LIST OF PETITIONS RECEIVED BY EDA FOR CERTIFICATION OF ELIGIBILITY TO APPLY FOR TRADE ADJUSTMENT ASSISTANCE FOR THE PERIOD DECEMBER 21, 2005 THROUGH JANUARY 13, 2006—Continued

Firm	Address	Date petition accepted	Product
M and H Machine Corporation	611 West Country Road E., Shoreview, MN 55126.	1/5/06	Precision-machined metal parts.
Fitzpatrick & Weller, Inc.	12 Mill Street, P.O. Box 490, Ellicottville, NY 14731.	1/5/06	Wood dimension products.
Naegle's Industrial Leather Machinery Co.	401 Irvine Street, Yoakum, TX 77995 ..	1/5/06	Machinery for making leather products.
Lukas Confections, Inc.	231 W. College Avenue, York, PA 17405.	1/10/06	Milk caramel, toffee and taffy products.
Home, Inc.	500 W. 9th Street, Hermann, MO 65041.	1/11/06	Standard and custom metal cabinets.
Columbia Sewing Company, Inc.	201 W. University Street Magnolia, AR 71753.	1/13/06	Outdoor camouflaged coats and trousers.
Excellon Acquisitions, LLC	2451 Crenshaw Boulevard, Torrance, CA 90505.	1/13/06	Drilling equipment for printed circuit board industry.

Any party having a substantial interest in the proceedings may request a public hearing on the matter. A written request for a hearing must be submitted to the Office of Chief Counsel, Room 7005, Economic Development Administration, U.S. Department of Commerce, Washington, DC 20230, no later than ten (10) calendar days following publication of this notice. Please follow the procedures set forth in Section 315.9 of EDA's interim final rule (70 FR 47002) for procedures for requesting a public hearing. The Catalog of Federal Domestic Assistance official program number and title of the program under which these petitions are submitted is 11.313, Trade Adjustment Assistance.

Barry Bird,

Chief Counsel.

[FR Doc. E6–618 Filed 1–19–06; 8:45 am]

BILLING CODE 3510–24–P

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

[I.D. 112505C]

Small Takes of Marine Mammals Incidental to Specified Activities; Marine Geophysical Survey in the Eastern Tropical Pacific

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

ACTION: Notice; receipt of application and proposed incidental take authorization; request for comments.

SUMMARY: NMFS has received an application from the Scripps Institution of Oceanography (SIO) for an Incidental Harassment Authorization (IHA) to take small numbers of marine mammals, by harassment, incidental to conducting a marine seismic survey in the Eastern Tropical Pacific from approximately March 3 to April 1, 2006. Under the Marine Mammal Protection Act (MMPA), NMFS is requesting comments on its proposal to issue an authorization to SIO to incidentally take, by harassment, small numbers of several species of marine mammals during the seismic survey.

DATES: Comments and information must be received no later than February 21, 2006.

ADDRESSES: Comments on the application should be addressed to Steve Leathery, Chief, Permits, Conservation and Education Division, Office of Protected Resources, National Marine Fisheries Service, 1315 East-West Highway, Silver Spring, MD 20910–3225. The mailbox address for providing e-mail comments is *PR1.112505C@noaa.gov*. NMFS is not responsible for e-mail comments sent to addresses other than the one provided here. Comments sent via e-mail, including all attachments, must not exceed a 10-megabyte file size.

A copy of the application containing a list of the references used in this document may be obtained by writing to the address specified above, telephoning the contact listed below (see **FOR FURTHER INFORMATION CONTACT**), or visiting the Internet at: *http://www.nmfs.noaa.gov/pr/permits/incidental.htm.*

Documents cited in this notice may be viewed, by appointment, during regular business hours, at the aforementioned address.

FOR FURTHER INFORMATION CONTACT: Jolie Harrison, Office of Protected Resources, NMFS, (301) 713–2289, ext 166.

SUPPLEMENTARY INFORMATION:

Background

Sections 101(a)(5)(A) and (D) of the MMPA (16 U.S.C. 1361 *et seq.*) direct the Secretary of Commerce to allow, upon request, the incidental, but not intentional, taking of marine mammals by U.S. citizens who engage in a specified activity (other than commercial fishing) within a specified geographical region if certain findings are made and either regulations are issued or, if the taking is limited to harassment, a notice of a proposed authorization is provided to the public for review.

Authorization shall be granted if NMFS finds that the taking will have a negligible impact on the species or stock(s), will not have an unmitigable adverse impact on the availability of the species or stock(s) for subsistence uses, and that the permissible methods of taking and requirements pertaining to the monitoring and reporting of such takings are set forth. NMFS has defined ''negligible impact'' in 50 CFR 216.103 as ''* * * an impact resulting from the specified activity that cannot be reasonably expected to, and is not reasonably likely to, adversely affect the species or stock through effects on annual rates of recruitment or survival.''

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. 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].

Section 101(a)(5)(D) establishes a 45-day time limit for NMFS review of an application followed by a 30-day public notice and comment period on any proposed authorizations for the incidental harassment of marine mammals. Within 45 days of the close of the comment period, NMFS must either issue or deny issuance of the authorization.

Summary of Request

On October 2, 2005, NMFS received an application from SIO for the taking, by harassment, of several species of marine mammals incidental to conducting, with research funding from the National Science Foundation (NSF), a marine seismic survey in the Eastern Tropical Pacific during March-April, 2006. The purpose of the seismic survey is to collect the site survey data for a future Integrated Ocean Drilling Program (IODP) drilling transect (not currently scheduled). The proposed drilling program will study the structure of the Cenozoic equatorial Pacific by drilling an age-transect flowline along the position of the paleo-equator in the Pacific, targeting selected time-slices of interest where calcareous sediments have been preserved best. The seismic survey and respective drilling transect will span the early Eocene to Miocene equatorial Pacific. Recovered sediments will: (1) Contribute towards resolving questions of how and why paleo-productivity of the equatorial Pacific changed over time, (2) provide rare material to validate and extend the astronomical calibration of the geological time scale for the Cenozoic, (3) determine sea-surface and benthic temperature and nutrient profiles and gradients, (4) provide important information about the detailed nature of calcium carbonate dissolution (CCD) and changes in the CCD, (5) enhance understanding of bio- and magnetostratigraphic datums at the equator, as well as (6) provide information about rapid biological evolution and turn-over during times of climatic stress. As SIO's strategy also implies a paleo-depth transect, they also hope to improve knowledge about the reorganization of water masses as a function of depth and time. Last, SIO intends to make use of the high level of correlation between tropical sediment sections and seismic stratigraphy collected on the survey cruise to develop a more complete model of equatorial circulation and sedimentation.

Description of the Activity

The seismic survey will utilize one source vessel, the R/V *Roger Revelle*, which is scheduled to depart from Papeete, French Polynesia, on or about March 03, 2006 and will return to port in Honolulu, Hawaii, on or about April 01, 2006. The exact dates of the activity may vary by a few days because of weather conditions, repositioning, streamer operations and adjustments, airgun deployment, or the need to repeat some lines if data quality is substandard. The overall area within which the seismic survey will occur is located between approx. 20° N and 10° S, and between approx. 100° and 155° W. The survey will be conducted entirely in International Waters.

The R/V *Roger Revelle* will deploy a pair of low-energy Generator-Injector Guns (GI guns) as an energy source (each with a discharge volume of 45 in^3), plus a 450 m-long, 48-channel, towed hydrophone streamer. As the GI guns are towed along the survey lines, the receiving system will acquire the returning acoustic signals. The program will consist of approximately (approx.) 8,900 km (4,800 nm) of survey, including turns. Water depths within the study area are 3,900 to 5,200 m (12,800 to 16,700 ft). The seismic source will be operated along the single track line en route between piston-coring sites, where seismic data will be acquired on a small scale grid and cores will be collected. There will be additional operations associated with equipment testing, start-up, line changes, and repeat coverage of any areas where initial data quality is sub-standard.

All planned geophysical data acquisition activities will be conducted by SIO under the direction of the scientists who have proposed the study. The scientists are Dr. Mitch Lyle of Boise State University, Drs. Neil Mitchell and Carolyn Lear of Cardiff University, and Dr. Heiko Palike of University of Southampton. The vessel will be self-contained and the crew will live aboard the vessel for the entire cruise.

