FINAL ENVIRONMENTAL ASSESSMENT

Issuance of an Incidental Harassment Authorization to the Scripps Institution of Oceanography to Take Marine Mammals by Harassment Incidental to a Marine Geophysical Survey off of Central and South America in the Eastern Tropical Pacific Ocean, October-November 2010

LEAD AGENCY:

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LOCATION:

The Eastern Tropical Pacific Ocean, off of Central and South America, in International Waters and within the Exclusive Economic Zones of Costa Rica, Panama, Colombia, and Ecuador

ABSTRACT:

The National Marine Fisheries Service proposes to issue an Incidental Harassment Authorization to the Scripps Institution of Oceanography for the taking, by Level B harassment, of small numbers of marine mammals, incidental to conducting a marine geophysical (seismic) survey in the Eastern Tropical Pacific Ocean, October through November, 2010.

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LIST OF ACRONYMS, ABBREVIATIONS, AND INITIALISMS

BiOp	Biological Opinion
CFR	Code of Federal Regulations
CEQ	President's Council on Environmental Quality
EA	Environmental Assessment
EIS	Environmental Impact Statement
EO	Executive Order
ESA	Endangered Species Act
FONSI	Finding of No Significant Impact
FR	Federal Register
IHA	Incidental Harassment Authorization
ITA	Incidental Take Authorization
ITS	Incidental Take Statement
km	kilometer
LOA	Letter of Authorization
MMPA	Marine Mammal Protection Act
NAO	NOAA Administrative Order
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanographic and Atmospheric Administration
NOR	Notice of Receipt
NSF	National Science Foundation
OPR	Office of Protected Resources
SIO	Scripps Institution of Oceanography
U.S.C.	United States Code

1. CHAPTER 1 – PURPOSE AND NEED FOR ACTION

1.1. DESCRIPTION OF PROPOSED ACTION

In response to the receipt of a request from the Scripps Institution of Oceanography (SIO), the National Marine Fisheries Service (NMFS) proposes to issue an Incidental Harassment Authorization (IHA) that authorizes takes by Level B harassment of marine mammals in the wild pursuant to section 101(a)(5)(D) of the Marine Mammal Protection Act of 1972, as amended (MMPA; 16 U.S.C. 1631 *et seq*.), and the regulations governing the taking and importing of marine mammals (50 Code of Federal Regulations (CFR) Part 216).

This EA, titled "*Issuance of an Incidental Harassment Authorization to the Scripps Institution of Oceanography to Take Marine Mammals by Harassment Incidental to a Marine Geophysical Survey in the Pacific Ocean off of Central and South America, October-November 2010*" (hereinafter, EA), addresses the impacts on the human environment that would result from the issuance of this IHA with a focus on impacts to marine mammals.

1.1.1. BACKGROUND

SIO plans to conduct a seismic survey off of Central and South America, in the Eastern Tropical Pacific Ocean from October through November 2010. SIO's conduct of the seismic survey is part of an integrated geophysical and geochemical study designed to obtain data necessary to better understand how marine sediments record paleo-oceanographic information.

The survey will involve one source vessel, the *Melville*, which deploys a towed array of 2 airguns. Airguns function by venting high-pressure air into the water, which creates an air bubble. The airgun array is towed through the water column along the survey lines, introducing acoustic energy (via an oscillating air bubble that transmits sounds downward through the seafloor) into the water column.

SIO, a part of the University of California, operates the oceanographic research vessel *Melville* under a charter agreement with the U.S. Office of Naval Research. As the action agency, the National Science Foundation (NSF) will fund SIO's proposed seismic survey.

SIO's seismic survey activities, which have the potential to cause marine mammals to be behaviorally disturbed, warrant an incidental take authorization from NMFS under section 101(a)(5)(D) of the MMPA. Accordingly, SIO has submitted a permit application requesting NMFS to issue an IHA for the take, by Level B harassment only, of small numbers of marine mammals, incidental to conducting a proposed marine geophysical (seismic) survey in the Eastern Tropical Pacific Ocean from October 19, 2010, through November 14, 2010.

