160 dB re: 1 μ Pa by multiplying the expected density of the marine mammals by the ensonified area excluding areas of overlap. This area includes the 25 percent contingency lines.

Any marine mammal sightings within or near the designated exclusion zone will result in the shut-down of seismic operations as a mitigation measure. Thus, the following estimates of the numbers of marine mammals potentially exposed to 160 dB re: 1 μ Pa sounds are precautionary, and probably overestimate the actual numbers of marine mammals that might be involved. These estimates assume that there will be no weather, equipment, or mitigation delays, which is highly unlikely.

Because this approach does not allow for turnover in the marine mammal populations in the study area during the course of the survey, the actual number of individuals exposed could be underestimated. However, the approach assumes that no cetaceans will move away from or toward the trackline as the Langseth approaches in response to increasing sound levels prior to the time the levels reach 160 dB re: 1 μ Pa, which will result in overestimates for those species known to avoid seismic vessels.

Juan de Fuca Plate Survey Exposure Estimates

The total estimate of the number of individual cetaceans that could be exposed to seismic sounds with received levels greater than or equal to 160 dB re: 1 μ Pa during this survey is 10,208 (see Table 4). The total includes 78 baleen whales, 56 of which are endangered: four blue whales (0.17 percent of the regional population), 30 fin whales (0.18 percent of the regional population), 19 humpback whales (0.09 percent of the regional population), and four sei whales (0.03 percent of the population). In addition, 24 sperm whales (0.10 percent of the regional population) and 303 Steller sea lions (0.46 percent of the population) (both listed as endangered under the Endangered Species Act) could be exposed during the survey.

Of the cetaceans potentially exposed, 57 percent are delphinids and 42 percent are pinnipeds. The most common species in the area potentially exposed to sound levels greater than or equal to 160 dB re: 1 μ Pa during the proposed survey would be harbor porpoises (2,153 or 4.12 percent), Dall's porpoises (1,935 or 4.61 percent), northern fur seals (1,931 or 0.30 percent), and northern elephant seals (1,058 or 0.85 percent). While potential exposures were modeled for killer whales, no incidental takes were authorized for killer whales due to the difficulty for Protected Species Observers to visually and acoustically

distinguish endangered Southern Resident killer whales from other types and stocks of killer whales (e.g., transient, resident, and offshore). We believe the additional required monitoring and mitigation measures and modifications in the survey design will reduce the take to zero.

Table 4. Estimates of the possible numbers of marine mammals exposed to sound levels greater than or equal to 160 dB re: 1 μ Pa during the proposed Juan de Fuca Plate seismic survey in the northeast Pacific Ocean, June to July, 2012.

Species	Estimated Number of Individuals Exposed to Sound Levels \geq 160 dB re: 1 μ Pa ¹	Incidental Take Authorized	Approximate Percent of Regional Population ²
Mysticetes			
Gray whale	10	10	0.05
Humpback whale	19	19	0.09
Minke whale	11	11	0.12
Sei whale	4	4	0.03
Fin whale	30	30	0.18
Blue whale	4	4	0.17
Odontocetes			
Sperm whale	24	24	0.10
Pygmy/Dwarf sperm whale	16	16	N/A
Cuvier's beaked whale	10	10	0.46
Baird's beaked whale	27	27	3.0
<i>Mesoplodon</i> spp. ³	40	40	3.95
Striped dolphin	1	2 ⁴	0.01
Short-beaked common dolphin	237	238 ⁴	0.06
Pacific white-sided dolphin	806	806	299
Northern right whale dolphin	297	297	3.57
Risso's dolphin	258	258	4.12
Killer whale	38	0	0
Harbor porpoise ⁵	2,153	2,153	4.12
Dall's porpoise	1,935	1,935	4.61
Pinnipeds			
Northern fur seal	1,931	1,931	0.30
Steller sea lion	303	303	0.46
Harbor seal ⁵	995	995	4.02
Northern elephant seal	1,058	1,058	0.85

N/A = Not Available

¹ Estimates are based on densities in Table 1 and an ensouffled area (including 25% contingency of 23,089 km²).