In addition to the operations of the pair of GI guns, a Kongsberg Simrad EM–120 multibeam echosounder, a 3.5 kHz sub-bottom profiler, and passive geophysical sensors (gravimeter and magnetometer) will be operated continuously throughout the entire cruise.

Vessel Specifications

The R/V *Roger Revelle* is owned by the U.S. Navy Office of Naval Research (ONR) and operated by SIO under a charter agreement. The R/V *Roger Revelle* has a length of 83 m (273 ft), a beam of 16 m (53 ft), and a maximum draft of 5.2 m (17 ft). The ship is powered by two 3000 hp Propulsion General Electric motors and a 1180 hp retracting azimuthing bow thruster. Typical operation speed of approx. 13 km/h (7 knots) is used during seismic acquisition. When not towing seismic survey gear, the R/V *Roger Revelle* cruises at 22 km/h (12 knots) and has a maximum speed of 28 km/h (15 knots). It has a normal operating range of approx. 27780 km (15,000 nm).

The R/V *Roger Revelle* holds 22 crew plus 37 scientists and will also serve as the platform from which marine mammal observers will watch for marine mammals before and during GI gun operations.

Seismic Source Description

The R/V *Roger Revelle* will tow the pair of GI guns and a streamer containing hydrophones along predetermined lines. Seismic pulses will be emitted at intervals of 6–10 seconds. At a speed of 7 knots (13 km/h), the 6–10-s spacing corresponds to a shot interval of approx. 22–36 m (71–118 ft).

The generator chamber of each GI gun, the one responsible for introducing the sound pulse into the water, is 45 in^3. The larger (105 in^3) injector chamber injects air into the previously-generated bubble to maintain its shape, and does not introduce more sound into the water. The two 45 in^3 GI guns will be towed 8 m (26 ft) apart side by side, 21 m (69 ft) behind the R/V *Roger Revelle*, at a depth of 2 m (7 ft). Specifications for the GI guns are as follows.

The two GI guns discharge a total volume of approx. 90 in^3 and the dominant frequency components are 1–188 Hz. The source output (downward) is 7.2 bar-m (237 dB re 1 microPascal-m) at 0-peak (0-pk) and 14.0 bar-m (243 dB re 1 microPascal-m) at peak-peak (pk-pk). The nominal downward-directed source levels indicated above do not represent actual sound levels that can be measured at any location in the water. Rather, they represent the level that would be found 1 m from a hypothetical point source emitting the same total amount of sound as is emitted by the combined GI guns. The actual received level at any location in the water near the GI guns will not exceed the source level of the strongest individual source. In this case, that will be about 231 dB re 1 microPa-m peak, or 237 dB re 1 microPa-m pk-pk. Actual levels experienced by any organism more than 1 m from either GI gun will be significantly lower.

A further consideration is that the rms (root mean square) received levels that are used as impact criteria for marine mammals are not directly comparable to the peak or pk-pk values normally used to characterize source levels of seismic sources. The measurement units used to describe seismic sources, peak or pk-pk decibels, are always higher than the rms decibels referred to in biological literature. A measured received level of 160 decibels rms in the far field would typically correspond to a peak measurement of about 170 to 172 dB, and to a peak-to-peak measurement of about 176 to 178 decibels, as measured for the same pulse received at the same location (Greene, 1997; McCauley *et al.*, 1998, 2000a). The precise difference between rms and peak or pk-pk values depends on the frequency content and duration of the pulse, among other factors. However, the rms level is always lower than the peak or pk-pk level for a seismic source.

In 1998, scientists convened at the High Energy Seismic Sound (HESS) Workshop, reviewed the available science, and agreed on the received sound levels above which marine mammals might incur permanent tissue damage resulting in a permanent threshold shift (PTS) of hearing. Shortly thereafter, a NMFS panel of bioacousticians used the information gathered at the HESS workshop to establish the current Level A Harassement acoustic criteria for non-explosive sounds, 180 re 1 microPa-m (rms) for for cetaceans, and 190 re 1 microPa-m (rms) for pinnipeds. Since no data existed, linking Permanent Threshold Shift (PTS) in marine mammals to any particular sound level to attain these thresholds scientists took the level at which Temporary Threshold Shift (TTS) was generally predicted to occur (180 dB) and conservatively suggested that PTS could occur anywhere above that level. NMFS established the acoustic criteria for Level B Harassment (160 re 1 microPa-m (rms) for impulse noises, 120 re 1 microPa-m (rms) for non-impulse, continuous, industrial noises) based on the work of Malme *et al.*, 1984, who looked at the effects of anthropogenic noise on the migration of grey whales. NMFS uses the isopleths of these sound levels to estimate Level A Harassment and Level B Harassment take of marine mammals and to establish safety zones within which monitoring or mitigation measures must be applied.

Received sound levels have been modeled by the Lamont-Doherty Earth Observatory (L–DEO) for two 105 in^3 GI guns in relation to distance and direction from the source. The model does not allow for bottom interactions, and is most directly applicable to deep water (such as will be ensonified in this survey). Based on the modeling, estimates of the maximum distances from the GI guns where sound levels of 160, 180, and 190 dB re 1 microPa (rms) are predicted to be received are as follows: 160 dB out to 175 m (574 ft); 180 dB out to 54 m (177 ft); and 190 dB out to 17 m (56 ft). Because the model results are for the larger 105 in^3 GI guns, those distances are overestimates of the distances for the two 45 in^3 GI guns used in this study.

Empirical data concerning the 160- and 180-dB distances have been acquired based on measurements during the acoustic verification study conducted by L–DEO in the northern Gulf of Mexico from 27 May to 3 June 2003 (Tolstoy *et al.*, 2004). Although the results are limited, the data showed that radii around the GI guns where the received level would be 180 dB re 1 microPa (rms) vary with water depth. Similar depth-related variation is likely in the 190 dB distances applicable to pinnipeds. The empirical data indicate that, for deep water (>1,000 m (3,281 ft)), the L–DEO model tends to overestimate the received sound levels at a given distance (Tolstoy *et al.*, 2004). However, to be precautionary pending acquisition of additional empirical data, it is proposed that safety radii during seismic operations in the deep water of this study will be the values predicted by L–DEO's model. Therefore, the assumed 180- and 190-dB radii are 54 m (177 ft) and 17 m (56 ft), respectively.

Bathymetric Sonar

Along with the GI-gun operations, two additional acoustical data acquisition systems will be operated during much or all of the cruise. One of the instruments used to map the ocean floor will be the Kongsberg Simrad EM–120 multi-beam echosounder, which is commonly operated simultaneously with GI guns.

The nominal transmit frequency of the Kongsberg Simrad EM–120 is 12 kHz with an angular coverage sector of up to 150 degrees and 191 beams per ping. The transmit fan is split into several individual sectors with independent active steering according to vessel roll, pitch and yaw. This method places all soundings on a ''best fit'' to a line perpendicular to the survey line, thus ensuring a uniform sampling of the bottom and 100 percent coverage. The sectors are frequency coded (11.25 to 12.60 kHz), and are transmitted sequentially at each ping. Pulse length and range sampling rate are variable with depth for best resolution, and in shallow waters due care is taken to the near field effects. The ping rate is primarily limited by round trip travel time in water, up to a ping rate of 5 Hz in shallow water. A pulse length of 15 ms is typically used in deep water. The transmit fan is split into nine different sectors transmitted sequentially within the same ping. Using electronic steering, the sectors are individually tilted alongtrack to take into account the vessel's current roll, pitch and yaw with respect to the survey line heading. The manufacturer provided information to show relevant parameters for their multibeam echosounders. For the model EM–120, with a one degree beamwidth (BW), the pressure levels at a set of fixed distances are as follows: 211 dB at 1 m (2.9 ft); 205 dB at 10 m (29 ft); 195 dB at 100 m (287 ft); and 180 dB at 1,000 m (3,280 ft). Note that the pressure levels are worst case, i.e. on-axis and with no defocusing. For our purpose the on-axis direction is vertical from the ship to the sea floor. The pressure level for sound traveling off-axis will fall rapidly for a narrow beam (alongtrack for a multibeam echosounder). The level will reduce by 20 dB at a little more than twice the beamwidth, which is 1 degree for the system installed on R/V *Roger Revelle.* Acrosstrack, the pressure level will typically reduce by 20 dB for angles of more than 75–80° from the vertical. For multibeams which use sectorized transmission, such as most current Kongsberg Simrad systems, beam defocusing is applied in the central sector(s) in shallow waters which results in a more rapid reduction in the pressure level. There will be a similar reduction for the outer sectors in flat arrays, as used with the EM–120, due to the virtual shortening of the array width in these directions.