As explained in Section 1.2, Scoping Summary, NMFS published a notice in the *Federal Register* announcing its preliminary determination to issue the proposed IHA in accordance with the procedures and requirements of the MMPA. The *Federal Register* notice referenced applicable documents such as the SIO application, provided detailed information on the description of the proposed action and anticipated impacts to marine mammals, set forth proposed measures for mitigation and monitoring, and initiated a 30-day period for the public to provide comments.

1.1.2. INCORPORATION OF NSF'S ANALYSIS AND REPORT BY REFERENCE

After conducting an independent review of the information and analyses for sufficiency and adequacy, NMFS incorporates by reference the NSF's Final National Environmental Policy Act of 1969 (NEPA; 42 U.S.C. 4321 *et seq*.) Analysis Pursuant To Executive Order (E.O.) 12114 (NSF, 2010) and an associated report (Report) prepared by LGL Limited Environmental Research Associates (LGL) for NSF, titled "*Environmental Assessment of a Marine Geophysical Survey by the R/V Melville in the Pacific Ocean off Central and South America, October-November 2010*", (LGL, 2010) by reference pursuant to 40 CFR 1502.21 and NOAA Administrative Order (NAO) 216-6 § 5.09(d).

1.1.3. PURPOSE AND NEED

The primary purpose of NMFS issuing an IHA is to provide an exception from the take prohibitions under the MMPA to allow "takes" by "level B harassment" of marine mammals, including endangered species, for the conduct of the seismic survey. The need for the issuance of the IHA is related to NMFS' mandates under the MMPA. Specifically the MMPA prohibits takes of marine mammals, with specific exceptions, including the incidental, but not intentional, taking of marine mammals, for periods of not more than one year, by United States citizens who engage in a specified activity (other than commercial fishing).

IHA issuance criteria require that activities authorized by an IHA 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. In addition, the IHA must set forth the permissible methods of taking, other means of effecting the least practicable impact on the species or stock and its habitat, and monitoring and reporting of such takings.

Issuance of an IHA is a federal agency action. For purposes of section 7 of the Endangered Species Act of 1973 (ESA; 16 U.S.C. 1531 *et seq*.), NMFS must conduct an intra-agency consultation to ensure that its action is not likely to jeopardize the continued existence of any federally-listed species or result in the destruction or adverse modification of critical habitat. For purposes of NEPA, NMFS has prepared this EA to assist in determining whether or not there is a need to prepare an Environmental Impact Statement (EIS) (i.e., whether the IHA amounts to a major Federal action with significant impacts on the human environment). After reviewing this EA and other relevant environmental information and considering the context and intensity of anticipated environmental impacts, NMFS will determine whether or not environmental impacts are likely to be significant. If they are, NMFS would publish a Notice of Intent to prepare an EIS. If they are not, NMFS will prepare a Finding of No Significant Impact (FONSI) concluding the NEPA process for this action.

1.2. SCOPING SUMMARY

The MMPA and its implementing regulations governing issuance of an IHA (50 CFR § 216.107) require that upon receipt of a valid and complete application for an IHA, NMFS must publish a notice of proposed IHA in the *Federal Register* (FR). The notice summarizes the purpose of the requested IHA, includes a statement about whether an EA or an environmental impact statement was prepared, and invites interested parties to submit written comments concerning the application and NMFS' preliminary findings.

NAO 216-6 established agency procedures for complying with NEPA and the implementing regulations issued by the President's Council on Environmental Quality (CEQ). NAO 216-6 specifies that the issuance of an IHA under the MMPA is among a category of actions that require further environmental review and the preparation of NEPA documentation. While the CEQ regulations implementing NEPA and NAO 216-6, NOAA's agency NEPA procedures, do not require that a draft EA be made available for public comment, NMFS structures the decision-making process for issuance of IHAs to provide for involvement of the public to the maximum extent practical, including inviting the public to participate in the scoping process.