² Regional population size estimates are from Table 1 (page 48 in Application #1).

³ Includes Blainville's, Stejneger's, and Hubb's beaked whales.

⁴ Requested take authorization increased to mean group size (see Application #1).

⁵ Estimates based on densities from Table 1 (page 48 in Application #1) and an ensouffled area in water depths less than 100 m (328 ft) (including 25 percent contingency) of 3,404 km².

Cascadia Thrust Zone Survey Exposure Estimates

The total estimate of the number of individual cetaceans that could be exposed to seismic sounds with received levels greater than or equal to 160 dB re: 1 μ Pa during this survey is 15,100 (see Table 5). The total includes 79 baleen whales, 35 of which are endangered: three blue whales (0.10 percent of the regional population), 18 fin whales (0.11 percent of the regional population), 12 humpback whales (0.06 percent of the regional population), and two sei whales (0.02 percent of the population). In addition, 15 sperm whales (0.06 percent of the regional population) and 188 Steller sea lions (0.29 percent of the population) (both listed as endangered under the Endangered Species Act) could be exposed during the survey.

Of the cetaceans potentially exposed, 63 percent are delphinids and 36 percent are pinnipeds. The most common species in the area potentially exposed to sound levels greater than or equal to 160 dB re: 1 μ Pa during the proposed survey would be, Dall's porpoises (1,199 or 2.86 percent), harbor porpoises (7,314 or 14 percent of the regional population or 9.2 percent of the overall population), and harbor seals (3,380 or 13.67 percent of the regional population or 4.6% of the overall population) and northern fur seals (1,197 or 0.18 percent) (Allen and Angliss, 2011). The percentages for harbor porpoises and harbor seals are the upper boundaries of the regional populations that could be affected by the proposed survey. However, these take estimates are small relative to the overall population sizes for each species in the northeast Pacific. Thus, these take estimates are likely an overestimate of the actual number of animals that may be taken by Level B harassment, and we expect that the actual number of individual animals that may be taken by Level B harassment to be less than the request. While potential exposures were

modeled for killer whales, no incidental takes were authorized for killer whales due to the difficulty for Protected Species Observers to visually and acoustically distinguish endangered Southern Resident killer whales from other types and stocks of killer whales (e.g., transient, resident, and offshore). We believe the additional required monitoring and mitigation measures and modifications in the survey design will reduce the take to zero.

Table 5. Estimates of the possible numbers of marine mammals exposed to sound levels greater than or equal to 160 dB re: 1 μ Pa during the Cascadia Thrust Zone seismic survey in the northeast Pacific Ocean, July, 2012.

Species	Estimated Number of Individuals Exposed to Sound Levels \geq 160 dB re: 1 μ Pa ¹	Incidental Take Authorized	Approximate Percent of Regional Population ²
Mysticetes			
Gray whale	35	35	0.18
Humpback whale	12	12	0.06
Minke whale	7	7	0.07
Sei whale	2	2	0.02
Fin whale	18	18	0.11
Blue whale	3	3	0.10
Odontocetes			
Sperm whale	15	15	0.06
Pygmy/Dwarf sperm whale	10	10	NA
Cuvier's beaked whale	6	6	0.28
Baird's beaked whale	17	17	1.86
<i>Mesoplodon</i> spp. ³	25	25	2.45
Striped dolphin	1	2 ⁴	< 0.01
Short-beaked common dolphin	147	238 ⁴	0.04
Pacific white-sided dolphin	500	500	1.86
Northern right whale dolphin	184	184	2.21
Risso's dolphin	160	160	2.55
Killer whale	24	0	0
Harbor porpoise ⁵	7,314	7,314	14.00
Dall's porpoise	1,199	1,199	2.86
Pinnipeds			
Northern fur seal	1,197	1,197	0.18
Steller sea lion	188	188	0.29
Harbor seal ⁵	3,380	3,380	13.67
Northern elephant seal	656	656	0.53

N/A = Not Available

¹ Estimates are based on densities in Table 1 and an ensouffled area (including 25% contingency) of 14,310 km².