The pressure level at 1 m (2.9 ft) is less for the Kongsberg Simrad EM–120 multibeam echosounder (211 dB) than it is for the pair of GI guns (237 dB) used in this study. However due to the very narrow (1°) directivity of the beam, the distance from the transducer at which 180 dB re 1 microPa-m is encountered is larger (1,000 m (3,280 ft)) than that calculated for the GI guns (54 m (177 ft)). Conversely, the narrowness of the beam, the short pulse length, the ping rate, and the ship's speed during the survey greatly lessens the probability of exposing an animal under the ship during one ping of the multibeam echosounder, much less for multiple pings. Since the 1° beam of sound is directed downward from transducers permanently mounted in the ship's hull, the horizontal safety radius of 54 m (177 ft) for 180 dB established for the GI guns will encompass the entire area ensonified by the multibeam echosounder, as well, and marine mammals takes by the echosounder will be avoided through the mitigation measures discussed later.

Sub-Bottom Profiler

A sub-bottom profiler will also be used simultaneously with the GI guns to map the ocean floor. The Knudsen Engineering Model 320BR sub-bottom profiler is a dual frequency transceiver designed to operate at 3.5 and/or 12 kHz. It is used in conjunction with the multibeam echosounder to provide data about the sedimentary features which occur below the sea floor. The maximum power output of the 320BR is 10 kilowatts for the 3.5 kHz section and 2 kilowatts for the 12 kHz section (the 12 kHz section is seldom used in survey mode on R/V *Roger Revelle* due to overlap with the operating frequency of the Kongsberg Simrad EM–120 multibeam).

Using the Sonar Equations and assuming 100 percent efficiency in the system, the source level for the 320BR is calculated to be 211 dB re 1 microPa-m. In practice, the system is rarely operated above 80 percent power level. The pulse length for the 3.5 kHz section of the 320BR ranges from 1.5 to 24 ms, and is controlled automatically by the system.

Since the maximum attainable source level of the 320BR sub-bottom profiler (211 db re 1 microPa-m) is less than that of the pair of GI guns (237 dB re 1 microPa-m) to be used in this study and the sound produced by the sub-bottom profiler is directed downward from transducers permanently mounted in the ship's hull, the 54 m (177 ft) horizontal safety radius established for the GI guns will encompass the entire area ensonified by the multibeam echosounder, and marine mammals takes by the echosounder will be avoided through the mitigation measures discussed later.

Characteristics of Airgun Pulses

Discussion of the characteristics of airgun pulses has been provided in the application and in previous **Federal Register** notices (see 69 FR 31792 (June 7, 2004) or 69 FR 34996 (June 23, 2004)). Reviewers are referred to those documents for additional information.

Description of Habitat and Marine Mammals Affected by the Activity

A detailed description of the R/V *Roger Revelle's* track from Papeete, French Polynesia to Honolulu, Hawaii and the associated marine mammals can be found in the SIO application and a number of documents referenced in the SIO application. In the proposed seismic survey region during the late winter and early spring months of 2006, 29 cetacean species are likely to occur including dolphins, small whales, tooth and baleen whales. Several of these species are listed under the U.S. Endangered Species Act (ESA) as endangered, including sperm whales, humpback whales, and blue whales; fin and sei whales may also occur in the proposed seismic program area. Information on the distribution of these and other species inhabiting the study area and the wider Eastern Tropical Pacific (ETP) has been summarized by several studies (e.g., Polacheck, 1987; Wade and Gerrodette, 1993; Ferguson and Barlow, 2001; Ferguson and Barlow 2003). Four species of pinnipeds (Guadelope fur seal (federally listed endangered under the ESA), northern elephant seal, South American sea lion, and California sea lion) could potentially be encountered during the proposed survey. However, impacts to pinnipeds are not anticipated due to the decreased likelihood of encountering them in very deep water, the relatively small area proposed to be ensonified, and the likely effectiveness of the proposed mitigation measures in such a small area. The species that may be impacted by this activity and their estimated abundances in the ETP are listed in Table 1.

The marine mammal populations in the proposed seismic survey area have not been studied in detail, but the region is included in the greater ETP, where several studies of marine mammal distribution and abundance have been conducted. The ETP is thought to be a biologically productive area (Wyrtki, 1966), and is known to support a variety of cetacean species (Au and Perryman, 1985).

Initial systematic studies of cetaceans in the ETP were prompted by the incidental killing of dolphins in the purse-seine fishery for yellowfin tuna, *Thunnus albacares*, in this area (Perrin 1968, 1969; Smith 1983; Wahlen, 1986; Wade, 1995). The main cetacean species that have been affected by the fishery include pantropical spotted dolphins (*Stenella attenuata*) and spinner dolphins (*S. longirostris*) (Smith, 1983). Short-beaked common dolphins (*Delphinus delphis*), striped dolphins (*S. coeruleoalba*), bottlenose dolphins (*Tursiops truncatus*), Fraser's dolphins (*Lagenodelphis hosei*), rough-toothed dolphins (*Steno bredanensis*), and short-finned pilot whales (*Globicephala macrorhynchus*) have also been killed in the fishery (e.g., Hall and Boyer, 1989). Dolphin mortality was high at the onset of the fishery (Allen, 1985). The average annual mortality from 1959 to 1972 was an estimated 347,082 dolphins (Wade, 1995). However, between 1973 and 1980, mortality dropped considerably (Allen, 1985). From 1986 to 1994, total annual mortality declined from approximately 130,000 to 4096 (Lennert and Hall, 1996). By 1995, annual mortality was 3300 (Hall, 1997), and in 1996, it was 2600 (Hall, 1998).

The center of the ETP is characterized by warm, tropical waters (Reilly and Fiedler, 1994). Cooler water is found along the equator and the eastern boundary current waters of Peru and California; this cool water is brought to the surface by upwelling (Reilly and Fiedler, 1994). The two different habitats are generally thought to support different cetacean species (Au and Perryman, 1985). Au *et al.* (1980 in Polacheck, 1987) noted an association between cetaceans and the equatorial surface water masses in the ETP, which are thought to be highly productive. Increased biological productivity has also been observed due to upwelling at the Costa Rica Dome (Wyrtki, 1964; Fiedler *et al.*,1991). Several studies have correlated these zones of high productivity with concentrations of cetaceans (Volkov and Moroz, 1977; Reilly and Thayer, 1990; Wade and Gerrodette, 1993). The ETP is also characterized by a shallow thermocline (Wyrtki, 1966) and a pronounced oxygen minimum layer (Perrin *et al.,* 1976; Au and Perryman, 1985). These features are thought to result in an ''oxythermal floor'' 20–100 m below the surface, which may cause large groups of cetaceans to concentrate in the warm surface waters (Scott and Cattanach, 1998).

In the application, many references are made to the occurrence of cetaceans in the Galapagos; however, for some species, abundance in the Galapagos can be quite different from that in the wider ETP (Smith and Whitehead, 1999). In addition, references to surveys in the ETP are also made. For example, Polacheck (1987) summarized cetacean abundance in the ETP for 1977–1980, although the season when surveys were carried out was not given. Polacheck (1987) calculated encounter rates as the number of schools sighted per 1,000 mi (1,609 km) surveyed. His encounter rates do not include any correction factors to account for changes in detectability of species with distance from the survey track line or the diving behavior of the animals. Wade and Gerrodette (1993) also calculated encounter rates for cetaceans (number of schools per 1,000 km surveyed) in the ETP, based on surveys between late July and early December from 1986 to 1990. Their encounter rates include a correction factor to account for detectability bias but do not include a correction factor to account for availability bias. Ferguson and Barlow (2001) calculated cetacean densities in the ETP based on summer/fall research vessel surveys in 1986–1996. Their densities are corrected for both detectability and availability biases. Ferguson and Barlow (2003) followed their 2001 report up with an addendum that estimated density and abundance with the respective coefficients of variation, whereas before some species and groups were pooled. Although species encounter rates and densities are generally given for summer/fall, the proposed seismic survey will be conducted in winter/spring 2006.