In order to identify environmental issues and impacts to be addressed in this EA, NMFS undertook several steps. NMFS independently evaluated and determined the sufficiency of the scope of NSF's analysis and Report, based on prior experience with the consideration and issuance of IHAs for scientific marine geophysical surveys. NSF also made available SIO's application and NSF's analysis and Report on the agency's website (http://www.nsf.gov/geo/oce/envcomp/index.jsp) for a 30-day public comment period. NMFS also made available the environmental analysis and the Report to the public at (http://www.nmfs.noaa.gov/pr/permits/incidental.htm#applications) concurrently with the release of the *Federal Register* notice of request for comments on the proposed IHA (75 FR 54095, September 3, 2010). As noted in Section 1.1.3, the Federal Register notice and corresponding public comment period is instrumental in providing the public with relevant environmental issues and information and offering the public a meaningful opportunity to offer comments for consideration by NMFS in the decision-making process.

1.2.1. COMMENTS ON APPLICATION AND EA

The Marine Mammal Commission (Commission) provides comments on all proposed IHAs as part of their established role under the MMPA (§ 202 (a)(2), *humane means of taking marine mammals*). No other organizations or private citizens have submitted comments to date. NMFS evaluated all comments and did not identify any comment either raising substantial questions as to whether the project may cause significant degradation to any marine mammal species or its habitat, or establishing a substantial dispute concerning the IHA's size, nature, or effect.

The Commission's comments are briefly summarized here. Generally, the Commission recommended that NMFS: require the applicant to use location-specific environmental parameters to estimate safety zones and to calculate associated exposure estimates; provide additional justification for its preliminary determination that the planned monitoring program will be sufficient to detect, with a high level of confidence, all marine mammals within or entering the identified safety zones; extend the required monitoring period at start-up to at least one hour before the initiations of seismic activities and one hour before the resumption of airgun activities after a power-down because of a marine mammal sighting within the safety zone; and propose that the applicant revise its study design to include collection of meaningful baseline data on the distribution and behavior of marine mammals.

NMFS has considered the comments regarding additional mitigation measures within the context of the MMPA requirement to effect the least practicable adverse effect to marine mammals and their habitats. NMFS' responses to these comments on the issuance of the IHA, provided below, will be included in the *Federal Register* notice announcing the issuance of the IHA.

Commission comments and NMFS responses

1. *Prior to authorization, require the applicant to use location-specific environmental parameters to re-estimate safety zones and then recalculate associated exposures; Require the applicant to use in-situ measurements to verify and, if need be, refine the safety zones prior to or at the beginning of the survey; Require the applicant to determine actual exposures based on refined safety zones, sightability, and relevant detection functions.*

   NMFS is confident in the peer-reviewed results of the seismic equipment calibration studies which, although viewed as conservative, are used to determine cruise-specific exclusion zones. With the expected low density of marine mammals, combined with the remote, deep-water survey location, NMFS has determined that the exclusion zones identified in the IHA are appropriate for the survey and additional field measurements are not necessary at this time. While exposures of marine mammals to acoustic stimuli are difficult to estimate, NMFS is confident that the levels of take authorized herein are estimated based upon the best available scientific information and estimation methodology.

2. *Provide additional justification for NMFS's preliminary determination that the planned monitoring program will be sufficient to detect, with a high level of confidence, all marine mammals within or entering the identified safety zones.*

   NMFS believes that the planned monitoring program will be sufficient to visually detect, with reasonable certainty, most marine mammals within or entering identified exclusion zones (EZ). This monitoring, along with the required mitigation measures, will help ensure the authorized taking effects the least practicable adverse impact on the affected species or stocks and will have a negligible impact on the affected species or stocks. Until proven technological advances are made, nighttime mitigation measures during operations include combinations of the use of protected species observers (PSOs) and night vision devices. In the event of a complete shut-down of the airgun array, for mitigation or repairs, airgun operations will be suspended until nautical twilight-dawn (when PSOs are able to clear the EZ). Airgun operations will not begin until the entire EZ radius is visible for at least 30 minutes.

3. *Propose to SIO that it revise its study design to include collection of meaningful baseline data on the distribution and behavior of marine mammals.*

   The purpose of this cruise is for marine geophysical research, not to conduct a dedicated marine mammal research survey. Extending or altering the survey is not practicable from either an operational or research standpoint for the applicant. Due to the remote location of the survey and the length of time needed to conduct the requested research, there may be little time left for the vessel to operate without the need for refueling and servicing.