² Regional population size estimates are from Table 1 (page 47 in Application #2).

³ Includes Blainville's, Stejneger's, and Hubb's beaked whales.

⁴ Requested take authorization increased to mean group size (see Application #2).

⁵ Estimates based on densities from Table 1 (page 47 in Application #2) and an ensouffled area in water depths less than 100 m (328 ft) (including 25 percent contingency) of 11.565 km².

Cascadia Subduction Margin Survey Exposure Estimates

The total estimate of the number of individual cetaceans that could be exposed to seismic sounds with received levels greater than or equal to 160 dB re: 1 μ Pa during this survey is 8,132 (see Table 6). The total includes 54 baleen whales, 35 of which are endangered: three blue whales (0.10 percent of the regional population), 18 fin whales (0.11 percent of the regional population), 11 humpback whales (0.06 percent of the regional population), and two sei whales (0.02 percent of the population). In addition, 15 sperm whales (0.06 percent of the regional population) and 187 Steller sea lions (0.29 percent of the population) (both listed as endangered under the Endangered Species Act) could be exposed during the survey.

Of the cetaceans potentially exposed, 59 percent are delphinids and 40 percent are pinnipeds. The most common species in the area potentially exposed to sound levels greater than or equal to 160 dB re: 1 μ Pa during the proposed survey would be harbor porpoises (2,580 or 4.94 percent), Dall's porpoises (1,193 or 2.84 percent), northern fur seals (1,190 or 0.18 percent), and harbor seals (1,192 or 4.82 percent). While potential exposures were modeled for killer whales, no incidental takes were authorized for killer whales due to the difficulty for Protected Species Observers to visually and acoustically distinguish endangered Southern Resident killer whales from other types and stocks of killer whales (e.g., transient, resident, and offshore). We believe the additional required monitoring and mitigation measures and modifications in the survey design will reduce the take to zero.

Table 6. Estimates of the possible numbers of marine mammals exposed to sound levels greater than or equal to 160 dB re: 1 μ Pa during the Cascadia Subduction Margin seismic survey in the northeast Pacific Ocean, July, 2012.

Species	Estimated Number of Individuals Exposed to Sound Levels \geq 160 dB re: 1 μ Pa ¹	Incidental Take Authorized	Approximate Percent of Regional Population ²
Mysticetes			
Gray whale	12	12	0.06
Humpback whale	11	11	0.06
Minke whale	6	6	0.07
Sei whale	2	2	0.02
Fin whale	18	18	0.11
Blue whale	3	3	0.10
Odontocetes			
Sperm whale	15	15	0.06
Pygmy/Dwarf sperm whale	10	10	NA
Cuvier's beaked whale	6	6	0.28
Baird's beaked whale	17	17	1.85
<i>Mesoplodon</i> spp. ³	25	25	2.44
Striped dolphin	1	2 ⁴	< 0.01
Short-beaked common dolphin	146	238 ⁴	0.04
Pacific white-sided dolphin	497	497	1.85
Northern right whale dolphin	183	183	2.20
Risso's dolphin	159	159	2.54
Killer whale	24	0	0
Harbor porpoise ⁵	2,580	2,580	4.94
Dall's porpoise	1,193	1,193	2.84
Pinnipeds			
Northern fur seal	1,190	1,190	0.18
Steller sea lion	187	187	0.29
Harbor seal ⁵	1,192	1,192	4.82
Northern elephant seal	652	652	0.53

N/A = Not Available

¹ Estimates are based on densities in Table 1 and an ensouffled area (including 25% contingency of 14,234 km²).

² Regional population size estimates are from Table 1 (page 47 in Application #3).

³ Includes Blainville's, Stejneger's, and Hubb's beaked whales.

⁴ Requested take authorization increased to mean group size (see Application #3).