Potential Effects on Marine Mammals

Summary of Potential Effects of GI Gun Sounds

The effects of sounds from GI guns might include one or more of the following: tolerance, masking of natural sounds, behavioral disturbance, and at least in theory temporary or permanent hearing impairment (Richardson *et al.*, 1995). Given the small size of the GI guns planned for the present project, effects are anticipated to be considerably less than would be the case with a large array of airguns. Both NMFS and SIO believe it very unlikely that there would be any cases of temporary or, especially, permanent hearing impairment. Also, behavioral disturbance is expected to be limited to animals that are at distances less than 510 m (1673 ft). A further review of potential impacts of airgun sounds on marine mammals is included in Appendix A of SIO's application.

Tolerance

Numerous studies have shown that pulsed sounds from airguns are often readily detectable in the water at distances of many kilometers. However, it should be noted that most of the measurements of airgun sounds that have been reported concerned sounds from larger arrays of airguns, whose sounds would be detectable farther away than those planned for use in the present project.

Numerous studies have shown that marine mammals at distances more than a few kilometers from operating seismic vessels often show no apparent response. That is often true even in cases when the pulsed sounds must be readily audible to the animals based on measured received levels and the hearing sensitivity of that mammal group. Although various baleen whales, toothed whales, and pinnipeds have been shown to react behaviorally to airgun pulses under some conditions, at other times mammals of all three types have shown no overt reactions. In general, pinnipeds and small odontocetes seem to be more tolerant of exposure to airgun pulses than are baleen whales. Given the relatively small and low-energy GI gun source planned for use in this project, mammals are expected to tolerate being closer to this source than might be the case for a larger airgun source typical of most seismic surveys.

Masking

Masking effects of pulsed sounds (even from large arrays of airguns) on marine mammal calls and other natural sounds are expected to be limited, although there are very few specific data on this. Some whales are known to continue calling in the presence of seismic pulses. Their calls can be heard between the seismic pulses (e.g., Richardson *et al.*, 1986; McDonald *et al.*, 1995; Greene *et al.*, 1999). Although there has been one report that sperm whales cease calling when exposed to pulses from a very distant seismic ship (Bowles *et al.*, 1994), a recent study reports that sperm whales off northern Norway continued calling in the presence of seismic pulses (Madsen *et al.*, 2002c). Given the small source planned for use here, there is even less potential for masking of baleen or sperm whale calls during the present study than in most seismic surveys. Masking effects of seismic pulses are expected to be negligible in the case of the smaller odontocete cetaceans, given the intermittent nature of seismic pulses and the relatively low source level of the GI guns to be used here. Also, the sounds important to small odontocetes are predominantly at much higher frequencies than are airgun sounds. Further information on masking effects may be found in Appendix A(d) of SIO's application.

Disturbance Reactions

Disturbance includes a variety of effects, including subtle changes in behavior, more conspicuous changes in activities, and displacement. Disturbance is one of the main concerns in this project. In the terminology of the 1994 amendments to the MMPA, seismic noise could cause ''Level B'' harassment of certain marine mammals. Level B harassment is defined as ''* * * disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering.''

Reactions to sound, if any, depend on species, state of maturity, experience, current activity, reproductive state, time of day, and many other factors. If a marine mammal does react to an underwater sound by changing its behavior or moving a small distance, it is difficult to know if the impacts of the change are significant to the individual, or the stock or the species as a whole. However, if a sound source displaces marine mammals from an important feeding or breeding area for a prolonged period, impacts on the animals are most likely significant. Given the many uncertainties in predicting the quantity and types of impacts of noise on marine mammals, it is common practice to estimate how many mammals were present within a particular distance of industrial activities, or exposed to a particular level of industrial sound, and assume that all of the animals within that area may have been disturbed.

The sound criteria used to estimate how many marine mammals might be disturbed to some biologically-important degree by a seismic program are based on behavioral observations during studies of several species. However, information is lacking for many species. Detailed studies have been done on humpback, gray, and bowhead whales, and on ringed seals. Less detailed data are available for some other species of baleen whales, sperm whales, and small toothed whales. Most of those studies have concerned reactions to much larger airgun sources than planned for use in the present project. Thus, effects are expected to be limited to considerably smaller distances and shorter periods of exposure in the present project than in most of the previous work concerning marine mammal reactions to airguns.

Baleen Whales—Baleen whales generally tend to avoid operating airguns, but avoidance radii are quite variable. Whales are often reported to show no overt reactions to pulses from large arrays of airguns at distances beyond a few kilometers, even though the airgun pulses remain well above ambient noise levels out to much longer distances. However, as reviewed in Appendix A of SIO's application, baleen whales exposed to strong noise pulses from airguns often react by deviating from their normal migration route and/or interrupting their feeding and moving away. In the case of the migrating gray and bowhead whales, the observed changes in behavior appeared to be of little or no biological consequence to the animals. They simply avoided the sound source by displacing their migration route to varying degrees, but within the natural boundaries of the migration corridors.

Studies of gray, bowhead, and humpback whales have determined that received levels of pulses in the 160–170 dB re 1 microPa (rms) range seem to cause obvious avoidance behavior in a substantial fraction of the animals exposed. In many areas, seismic pulses from large arrays of airguns diminish to those levels at distances ranging from 4.5–14.5 km (2.4–7.8 nm) from the source. A substantial proportion of the baleen whales within those distances may show avoidance or other strong disturbance reactions to the airgun array. Subtle behavioral changes sometimes become evident at somewhat lower received levels, and recent studies reviewed in the application have shown that some species of baleen whales, notably bowheads and humpbacks, at times show strong avoidance at received levels lower than 160–170 dB re 1 microPa (rms). Reaction distances would be considerably smaller during the present project, in which the 160 dB radius is predicted to be approx. 0.5 km (0.27 nm), as compared with several kilometers when a large array of airguns is operating.

Data on short-term reactions (or lack of reactions) of cetaceans to impulsive noises do not necessarily provide information about long-term effects. It is not known whether impulsive noises affect reproductive rate or distribution and habitat use in subsequent days or years. However, gray whales continued to migrate annually along the west coast of North America despite intermittent seismic exploration and much ship traffic in that area for decades (Malme *et al.*, 1984). Bowhead whales continued to travel to the eastern Beaufort Sea each summer despite seismic exploration in their summer and autumn range for many years (Richardson *et al.*, 1987). In any event, the brief exposures to sound pulses from the present small GI gun source are highly unlikely to result in prolonged effects in baleen whales.

Toothed Whales—Little systematic information is available about reactions of toothed whales to noise pulses. Few studies similar to the more extensive baleen whale/seismic pulse work summarized above have been reported for toothed whales. However, systematic work on sperm whales is underway.

Seismic operators sometimes see dolphins and other small toothed whales near operating airgun arrays, but in general there seems to be a tendency for most delphinids to show some limited avoidance of seismic vessels operating large airgun systems. However, some dolphins seem to be attracted to the seismic vessel and floats, and some ride the bow wave of the seismic vessel even when large arrays of airguns are firing. Nonetheless, there have been indications that small toothed whales sometimes tend to head away, or to maintain a somewhat greater distance from the vessel, when a large array of airguns is operating than when it is silent (*e.g.,* Goold, 1996a; Calambokidis and Osmek, 1998; Stone, 2003). Similarly, captive bottlenose dolphins and beluga whales exhibit changes in behavior when exposed to strong pulsed sounds similar in duration to those typically used in seismic surveys (Finneran *et al.*, 2000, 2002). However, the animals tolerated high received levels of sound (pk-pk level >200 dB re 1 microPa) before exhibiting aversive behaviors. With the presently-planned pair of GI guns, such levels would only be found within a few meters of the source.