   During the cruise, there will be significant amounts of transit time pre- and post-survey during which PSOs will be on watch (e.g., prior to and after the seismic portions of the

survey). The collection of this observational data by PSOs may provide meaningful baseline data on marine mammals, but it is unlikely that the information would result in any statistically robust conclusions for this particular seismic survey.

In addition, SIO is not responsible for the study design. Through a cooperative agreement with the NSF, SIO is the operator of the R/V *Melville*, which hosts the field research program. The study is designed by the Principal Investigator and is submitted to NSF as a proposal for funding consideration and subsequently reviewed by a merit review panel. This study was selected based on its scientific merits, and extension or modification of the field component would require scientific justification and NSF approval and potentially further merit review.

4. *Extend the monitoring period to at least one hour before initiation of seismic activities and at least one hour before the resumption of airgun activities after a power-down because of a marine mammal sighting within a safety zone.*

As the Commission points out, several species of deep-diving cetaceans are capable of remaining underwater for more than 30 minutes, however, for the following reasons NMFS believes that 30 minutes is an adequate length for the monitoring period prior to the start-up of airguns: (1) in most cases PSOs are making observations during times when seismic sources are not being operated and will actually be observing prior to the 30 min observation period anyway, (2) the majority of the species that may be exposed do not stay underwater more than 30 minutes, and (3) if deep-diving individuals happened to be in the area in the short time immediately prior to the pre-start-up monitoring and if an animal's maximum underwater time is 45 min, there is only a one in three chance that the last random surfacing would be prior to the beginning of the required 30 min monitoring period.

Also, seismic vessels are moving continuously (because of the long, towed array) and NMFS believes that unless the animal submerges and follows at the speed of the vessel (highly unlikely, especially when considering that a significant part of their movements is vertical [deep-diving]), the vessel will be far beyond the length of the safety radii within 30 min, and therefore it will be safe to resume acquisition.

In addition, mitigation measures are required to be "practicable." NMFS believes 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 the exclusion zones. The Commission's recommendation would cause additional impact on the science mission, limiting acquisition opportunity without dramatically increasing overall effectiveness of visual monitoring.

NMFS finds that the NSF's analysis and Report include appropriate mitigation measures to allow a meaningful analysis of the direct, indirect, and cumulative effects of issuing the IHA

on marine mammals and other marine species, including marine turtles, seabirds, fish, and invertebrates.

1.2.2. Issues within the Scope of This EA

The EA addresses the NMFS proposal to issue an IHA under Section 101(a)(5)(D) of the MMPA and the alternatives to the proposed action and focuses on the effects to marine mammals. The IHA, if issued, would authorize the harassment of 20 species of marine mammals, incidental to marine geophysical activities.

NMFS identified the following issues as relevant to the action and appropriate for detailed evaluation: tolerance, masking of natural sounds, behavioral disturbance, temporary or permanent hearing impairment, or non-auditory physical or physiological effects.

1.3. Applicable Laws and Necessary Federal Permits, Licenses, and Entitlements

This section summarizes federal, state, and local permits, licenses, approvals, and consultation requirements necessary to implement the proposed action.

1.3.1. National Environmental Policy Act

NEPA, enacted in 1969, is applicable to all "major" federal actions significantly affecting the quality of the human environment. A major federal action is an activity that is fully or partially funded, regulated, conducted, or approved by a federal agency. NMFS' issuance of an IHA for incidental harassment of marine mammals represents approval and regulation of the applicant's activities and thus amounts to a major Federal action for which environmental review is required. While NEPA does not dictate substantive outcome for an IHA, it requires consideration of environmental issues in federal agency planning and decision making related to that action.

1.3.2. Endangered Species Act

Section 7 of the ESA requires consultation with the appropriate federal agency (either NMFS or the US Fish and Wildlife Service) for federal actions that "may affect" a listed species or critical habitat. NMFS' issuance of an IHA affecting ESA-listed species or designated critical habitat, directly or indirectly, is a federal action subject to these section 7 consultation requirements. Accordingly, NMFS is required to ensure that its action is not likely to jeopardize the continued existence of any threatened or endangered species or result in destruction or adverse modification of critical habitat for such species. Regulations specify the requirements for these consultations (50 CFR 402). NMFS has determined that issuance of the IHA is likely to result in adverse effects to listed marine mammal species and, therefore, NMFS is completing formal Section 7 consultation and preparing a Biological Opinion to consider whether or not the action is likely to jeopardize such species or result in the adverse modification or destruction of critical habitat designated for such species, if applicable.