⁵ Estimates based on densities from Table 1 (page 47 in Application #3) and an ensouffled area in water depths less than 100 m (328 ft) (including 25 percent contingency) of 4,080 km².

Encouraging and Coordinating Research

The Observatory and the Foundation will coordinate the planned marine mammal monitoring program associated with each seismic survey in the northeastern Pacific Ocean with other parties that may have interest in the area and/or may be conducting marine mammal studies in the same region during the seismic surveys.

Negligible Impact and Small Numbers Analysis and Determination

We have 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.” In making a negligible impact determination, we consider:

- (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);
- (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 (i.e., the manner and degree in which the measure is likely to reduce adverse impacts to marine mammals, the likely effectiveness of the measures, and the practicability of implementation).

For reasons stated previously in this document, and in the notice of the proposed Incidental Harassment Authorization (77 FR 25966, May 2, 2012), the specified activities associated with the marine seismic surveys are not likely to cause permanent threshold shift, or other non-auditory injury, serious injury, or death because:

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

(2) The potential for temporary or permanent hearing impairment is relatively low and that we would likely avoid this impact through the incorporation of the required monitoring and mitigation measures (described previously in this document);

(3) The fact that cetaceans would have to be closer than 940 m (3,084 ft) in deep water, 1,540 m (5,052 ft) in intermediate depths, and 2,140 m (7,020 ft) in shallow depths, when the 36-airgun array is in use at 9 m (29.5 ft) tow depth from the vessel to be exposed to levels of sound believed to have a minimal chance of causing permanent threshold shift;

(4) The fact that cetaceans would have to be closer than 1,100 m (3,609 ft) in deep water, 1,810 m (5,938 ft) in intermediate depths, and 2,520 m (8,268 ft) in shallow depths, when the 36-airgun array is in use at 12 m (39.4 ft) tow depth from the vessel to be exposed to levels of sound believed to have a minimal chance of causing permanent threshold shift;

(5) The fact that cetaceans would have to be closer than 1,200 m (3,937 ft) in deep water, 1,975 m (6,480 ft) in intermediate depths, and 2,750 m (9,022 ft) in shallow depths, when the 36-airgun array is in use at 15 m (49.2 ft) tow depth from the vessel to

be exposed to levels of sound believed to have a minimal chance of causing permanent threshold shift;

(6) The fact that cetaceans would have to be closer than 40 m (131 ft) in deep water, 60 m (197 ft) in intermediate depths, and 296 m (971 ft) in shallow depths, when the single airgun is in use at six to 15 m (20 to 49.2 ft) tow depth from the vessel to be exposed to levels of sound believed to have a minimal chance of causing permanent threshold shift;

(7) The fact that pinnipeds would have to be closer than 400 m (1,312 ft) in deep water, 550 m (1,804 ft) in intermediate depths, and 680 m (2,231 ft) in shallow depths, when the 36-airgun array is in use at 9 m (29.5 ft) tow depth from the vessel to be exposed to levels of sound believed to have a minimal chance of causing permanent threshold shift;

(8) The fact that pinnipeds would have to be closer than 460 m (1,509 ft) in deep water, 615 m (2,018 ft) in intermediate depths, and 770 m (2,526 ft) in shallow depths, when the single airgun is in use at 12 m (39.4 ft) tow depth from the vessel to be exposed to levels of sound believed to have a minimal chance of causing permanent threshold shift;

(9) The fact that pinnipeds would have to be closer than 520 m (1,706 ft) in deep water, 690 m (2,264 ft) in intermediate depths, and 865 m (2,838 ft) in shallow depths, when the single airgun is in use at 15 m (49.2 ft) tow depth from the vessel to be exposed to levels of sound believed to have a minimal chance of causing permanent threshold shift;

(10) The fact that pinnipeds would have to be closer than 12 m (39.4 ft) in deep

water, 18 m (59 ft) in intermediate depths, and 150 m (492 ft) in shallow depths, when the single airgun is in use at six to 15 m (20 to 49.2 ft) tow depth from the vessel to be exposed to levels of sound believed to have a minimal chance of causing permanent threshold shift; and

(11) The likelihood that marine mammal detection ability by trained Protected Species Visual Observers is high at close proximity to the vessel.