There are no specific data on the behavioral reactions of beaked whales to seismic surveys. However, most beaked whales tend to avoid approaching vessels of other types (*e.g.*, Kasuya, 1986; Würsig *et al.*, 1998). There are increasing indications that some beaked whales tend to strand when naval exercises, including sonar operations, are ongoing nearby—see Appendix A of SIO's application. The strandings are apparently at least in part a disturbance response, although auditory or other injuries may also be a factor. Whether beaked whales would ever react similarly to seismic surveys is unknown. Seismic survey sounds are quite different from those of the sonars in operation during the above-cited incidents. There has been a recent (Sept. 2002) stranding of Cuvier's beaked whales in the Gulf of California (Mexico) when the L–DEO vessel *Maurice Ewing* was operating a large array of airguns (20 guns; 8,490 in^3) in the general area. This might be a first indication that seismic surveys can have effects similar to those attributed to naval sonars. However, the evidence with respect to seismic surveys and beaked whale strandings is inconclusive even for large airgun sources.

All three species of sperm whales have been reported to show avoidance reactions to standard vessels not emitting airgun sounds, and it is to be expected that they would tend to avoid an operating seismic survey vessel. There were some limited early observations suggesting that sperm whales in the Southern Ocean and Gulf of Mexico might be fairly sensitive to airgun sounds from distant seismic surveys. However, more extensive data from recent studies in the North Atlantic suggest that sperm whales in those areas show little evidence of avoidance or behavioral disruption in the presence of operating seismic vessels, (McCall Howard 1999; Madsen *et al.*, 2002c; Stone, 2003). An experimental study of sperm whale reactions to seismic surveys in the Gulf of Mexico has been done recently (Tyack *et al.*, 2003).

Odontocete reactions to large arrays of airguns are variable and, at least for small odontocetes, seem to be confined to a smaller radius than has been observed for mysticetes. Thus, behavioral reactions of odontocetes to the small GI gun source to be used here are expected to be very localized, probably to distances <0.5 km (<0.3 mi).

Pinnipeds—Pinnipeds are not likely to show a strong avoidance reaction to the small GI gun source that will be used. Visual monitoring from seismic vessels, usually employing larger sources, has shown only slight (if any) avoidance of airguns by pinnipeds, and only slight (if any) changes in behavior. Those studies show that pinnipeds frequently do not avoid the area within a few hundred meters of operating airgun arrays, even for arrays much larger than the one to be used here (*e.g.*, Harris *et al.*, 2001). However, initial telemetry work suggests that avoidance and other behavioral reactions to small airgun sources may be stronger than evident to date from visual studies of pinniped reactions to airguns (Thompson *et al.*, 1998). Even if reactions of the species occurring in the present study area are as strong as those evident in the telemetry study, reactions are expected to be confined to relatively small distances and durations, with no long-term effects on pinnipeds.

Additional details on the behavioral reactions (or the lack thereof) by all types of marine mammals to seismic vessels can be found in Appendix A (e) of SIO's application.

Hearing Impairment and Other Physical Effects

Temporary or permanent hearing impairment is a possibility when marine mammals are exposed to very strong sounds, but there has been no specific documentation of this for marine mammals exposed to airgun pulses. Current NMFS policy regarding exposure of marine mammals to high-level sounds is that in order to avoid hearing impairment, cetaceans and pinnipeds should not be exposed to impulsive sounds exceeding 180 and 190 dB re1 microPa (rms), respectively (NMFS, 2000). Those criteria have been used in defining the safety (shutdown) radii planned for this seismic survey. However, those criteria were established before there were any data on the minimum received levels of sounds necessary to cause auditory impairment in marine mammals. As discussed in Appendix A (f) of the application and summarized here:

- The 180-dB criterion for cetaceans is probably quite precautionary, *i.e.*, lower than necessary to avoid TTS, let alone permanent auditory injury, at least for delphinids;
- The minimum sound level necessary to cause permanent hearing impairment is higher, by a variable and generally unknown amount, than the level that induces barely-detectable TTS; and
- The level associated with the onset of TTS is often considered to be a level below which there is no danger of permanent damage.

Because of the small size of the GI gun source in this project (two 45 in^3 guns), along with the planned monitoring and mitigation measures, there is little likelihood that any marine mammals will be exposed to sounds sufficiently strong to cause hearing impairment. Several aspects of the planned monitoring and mitigation measures for this project are designed to detect marine mammals occurring near the pair of GI guns (and multibeam echosounder), and to avoid exposing them to sound pulses that might cause hearing impairment (see Mitigation Measures). In addition, many cetaceans are likely to show some avoidance of the area with ongoing seismic operations (see above). In those cases, the avoidance responses of the animals themselves will reduce or avoid the possibility of hearing impairment.

Non-auditory physical effects may also occur in marine mammals exposed to strong underwater pulsed sound. Possible types of non-auditory physiological effects or injuries that theoretically might occur include stress, neurological effects, bubble formation, resonance effects, and other types of organ or tissue damage. It is possible that some marine mammal species (*i.e.*, beaked whales) may be especially susceptible to injury and/or stranding when exposed to strong pulsed sounds. However, as discussed below, it is very unlikely that any effects of these types would occur during the present project given the small size of the source and the brief duration of exposure of any given mammal, especially in view of the planned monitoring and mitigation measures.

Temporary Threshold Shift (TTS)—TTS is the mildest form of hearing impairment that can occur during exposure to a strong sound (Kryter 1985). While experiencing TTS, the hearing threshold rises and a sound must be stronger in order to be heard. TTS can last from minutes or hours to (in cases of strong TTS) days. For sound exposures at or somewhat above the TTS threshold, hearing sensitivity recovers rapidly after exposure to the noise ends. Little information on sound levels and durations necessary to elicit mild TTS have been obtained for marine mammals, and none of the published data concern TTS elicited by exposure to multiple pulses of sound.

Finneran *et al.* (2002) compared the few available data that exist on sound levels and durations necessary to elicit mild TTS and found that for toothed whales exposed to single short pulses, the TTS threshold appears to be a function of the energy content of the pulse. Finneran used the available data to plot known TTS in odontocetes on a line depicting sound pressure level versus duration of pulse, and SIO used that line to estimate that a single seismic pulse received at 210 dB re 1 microPa (rms) (approx. 221–226 dB pk-pk) may produce brief, mild TTS in Odontocetes. If received sound energy is calculated from the sound pressure, a single seismic pulse at 210 dB re 1 microPa (rms) equates to several seismic pulses at received levels near 200–205 dB (rms). The L–DEO model indicates that seismic pulses with received levels of 200–205 dB would be limited to distances within a few meters of the small GI gun source to be used in this project.

There are no data, direct or indirect, on levels or properties of sound that are required to induce TTS in any baleen whale. Richardson *et al.* (1995) compiled studies of the reactions of several species of baleen whales to seismic sound and found that baleen whales often show strong avoidance several kilometers away from an airgun at received levels of 150–180 dB. Given the small size of the source, and the likelihood that baleen whales will avoid the approaching airguns (or vessel) before being exposed to levels high enough to induce TTS, NMFS believes it unlikely that the R/V *Roger Revelle's* airguns will cause TTS in any baleen whales.

TTS thresholds for pinnipeds exposed to brief pulses (single or multiple) have not been measured. However, prolonged exposures show that some pinnipeds may incur TTS at somewhat lower received levels than do small odontocetes exposed for similar durations (Kastak *et al.*, 1999; Ketten *et al.*, 2001; cf. Au *et al.*, 2000).