1.3.3. Marine Mammal Protection Act

Section 101(a)(5)(D) of the MMPA (16 U.S.C. 1371 (a)(5)(D)) directs the Secretary of Commerce (Secretary) to authorize, upon request, the incidental, but not intentional, taking by harassment of small numbers of marine mammals of a species or population stock, for periods of not more than one year, by United States citizens who engage in a specified

activity (other than commercial fishing) within a specific geographic region if certain findings are made and a *Federal Register* notice of a proposed authorization is provided to the public for review.

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

1.3.4. EXECUTIVE ORDER (E.O.) 12114

The requirements for E.O. 12114, Environmental Effects Abroad of Major Federal Actions, discussed in the NSF analysis and Report (NSF 2010, LGL 2010) are incorporated herein, by reference.

2. CHAPTER 2 – ALTERNATIVES INCLUDING THE PROPOSED ACTION

This EA evaluates a range of reasonable alternatives to ensure that they would fulfill the purpose and need, namely: (1) the issuance of an IHA for the take of marine mammals, by level B behavioral harassment, incidental to SIO's conduct of a marine geophysical survey in the Eastern Tropical Pacific Ocean from October 19, 2010, through November 14, 2010; and (2) compliance with the MMPA, which sets forth specific standards (i.e., unmitigable adverse impact and negligible impact) that must be met in order for NMFS to issue an IHA.

The Proposed Action (Preferred) alternative represents the activities proposed in the submitted application for an IHA, with standard monitoring and mitigation measures. If the action will have no more than a negligible impact on the species or stocks; will not have an unmitigable adverse impact on the availability of the species or stock(s) for subsistence uses; and sets forth the appropriate level of mitigation measures and monitoring, then NMFS shall issue the IHA.

The EA, which incorporated NSF's analysis and LGL's Report, evaluated three alternatives: (1) issuance of an IHA and the conduct of the proposed seismic survey from October 19 through November 14, 2010; (2) issuance of an IHA and the conduct of the proposed seismic survey at an alternative time; and (3) a no action alternative (i.e., NMFS does not issue an IHA, and SIO does not conduct the survey). For the purposes of this EA, NMFS is considering the same alternatives as those considered by NSF, as presented (NSF, 2010; LGL, 2010).

2.1. ALTERNATIVE 1 – NO ACTION ALTERNATIVE

This alternative, analyzed in NSF's analysis and LGL's Report, is hereby incorporated by reference (NSF, 2010; LGL, 2010). NSF considered, but rejected the no action alternative (i.e., NMFS does not issue an IHA, and, as a result, SIO would not conduct the seismic survey). This alternative does not meet SIO's purpose and need.

2.2. ALTERNATIVE 2 – PREFERRED ALTERNATIVE

This alternative, analyzed in NSF's analysis and LGL's Report, is hereby incorporated by reference (NSF, 2010; LGL, 2010). Under this alternative, NSF considered that SIO would use one source vessel, the *Melville*, to conduct a seismic survey in international waters off the east coast of Central and South America. The project is scheduled to commence on October 19, 2010, and scheduled to end on November 14, 2010.

NMFS will incorporate the mitigation and monitoring measures and reporting requirements described in NSF's analysis and LGL's Report into the IHA. Accordingly, this Preferred Alternative (Issuance of an IHA with Mitigation) would satisfy the purpose and need of the action—issuance of an IHA, with mitigation measures and monitoring, would enable the agency and SIO to comply with the statutory and regulatory requirements of the MMPA and ESA.

Required mitigation and monitoring measures are summarized briefly here. Generally, NMFS requires that SIO undertake (1) visual monitoring by protected species observers (PSOs), (2) establishment of an exclusion zone (EZ), (3) speed or course alteration, provided that doing so will not compromise operational safety requirements, (4) GI airgun shut down procedures, and (5) ramp-up procedures. NMFS has determined that for acoustic effects, using acoustic thresholds in combination with corresponding safety radii is an effective way to consistently apply measures to avoid or minimize the impacts of an action. Thresholds are used to establish a mitigation shut-down, or exclusion, zone, i.e., if an animal enters an area calculated to be ensonified above the level of an established threshold, a sound source is shut down.