We do not anticipate that any injuries, serious injuries, or mortalities would occur as a result of the Observatory's planned marine seismic surveys, and we are not authorizing injury, serious injury or mortality for these surveys. We anticipate only short-term behavioral disturbance to occur during the conduct of the survey activities. Tables 5, 6, and 7 of this document outline the number of Level B harassment takes that we anticipate as a result of these activities. Due to the nature, degree, and context of Level B (behavioral) harassment anticipated and described (see "Potential Effects on Marine Mammals" section in this notice), we do not expect the activity to impact rates of recruitment or survival for any affected species or stock. Further, the seismic surveys would not take place in areas of significance for marine mammal feeding, resting, breeding, or calving and would not adversely impact marine mammal habitat.

Many animals perform vital functions, such as feeding, resting, traveling, and socializing, on a diel cycle (i.e., 24 hour cycle). Behavioral reactions to noise exposure (such as disruption of critical life functions, displacement, or avoidance of important habitat) are more likely to be significant if they last more than one diel cycle or recur on subsequent days (Southall et al., 2007). While we anticipate that the seismic operations would occur on consecutive days, the estimated duration of the Juan de Fuca Plate survey

would last no more than 17 days, the Cascadia Thrust Zone survey would last approximately 3 days, and the Cascadia Subduction Margin survey would occur over 10 days.

Because the Langseth will move continuously along planned tracklines, each of the three seismic surveys would increase sound levels in the marine environment surrounding the vessel for 21 days during the first and second study and for 10 days during the last study. There will be an estimated 4-day period of non-seismic activity between the second and third survey.

Of the 31 marine mammal species under our jurisdiction that are known to occur or likely to occur in the study area, six of these species and two stocks are listed as endangered under the ESA: the blue, fin, humpback, North Pacific right, sei, and sperm whales; the Southern Resident stock of killer whales; and the eastern U.S. stock of the Steller sea lion. These species are also categorized as depleted under the MMPA. With the exception of North Pacific right whales and Southern Resident killer whales, the Observatory has requested take for these listed species. To protect these animals (and other marine mammals in the study area), the Observatory must cease or reduce airgun operations if animals enter designated zones. No injury, serious injury, or mortality is expected to occur and due to the nature, degree, and context of the Level B harassment anticipated, the activity is not expected to impact rates of recruitment or survival.

Based on available data, we do not expect the Observatory to encounter five of the 31 species under our jurisdiction in the proposed survey areas. They include the following: the North Pacific right, false killer, and short-finned pilot whales; the California sea lion; and the bottlenose dolphin because of the species' rare and/or

extralimital occurrence in the survey areas. As mentioned previously, we estimate that 26 species of marine mammals under our jurisdiction could be potentially affected by Level B harassment over the course of the Incidental Take Authorization. For each species, these numbers are small, relative to the regional or overall population size and we have provided the regional population estimates for the marine mammal species that may be taken by Level B harassment in Tables 4, 5, and 6 in this document.

Our practice has been to apply the 160 dB re: 1 μ Pa (rms) received level threshold for underwater impulse sound levels to determine whether take by Level B harassment occurs. Southall et al. (2007) provides 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]).

We have determined, provided that the aforementioned mitigation and monitoring measures are implemented, that the impact of conducting three marine seismic surveys off Oregon and Washington in the northeastern Pacific Ocean, June through July, 2012, may result, at worst, in a temporary modification in behavior and/or low-level physiological effects (Level B harassment) of small numbers of certain species of marine mammals. See Tables 4, 5, and 6 for the requested authorized take numbers of cetaceans and pinnipeds.

While these species may make behavioral modifications, including temporarily vacating the area during the operation of the airgun(s) to avoid the resultant acoustic disturbance, the availability of alternate areas within these areas and the short duration of the research activities, have led us to determine that this action will have a negligible impact on the species in the specified geographic region.