A marine mammal within a radius of 100 m (328 ft) around a typical large array of operating airguns might be exposed to a few seismic pulses with levels of 205 dB, and possibly more pulses if the mammal moved with the seismic vessel. As noted above, most cetaceans show some degree of avoidance of operating airguns. In addition, ramping up airgun arrays, which is standard operational protocol for large airgun arrays, should allow cetaceans to move away from the seismic source and to avoid being exposed to the full acoustic output of the airgun array. Even with a large airgun array, it is unlikely that the cetaceans would be exposed to airgun pulses at a sufficiently high level (180 dB) for a sufficiently long period (due to the tendency of baleen whales to avoid seismic sources) to cause more than mild TTS, given the relative movement of the vessel and the marine mammal. The potential for TTS is much lower in this project due to the small size of the airgun array (past IHA's have authorized take of marine mammals incidental to the operation of seismic airguns with a total volume of up to 8,800 in^3 (L–DEO 20-gun array)) . With a large array of airguns, TTS would be most likely in any odontocetes that bow-ride or otherwise linger near the airguns. While bow riding, odontocetes would be at or above the surface, and thus not exposed to strong sound pulses given the pressure-release effect at the surface. However, bow-riding animals generally dive below the surface intermittently. If they did so while bow riding near airguns, they would be exposed to strong sound pulses, possibly repeatedly. In this project, the anticipated 180-dB distance is <54 m (<155 ft), and the bow of the R/V *Roger Revelle* will be 106 m (304 ft) ahead of the GI guns. As noted above, the TTS threshold (at least for brief or intermittent exposures) is likely >180 dB. Thus, TTS would not be expected in the case of odontocetes bow riding during the planned seismic operations. Furthermore, even if some cetaceans did incur TTS through exposure to GI gun sounds, this would very likely be mild, temporary, and reversible.

As mentioned earlier, NMFS has established acoustic criteria to avoid permanent physiological damage that indicate that cetaceans and pinnipeds should not be exposed to pulsed underwater noise at received levels exceeding, respectively, 180 and 190 dB re 1 microPa (rms). The predicted 180 and 190 dB distances for the GI guns operated by SIO are <54 m (<155 ft) and <17 m (<49 ft), respectively (Those distances actually apply to operations with two 105 in^3 GI guns, and smaller distances would be expected for the two

45 in^3 GI guns to be used here.). These sound levels represent the received levels above which one could not be certain that there would be no injurious effects, auditory or otherwise, to marine mammals. As mentioned previously in the toothed whale section, Finneran *et al.*'s (2000 and 2002) TTS data indicate that a small number of captive dolphins have been exposed to more 200 dB re 1 microPa (rms) without suffering from TTS, though NMFS believes that the sound levels represented by these studies of small numbers of captive animals may not accurately represent the predicted reactions of wild animals under the same circumstances. Scientists at NMFS are currently compiling and reanalyzing available information on the reactions of marine mammals to sound in an effort to eventually establish new acoustic criteria. However, NMFS currently considers the 160, 180, and 190 dB thresholds to be the appropriate sound pressure level criteria for non-explosive sounds.

Permanent Threshold Shift (PTS)—When PTS occurs, there is physical damage to the sound receptors in the ear. In some cases, there can be total or partial deafness, while in other cases, the animal has an impaired ability to hear sounds in specific frequency ranges.

There is no specific evidence that exposure to pulses of airgun sound can cause PTS in any marine mammal, even with large arrays of airguns. However, given the possibility that mammals close to an airgun array might incur TTS, there has been further speculation about the possibility that some individuals occurring very close to airguns might incur PTS. Single or occasional occurrences of mild TTS are not indicative of permanent auditory damage in terrestrial mammals. Relationships between TTS and PTS thresholds have not been studied in marine mammals, but NMFS assumes they are probably similar to those in humans and other terrestrial mammals. PTS might occur at a received sound level 20 dB or more above that inducing mild TTS if the animal were exposed to the strong sound for an extended period, or to a strong sound with rather rapid rise time (Cavanaugh, 2000).

It is highly unlikely that marine mammals could receive sounds strong enough to cause permanent hearing impairment during a project employing two 45 in^3 GI guns. In the present project, marine mammals are unlikely to be exposed to received levels of seismic pulses strong enough to cause TTS, as they would probably need to be within a few meters of the GI guns for this to occur. Given the higher level of sound necessary to cause PTS, it is even less likely that PTS could occur. In fact, even the levels immediately adjacent to the GI guns may not be sufficient to induce PTS, especially since a mammal would not be exposed to more than one strong pulse unless it swam immediately alongside a GI gun for a period longer than the inter-pulse interval (6–10 s). Also, baleen whales generally avoid the immediate area around operating seismic vessels. Furthermore, the planned monitoring and mitigation measures, including visual monitoring, ramp ups, and shut downs of the GI guns when mammals are seen within the ''safety radii,'' will minimize the already-minimal probability of exposure of marine mammals to sounds strong enough to induce PTS.

Non-auditory Physiological Effects—Non-auditory physiological effects or injuries that theoretically might occur in marine mammals exposed to strong underwater sound include stress, neurological effects, bubble formation, resonance effects, and other types of organ or tissue damage. There is no proof that any of these effects occur in marine mammals exposed to sound from airgun arrays (even large ones), but there have been no direct studies of the potential for airgun pulses to elicit any of those effects. If any such effects do occur, they would probably be limited to unusual situations when animals might be exposed at close range for unusually long periods.

It is doubtful that any single marine mammal would be exposed to strong seismic sounds for sufficiently long that significant physiological stress would develop. That is especially so in the case of the present project where the GI guns are small, the ship's speed is relatively fast (7 knots (13 km/h)), and for the most part the survey lines are widely spaced with little or no overlap.

Gas-filled structures in marine animals have an inherent fundamental resonance frequency. If stimulated at that frequency, the ensuing resonance could cause damage to the animal. A workshop (Gentry [ed.], 2002) was held to discuss whether the stranding of beaked whales in the Bahamas in 2000 (Balcomb and Claridge, 2001; NOAA and USN, 2001) might have been related to air cavity resonance or bubble formation in tissues caused by exposure to noise from naval sonar. A panel of experts concluded that resonance in air-filled structures was not likely to have caused this stranding. Opinions were less conclusive about the possible role of gas (nitrogen) bubble formation/growth in the Bahamas stranding of beaked whales.

Until recently, it was assumed that diving marine mammals are not subject to the bends or air embolism. However, a short paper concerning beaked whales stranded in the Canary Islands in 2002 suggests that cetaceans might be subject to decompression injury in some situations (Jepson *et al.*, 2003). If so, that might occur if they ascend unusually quickly when exposed to aversive sounds. Even if that can occur during exposure to mid-frequency sonar, there is no evidence that that type of effect occurs in response to airgun sounds. It is especially unlikely in the case of this project involving only two small GI guns.

In general, little is known about the potential for seismic survey sounds to cause auditory impairment or other physical effects in marine mammals. Available data suggest that such effects, if they occur at all, would be limited to short distances and probably to projects involving large arrays of airguns. However, the available data do not allow for meaningful quantitative predictions of the numbers (if any) of marine mammals that might be affected in those ways. Marine mammals that show behavioral avoidance of seismic vessels, including most baleen whales, some odontocetes, and some pinnipeds, are especially unlikely to incur auditory impairment or other physical effects. Also, the planned mitigation measures, including shut downs, will reduce any such effects that might otherwise occur.

Strandings and Mortality

Marine mammals close to underwater detonations of high explosive can be killed or severely injured, and the auditory organs are especially susceptible to injury (Ketten *et al.*, 1993; Ketten, 1995). Airgun pulses are less energetic and have slower rise times, and there is no proof that they can cause serious injury, death, or stranding even in the case of large airgun arrays. However, the association of mass strandings of beaked whales with naval exercises and, in one case, an L–DEO seismic survey, has raised the possibility that beaked whales exposed to strong pulsed sounds may be especially susceptible to injury and/or behavioral reactions that can lead to stranding. Additional details may be found in Appendix A (g) of SIO's application.

Seismic pulses and mid-frequency sonar pulses are quite different. Sounds produced by airgun arrays are broadband with most of the energy below 1 kHz. Typical military mid-frequency sonars operate at frequencies of 2–10 kHz, generally with a relatively narrow bandwidth at any one time. Thus, it is not appropriate to assume that there is a direct connection between the effects of military sonar and seismic surveys on marine mammals. However, evidence that sonar pulses can, in special circumstances, lead to physical damage and mortality NOAA and USN, 2001; Jepson *et al.*, 2003), even if only indirectly, suggests that caution is warranted when dealing with exposure of marine mammals to any high-intensity pulsed sound.