Three PSOs will be based aboard the seismic source vessel for the duration of the cruise and will watch for marine mammals near the vessel during daytime airgun operations and during start-up of airguns at any time. Watches will be conducted by at least one observer 100% of the time during seismic surveys in daylight hours. PSOs will record data to estimate the numbers of marine mammals exposed to various received sound levels and to document reactions or lack thereof. Data will be used to estimate numbers of animals potentially 'taken' by harassment (as defined in the MMPA). They will also provide information needed to order a shutdown of the seismic source when a marine mammal is within or near the EZ.

3. CHAPTER 3 – AFFECTED ENVIRONMENT

The summary of the physical and biological environment of the study area, as analyzed in NSF's analysis and LGL's Report, are hereby incorporated by reference (NSF, 2010; LGL, 2010). The analysis and Report present baseline information necessary for consideration of the alternatives and describe the resources that would be affected by the alternatives, as well as environmental components that would affect the alternatives if they were to be implemented.

Forty-three species of marine mammals, including 29 odontocetes (toothed whales), 7 mysticetes (baleen whales), 6 pinnipeds (seals and sea lions), and the marine sea otter (*Enhydra lutris*), are known to occur in the eastern tropical Pacific Ocean (ETP). Of these, 23 cetacean (whale and dolphin) species are likely to occur in the proposed survey areas in the ETP during October-November. Three of these 23 cetacean species are listed under the Endangered Species Act as Endangered: the sperm (*Physeter macrocephalus*), humpback (*Megaptera novaeangliae*), and blue (*Balaenoptera musculus*) whales. The five species of marine mammals expected to be most common in the waters of the project area, all delphinids (dolphin-like), include the short beaked

common dolphin (*Delphinus delphis*), pantropical spotted dolphin (*Stenella attenuata*), bottlenose dolphin (*Tursiops truncatus*), Risso's dolphin (*Grampus griseus*), and short-finned pilot whale (*Globicephala macrorhynchus*).

4. CHAPTER 4 –ENVIRONMENTAL CONSEQUENCES

NSF's analysis and LGL's Report, which address potential direct, indirect, and cumulative impacts of the marine seismic survey on marine mammals, sea turtles, fish, and invertebrates, and impacts to prey species and marine mammal habitats, are hereby incorporated by reference (NSF, 2010; LGL, 2010).

NMFS has evaluated the potential impacts of SIO's action in order to determine whether to authorize incidental take of marine mammals pursuant to the MMPA. NMFS, therefore, has determined that an EA is appropriate to evaluate the potential significance of impacts to marine mammals and other species resulting from the issuance of this IHA. NSF expects that marine mammals, including species that are depleted and strategic due to listing as threatened or endangered species under the ESA, may be present throughout the study area and throughout the seasons during which the project might occur.

NMFS' evaluation indicates that any direct or indirect effects of the action would not result in a substantial impact on biodiversity or ecosystem function. Most effects are considered to be short-term and unlikely to affect normal ecosystem function or predator/prey relationships; therefore, there will not be a substantial impact on marine life biodiversity or on the normal function of the nearshore or offshore environment. NMFS finds that NSF's analysis and LGL's Report include appropriate mitigation measures to allow a meaningful analysis of the direct, indirect, and cumulative effects of issuing the IHA on marine mammals and other marine species, including marine turtles, seabirds, fish, and invertebrates.

SIO will conduct the proposed open-water marine geophysical survey for a short period of time (seismic activities of 15 days total) in deep water (water greater than 1,000 meters (m) (3,820 feet (ft)) in depth). As the *Melville* transits the area while conducting the survey, any displacement of marine fish species by the proposed action would be temporary. Many fish species (i.e., those that do not have swim bladders, have rudimentary swim bladders (such as bottom-dwelling species, including flatfish), or well-developed swim bladders that are not directly connected to the ears) tend to have relatively poor auditory sensitivity and are not likely to be affected by exposure to intense noise. The seismic survey may potentially displace prey items of marine mammals, such as fish. However, prey items would return after the *Melville* has powered down the airgun array.