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 mitigation and monitoring measures, we find that the Observatory's planned research activities will result in the incidental take of small numbers of marine mammals, by Level B harassment only, and that the required measures mitigate impacts to affected species or stocks of marine mammals to the lowest level practicable.

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

Section 101(a)(5)(D) of the Marine Mammal Protection Act also requires us 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 in the study area (northeastern Pacific Ocean) that implicate section 101(a)(5)(D) of the MMPA.

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 blue, fin, humpback, North Pacific right, sei, sperm, and Southern Resident killer whales. The Observatory did not request take of endangered North Pacific right whales because of the low likelihood of encountering these species during the cruise. No incidental takes of Southern Resident killer whales has been authorized.

Under section 7 of the ESA, the Foundation initiated formal consultation with the Service's, Office of Protected Resources, Endangered Species Act Interagency Cooperation Division, on these seismic surveys. We (i.e., NMFS, Office of Protected

Resources, Permits and Conservation Division), also initiated and engaged in formal consultation under section 7 of the ESA with the Endangered Species Act Interagency Cooperation Division to obtain a Biological Opinion evaluating the effects of issuing the Incidental Harassment Authorization 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 interdependent actions. On June 8 and 11, 2012, new information was received and consultation was reinitiated on the three proposed seismic surveys and the associated issuance of the Incidental Harassment Authorizations. The designs of the seismic surveys were modified and enhanced monitoring and mitigation measures were added to address concerns regarding endangered Southern Resident killer whales. In June and July, 2012, we issued three Biological Opinions and concluded that the action and issuance of the Incidental Harassment Authorizations are not likely to jeopardize the continued existence of endangered or threatened cetaceans, pinnipeds, and sea turtles and included an Incidental Take Statement incorporating the requirements of the Incidental Harassment Authorizations as Terms and Conditions. Compliance with those Relevant Terms and Conditions of the Incidental Take Statement is likewise a mandatory requirement of the Incidental Harassment Authorizations. The Biological Opinion also concluded that designated critical habitat would not be destroyed or adversely modified by the surveys.

National Environmental Policy Act

With its complete application, the Foundation and the Observatory provided an “Environmental Assessment and Finding of No Significant Impact Determination Pursuant to the National Environmental Policy Act, (NEPA: 42 U.S.C. 4321 et seq.) and

Executive Order 12114 for a Marine Seismic Survey in the northeastern Pacific Ocean, 2012,” which incorporates an “Environmental Assessment of a Marine Geophysical Survey by the R/V Marcus G. Langseth in the Northeastern Pacific Ocean, June- July 2012,” prepared by LGL Limited, Environmental Research Associates.

The Environmental Assessment 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. We have conducted an independent review and evaluation of the document for sufficiency and compliance with the Council of Environmental Quality and NOAA Administrative Order 216-6 § 5.09(d), Environmental Review Procedures for Implementing the National Environmental Policy Act, and have determined that issuance of the Incidental Harassment Authorizations is not likely to result in significant impacts on the human environment. Also, we have provided relevant environmental information to the public through the notice of the proposed Incidental Harassment Authorization (77 FR 25966, May 2, 2012) and have considered public comments received in response prior to adopting the Foundation’s Environmental Assessment. We have concluded that the issuance of the Incidental Harassment Authorizations would not significantly affect the quality of the human environment and have issued a separate Finding of No Significant Impact. Because we have made this finding, it is not necessary to prepare an Environmental Impact Statement for the issuance of the Incidental Harassment Authorizations to the Observatory for this activity.

Authorization

We have issued three Incidental Harassment Authorizations to the Observatory

for the take of marine mammals incidental to conducting three marine seismic surveys in the northeast Pacific Ocean, June to July, 2012, provided the previously mentioned mitigation, monitoring, and reporting requirements are incorporated.

Dated: July 10, 2012

Helen M. Golde,
Acting Director,
Office of Protected Resources,
National Marine Fisheries Service.

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