In Sept. 2002, there was a stranding of two Cuvier's beaked whales in the Gulf of California, Mexico, when the L–DEO vessel *Maurice Ewing* was operating a 20-gun 8490 in^3 array in the general area. The link between this stranding and the seismic surveys was inconclusive and not based on any physical evidence (Hogarth, 2002; Yoder, 2002). Nonetheless, that plus the incidents involving beaked whale strandings near naval exercises suggests a need for caution in conducting seismic surveys in areas occupied by beaked whales. The present project will involve a much smaller sound source than used in typical seismic surveys. That, along with the monitoring and mitigation measures that are planned, are expected to minimize any possibility for strandings and mortality.

Possible Effects of Bathymetric Sonar Signals

A multibeam bathymetric echosounder (Kongsberg Simrad EM–120, 12 kHz) will be operated from the source vessel during much of the planned study. Sounds from the multibeam echosounder are very short pulses, occurring for 5–15 ms at up to 5 Hz, depending on water depth. As compared with the GI guns, the sound pulses emitted by this multibeam echosounder are at moderately high frequencies, centered at 12 kHz. The beam is narrow (1°) in fore-aft extent, and wide (150°) in the cross-track extent.

Navy sonars that have been linked to avoidance reactions and stranding of cetaceans (1) generally are more powerful than the Kongsberg Simrad EM–120, (2) have a longer pulse duration, and (3) are directed close to horizontally, vs. downward, as for the multibeam echosounder. The area of possible influence of the Kongsberg Simrad EM–120 is much smaller—a narrow band oriented in the cross-track direction below the source vessel. Marine mammals that encounter the EM–120 at close range are unlikely to be subjected to repeated pulses because of the narrow fore-aft width of the beam, and will receive only limited amounts of pulse energy because of the short pulses.

Masking

Marine mammal communications will not be masked appreciably by the multibeam echosounder signals given the low duty cycle of the system and the brief period when an individual mammal is likely to be within its beam. Furthermore, in the case of baleen whales, the signals do not overlap with the predominant frequencies in the calls, which would avoid significant masking.

Behavioral Responses

Behavioral reactions of free-ranging marine mammals to military and other sonars appear to vary by species and circumstance. Observed reactions have included silencing and dispersal by sperm whales (Watkins *et al.*, 1985), increased vocalizations and no dispersal by pilot whales (Rendell and Gordon, 1999), and the previously-mentioned beachings by beaked whales. However, all of those observations are of limited relevance to the present situation. Pulse durations from those sonars were much longer than those of the SIO multibeam echosounder, and a given mammal would have received many pulses from the naval sonars. During SIO's operations, the individual pulses will be very short, and a given mammal would not be likely to receive more than a few of the downward-directed pulses as the vessel passes by unless it were swimming in the same speed and direction as the ship in a fixed position underneath the ship.

Captive bottlenose dolphins and a white whale exhibited changes in behavior when exposed to 1 s pulsed sounds at frequencies similar to those that will be emitted by the multibeam echosounder used by SIO, and to shorter broadband pulsed signals. Behavioral changes typically involved what appeared to be deliberate attempts to avoid the sound exposure (Schlundt *et al.*, 2000; Finneran *et al.*, 2002). The relevance of those data to free-ranging odontocetes is uncertain, and in any case, the test sounds were quite different in either duration or bandwidth as compared with those from a bathymetric echosounder.

NMFS is not aware of any data on the reactions of pinnipeds to sonar sounds at frequencies similar to those of the R/V *Roger Revelle's* multibeam echosounder. Based on observed pinniped responses to other types of pulsed sounds, and the likely brevity of exposure to the multibeam sounds, pinniped reactions are expected to be limited to startle or otherwise brief responses of no lasting consequence to the animals. NMFS (2001) concluded that momentary behavioral reactions ''do not rise to the level of taking.'' Thus, brief exposure of cetaceans or pinnipeds to small numbers of signals from the multibeam bathymetric echosounder system are not expected to result in a ''take'' by harassment.

Hearing Impairment and Other Physical Effects

Given recent stranding events that have been associated with the operation of naval sonar, there is concern that mid-frequency sonar sounds can cause serious impacts to marine mammals (see above). However, the multibeam echosounder proposed for use by SIO is quite different than sonars used for navy operations. Pulse duration of the multibeam echosounder is very short relative to the naval sonars. Also, at any given location, an individual marine mammal would be exposed to the multibeam sound signal for much less time given the generally downward orientation of the beam and its narrow fore-aft beamwidth. (Navy sonars often use near-horizontally-directed sound.) Those factors would all reduce the sound energy received from the multibeam echosounder rather drastically relative to that from the sonars used by the Navy.

Possible Effects of Sub-Bottom Profiler Signals

A sub-bottom profiler will be operated from the source vessel much of the time during the planned study. Sounds from the sub-bottom profiler are short pulses of 1.5–24 ms duration. The triggering rate is controlled automatically so that only one pulse is in the water column at a time. Most of the energy in the sound pulses emitted by this sub-bottom profiler is at mid frequencies, centered at 3.5 kHz. The beamwidth is approx. 30° and is directed downward. Sound levels have not been measured directly for the sub-bottom profiler used by the R/V *Roger Revelle,* but Burgess and Lawson (2000) measured sounds propagating more or less horizontally from a similar unit with similar source output (205 dB re 1 microPa-m). The 160 and 180 dB re 1 microPa (rms) radii, in the horizontal direction, were estimated to be, respectively, near 20 m (66 ft) and 8 m (26 ft) from the source, as measured in 13 m (43 ft) water depth. The corresponding distances for an animal in the beam below the transducer would be greater, on the order of 180 m (591 ft) and 18 m (59 ft), assuming spherical spreading.

The sub-bottom profiler on the R/V *Roger Revelle* has a stated maximum source level of 211 dB re 1 microPa-m and a normal source level of 200 dB re 1 microPa-m. Thus the received level would be expected to decrease to 160 and 180 dB about 160 m (525 ft) and 16 m (52 ft) below the transducer, respectively, again assuming spherical spreading. Corresponding distances in the horizontal plane would be lower, given the directionality of this source (30° beamwidth) and the measurements of Burgess and Lawson (2000).

Masking

Marine mammal communications will not be masked appreciably by the sub-bottom profiler signals given its relatively low power output, the low duty cycle, directionality, and the brief period when an individual mammal is likely to be within its beam. Furthermore, in the case of most odontocetes, the sonar signals do not overlap with the predominant frequencies in the calls, which would avoid significant masking.

Behavioral Responses

Marine mammal behavioral reactions to other pulsed sound sources are discussed above, and responses to the sub-bottom profiler are likely to be similar to those for other pulsed sources received at the same levels. Therefore, behavioral responses are not expected unless marine mammals are very close to the source, *e.g.*, within approx. 160 m (525 ft) below the vessel, or about 17 m (54 ft) to the side of a vessel.

NMFS (2001) has concluded that momentary behavioral reactions ''do not rise to the level of taking''. Thus, brief exposure of cetaceans to a few signals from the sub-bottom profiler would not result in a ''take'' by harassment.

Hearing Impairment and Other Physical Effects

Source levels of the sub-bottom profiler are much lower than those of the GI guns that are discussed above. Sound levels from a sub-bottom profiler similar to the one on the R/V *Roger Revelle* were estimated to decrease to 180 dB re 1 microPa (rms) (NMFS criteria for Level A harassment) at 8 m (26 ft) horizontally from the source, Burgess and Lawson 2000), and at approx. 18 m (59 ft) downward from the source. Because of the fact that the entire area to be ensonified by the sub-bottom profiler will be within the safety radius in which mitigation measures will be taken and because an animal would have to be directly beneath, close to, and traveling at the same speed and direction as the boat to be exposed to multiple pings above 180 dB, it is unlikely that the sub-bottom profiler will cause hearing impairment or other physical injuries even in an animal that is (briefly) in a position near the source.

The sub-bottom profiler is usually operated simultaneously with other higher-power acoustic sources. Many marine mammals will move away in response to the approaching higher-power sources or the vessel itself before the mammals would be close enough for there to be any possibility of effects from the less intense sounds from the sub-bottom profiler. In the case of mammals that do not avoid the approaching vessel and its various sound sources, mitigation measures that would be applied to minimize effects of the higher-power sources would further reduce or eliminate any minor effects of the sub-bottom profiler.