The overall response of fishes and squids is to exhibit startle responses and undergo vertical and horizontal movements away from the sound source. NMFS does not expect that the survey would have a substantial cumulative effect on any fish or invertebrate species. Although some loss of fish and other marine life might occur as a result of being in close proximity to the seismic airguns, this loss is, while short-term and adverse, is not expected to be significant.

NMFS conducted additional literature reviews for purposes of the MMPA analyses, and applicable information is included here to support this finding. Sperm whales (*Physeter macrocephalus*) regularly feed on squid and some fishes and may be feeding while in the area during the proposed

survey. One study[1] investigating behavioral response of southern calamari squid exposed to seismic survey sound reported that the squid exhibited both startle and avoidance responses. It is expected that sperm whales remaining in this area, although potentially not affected directly, would experience indirect effects from airgun activities through reduced feeding opportunities. Like their prey, sperm whales are expected to follow prey out of the survey area temporarily and re-distribute back into the area once survey activities are complete and prey species return.

Available data suggest that sounds from the airguns will diminish dramatically by the time they travel more than 1,000 m (3,820 ft) to the ocean floor. The seismic program in the northeast Pacific Ocean is not expected to significantly impact benthic and invertebrate communities in the study area.

The existing body of information on the impacts of seismic survey sound on marine invertebrates and benthic fauna is very limited. Recent controlled field experiments[2] on adult crustaceans exposed to seismic energy did not result in any significant pathological impacts on the animals. The study reported that the seismic survey did not: (1) cause any acute or mid-term mortality of the crab; (2) alter feeding behavior; or (3) affect embryo survival or post-hatch locomotion of larvae.

The impacts of the seismic survey on marine mammals and sea turtles are specifically related to acoustic activities, and these are expected to be temporary in nature, negligible, and would not result in substantial impact to marine mammals or to their role in the ecosystem. These temporary acoustic activities would not affect physical habitat features, such as substrates and water quality. Additionally, the effects from vessel transit and routine operation of one seismic source vessel would not result in substantial damage to ocean and coastal habitats that might constitute marine mammal habitats. The potential for striking marine mammals and sea turtles is a concern with vessel traffic. The probability of a ship strike resulting in an injury or mortality of an animal has been associated with ship speed; however, it is highly unlikely that the proposed seismic survey would result in a serious injury or mortality to any marine mammal as a result of vessel strike given the *Melville's* slow survey speed.

NMFS anticipates, and would authorize, the incidental, Level B harassment only, in the form of temporary behavioral disturbance, of several species of cetaceans. NMFS does not anticipate that take by injury (Level A harassment), serious injury, or death will occur and expects that harassment takes should be at the lowest level practicable due to the incorporation of the mitigation measures proposed in the EA and Report. The Level B harassment is not expected to affect biodiversity or ecosystem function. As with marine mammals, sea turtles may experience threshold shifts and behavioral responses.

4.1. EFFECTS OF ALTERNATIVE 1 – NO ACTION ALTERNATIVE

The summary of the effects of the No Action alternative, analyzed in NSF's analysis and LGL's Report, are hereby incorporated by reference (NSF, 2010; LGL, 2010).

4.2. EFFECTS OF ALTERNATIVE 2 – PREFERRED ALTERNATIVE

The NSF's analysis and LGL's Report, incorporated by reference, describe, in detail, the

[1] McCauley, R.D., J. Fewtrell, A.J. Duncan, C. Jenner, M.-N. Jenner, J.D. Penrose, R.I.T. Prince, A. Adhitya, J. Murdoch, and K. McCabe. 2000b. Marine seismic surveys – a study of environmental implications. APPEA J. 40:692-706.

[2] Christian, J.R., A. Mathieu, D.H. Thomson, D. White, and R.A. Buchanan. 2003. Effect of seismic energy on snow crab (*Chionoecetes opilio*). Environmental Studies Research Funds Report No. 144. Calgary, AB, Canada. November.

potential effects of airgun sounds, multibeam echosounder and sub-bottom profiler signals on marine species, particularly marine mammals and marine turtles of particular concern (see Section IV and Appendices B through E of the LGL Report). The Report also includes analyses of effects on sea turtles, fish, and invertebrates.

SIO proposed a number of monitoring and mitigation measures for marine mammals as part of the action evaluated in NSF's analysis and LGL's Report. In analyzing the effects of the preferred alternative, NMFS has considered the following monitoring and mitigation measures as part of the preferred alternative as considered by NSF and SIO:

(1) establishment of an exclusion zone (EZ) to avoid injury to marine mammals and visual monitoring of the EZ by protected species observers (PSOs);
(2) change of speed and/or course when PSOs detect marine mammals either in or entering the EZ;
(3) shut-down procedures when PSOs detect marine mammals within the EZ while the airgun array is operating; and
(4) ramp-up procedures.

Inclusion of these monitoring and mitigation measures is anticipated to minimize and/or avoid impacts to marine resources. With the above planned monitoring and mitigation measures, unavoidable impacts to each species of marine mammal and sea turtle that could be encountered are expected to be limited to short-term, localized changes in behavior (such as brief masking of natural sounds) and distribution near the seismic vessel. At most, effects on marine mammals may be interpreted as falling within the MMPA definition of "Level B behavioral harassment" for those species managed by NMFS. No long-term or significant effects are expected on individual marine mammals, marine turtles, seabirds, fish, invertebrates, or the populations to which they belong or on their habitats.

NMFS does not anticipate that take by injury (Level A harassment), serious injury, or death will occur and expects that harassment takes should be at the lowest level practicable due to the incorporation of the mitigation measures proposed in the application, analysis and Report, and NMFS' notice of proposed IHA (75 FR 54095, September 3, 2010), nor is take by injury authorized by this IHA.

4.3. COMPLIANCE WITH NECESSARY LAWS – NECESSARY FEDERAL PERMITS

NMFS has determined that the IHA is consistent with the applicable requirements of the MMPA, ESA, and NMFS' regulations. The applicant has secured or applied for necessary permits from NMFS.

4.4. UNAVOIDABLE ADVERSE IMPACTS

The summary of unavoidable adverse impacts to marine mammals, marine turtles, seabirds, fish, invertebrates, or the populations to which they belong or on their habitats occurring in the survey area analyzed in NSF's analysis and LGL's Report are hereby incorporated by reference (NSF, 2010; LGL, 2010).

NMFS does not expect SIO's activities to have adverse consequences on the viability of marine mammals in the study area. Further, NMFS does not expect the marine mammal populations in that area to experience reductions in reproduction, numbers, or distribution that might appreciably reduce their likelihood of surviving and recovering in the wild. Numbers of

individuals of all species taken by harassment are expected to be small (relative to species or stock abundance), and the marine seismic survey will have a negligible impact on the affected species or stocks of marine mammals. The requirement of no unmitigable adverse impact to subsistence uses does not apply here because of the location of the proposed activity.

4.5. CUMULATIVE EFFECTS

The summary of cumulative effects to marine mammals, marine turtles, seabirds, fish, invertebrates, or the populations to which they belong or on their habitats occurring in the survey area analyzed in NSF's analysis and LGL's Report, are hereby incorporated by reference (NSF, 2010; LGL, 2010). The impacts of the seismic survey on marine mammals and sea turtles are specifically related to acoustic activities, and these are expected to be temporary in nature, negligible, and would not result in substantial impacts to marine mammals or to their role in the ecosystem. NMFS does not expect that the survey would have a substantial cumulative effect on any fish or invertebrate species.

NMFS has issued incidental take authorizations for other seismic research surveys (to SIO and other parties) that may have resulted in the harassment of marine mammals, but they are dispersed both geographically (throughout the world) and temporally, are short-term in nature, and all use mitigation and monitoring measures to minimize impacts to marine mammals in the activity area. There are no other NSF-sponsored seismic surveys scheduled for the ETP in 2010 and therefore, NMFS is unaware of any synergistic impacts to marine resources associated with reasonably foreseeable future actions that may be planned or occur within the same region of influence.

5. LIST OF PREPARERS

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6. WORKS CITED

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