Estimated Take by Incidental Harassment for the Eastern Tropical Pacific Seismic Survey

Given the proposed mitigation (see Mitigation later in this document), all anticipated takes involve a temporary change in behavior that would constitute Level B harassment, at most. The proposed mitigation measures are expected to minimize or eliminate the possibility of Level A harassment or mortality. It is difficult to make accurate, scientifically defensible, and observationally verifiable estimates of the number of individuals likely to be subject to low-level harassment by the noise from SIO's GI guns. There are many uncertainties in marine mammal distribution and seasonally varying abundance, and in local horizontal and vertical distribution; in marine mammal reactions to varying frequencies and levels of acoustic pulses; and in perceived sound levels at different horizontal and oblique ranges from the source. The best estimate of potential ''take by harassment'' is derived by converting the abundances of the affected species in Table 1 to per km abundances (even though most of the data used in this table were collected in different seasons than the SIO planned activity), and multiplying these abundances (for the appropriate region) by the area to be ensonified at levels greater than 160 dB (rms) (NMFS Level B harassment criteria). The area to be ensonified at levels greater than 160 dB is calculated using a 9-dB loss when converting from p-p to rms, and purely spherical spreading with no sea-surface baffling, which results in a swath width of 4.5 km (2.8 mi) (2.3 km (1.4 mi) either side of the survey vessel). The total area ensonified is derived by multiplying this width by the numbers of hours profiling on each leg, and by the 13 km/hr (7 mi/hr) average speed of the R/V *Roger Revelle* during the sea floor profiling. The total estimated ''take by harassment'' is presented in Table 1. Eleven species of odontocete whales, one species of mysticete whale, and no pinnipeds are expected to be harassed. No more than 0.72 percent of any stock is expected to be affected, and NMFS believes that this is a very small proportion of the eastern tropical Pacific population of any of the affected species.

Data regarding distribution, seasonal abundance, and response of pinnipeds to seismic sonar is sparse. While estimating numbers potentially vulnerable to noise harassment is difficult, NMFS believes the R/V *Roger Revelle* is unlikely to encounter significant numbers of any of the four pinniped species that live, for at least part of the year, in SIO's proposed survey area because of the decreased likelihood of encountering them in the very deep water, the relatively small area proposed to be ensonified, and the likely effectiveness of the proposed mitigation measures in such a small area.

The proposed SIO seismic survey in the Eastern Tropical Pacific Ocean will involve towing a pair of GI guns that introduce pulsed sounds into the ocean, along with simultaneous operation of a multi-beam echosounder and sub-bottom profiler. A towed hydrophone streamer will be deployed to receive and record the returning signals. No ''taking'' by harassment, injury, or mortality of marine mammals is expected in association with operations of the other sources discussed (bathymetric sonar or sub-bottom profiler), as produced sounds are beamed downward, the beam is narrow, and the pulses are extremely short.

Effects on Cetaceans

Strong avoidance reactions by several species of mysticetes to seismic vessels have been observed at ranges up to 6–8 km (3–4 nm) and occasionally as far as 20–30 km (11–16 nm) from the source vessel when much larger airgun arrays have been used. Additionally, the numbers of mysticetes estimated to occur within the 160-dB isopleth in the survey area are expected to be low (4 or less, see Table 1). In addition, the estimated numbers presented in Table 1 are considered overestimates of actual numbers for two primary reasons. First, the estimated 160-radii used here are probably overestimates of the actual 160-radii at deep-water sites (Tolstoy *et al.*, 2004) such as the Eastern Tropical Pacific Ocean survey area. Second, SIO plans to use smaller GI guns than those on which the radii are based.

Odontocete reactions to seismic pulses, or at least the reactions of dolphins, are expected to extend to lesser distances than are those of mysticetes. Odontocete low-frequency hearing is less sensitive than that of mysticetes, and dolphins are often seen from seismic vessels. In fact, there are documented instances of dolphins approaching active seismic vessels. However, dolphins and some other types of odontocetes sometimes show avoidance responses and/or other changes in behavior when near operating seismic vessels.

Taking into account the proposed mitigation measures, effects on cetaceans are generally expected to be limited to avoidance of the area around the seismic operation and short-term changes in behavior, falling within the MMPA definition of ''Level B harassment.'' Furthermore, the estimated numbers of animals potentially exposed to sound levels sufficient to cause appreciable disturbance are very low percentages of their population sizes in the Eastern Tropical Pacific Ocean.

Larger numbers of delphinids may be affected by the proposed seismic study, but the population sizes of species likely to occur in the operating area are large, and the numbers potentially affected are small relative to the population sizes.

Mitigation measures such as controlled speed, course alternation, look outs, non-pursuit, ramp ups, and shut downs when marine mammals are seen within defined ranges should further reduce short-term reactions and minimize any effects on hearing sensitivity. Effects on marine mammals are expected to be short-term, with no lasting biological consequences anticipated.

Potential Effects on Habitat

The proposed GI gun operations will not result in any permanent impact on habitats used by marine mammals, or to the food sources they use. The main impact issue associated with the proposed activities will be temporarily elevated noise levels and the associated direct effects on marine mammals, as discussed above.

One of the reasons for the adoption of airguns as the standard energy source for marine seismic surveys was that they (unlike the explosives used in the distant past) do not appear to result in any appreciable fish kill. Various experimental studies showed that airgun discharges caused little or no fish kill, and that any injurious effects were generally limited to the water within a meter or so of an airgun. However, it has recently been found that injurious effects on captive fish, especially on hearing, may occur to somewhat greater distances than previously thought (McCauley *et al.*, 2000a,b, 2002, 2003). Even so, any injurious effects on fish would be limited to short distances. Also, many of the fish that might otherwise be within the injury radius likely would be displaced from the region prior to the approach of the GI guns through avoidance reactions to the passing seismic vessel or to the GI gun sounds as received at distances beyond the injury radius.

Short, sharp sounds can cause overt or subtle changes in fish behavior. Chapman and Hawkins (1969) tested the reactions of whiting (hake) in the field to an airgun. When the airgun was fired, the fish dove from 25 to 55 m (80 to 180 ft) and formed a compact layer. By the end of an hour of exposure to the sound pulses, the fish had habituated; they rose in the water despite the continued presence of the sound pulses. However, they began to descend again when the airgun resumed firing after it had stopped. The whiting dove when received sound levels were higher than 178 dB re 1 microPa (peak pressure) (Pearson *et al.*, 1992).

Pearson *et al.* (1992) conducted a controlled experiment to determine effects of strong noise pulses on several species of rockfish off the California coast. They used an airgun with a source level of 223 dB re 1 microPa. They noted: startle responses at received levels of 200–205 dB re 1 microPa (peak pressure) and above for two sensitive species, but not for two other species exposed to levels up to 207 dB; alarm responses at 177–180 dB (peak) for the two sensitive species, and at 186–199 dB for other species; an overall threshold for the above behavioral response at approx. 180 dB (peak); an extrapolated threshold of approx. 161 dB (peak) for subtle changes in the behavior of rockfish; and a return to pre-exposure behaviors within the 20–60 min. after the exposure period.

In other airgun experiments, catch per unit effort (CPUE) of demersal fish declined when airgun pulses were emitted (Dalen and Raknes, 1985; Dalen and Knutsen, 1986; Skalski *et al.*, 1992). Reductions in the catch may have resulted from a change in behavior of the fish. The fish schools descended to near the bottom when the airgun was firing, and the fish may have changed their swimming and schooling behavior. Fish behavior returned to normal minutes after the sounds ceased. In the Barents Sea, abundance of cod and haddock measured acoustically was reduced by 44 percent within 9 km (5 nm) of an area where airguns operated (Engås *et al.*, 1993). Actual catches declined by 50 percent throughout the trial area and 70 percent within the shooting area. The reduction in catch decreased with increasing distance out to 30–33 km (16–18 nm), where catches were unchanged.

Other recent work concerning behavioral reactions of fish to seismic surveys, and concerning effects of seismic surveys on fishing success, is reviewed in Turnpenny and Nedwell (1994), Santulli *et al.*, (1999), Hirst and Rodhouse, (2000), Thomson *et al.*, (2001), Wardle *et al.*, (2001), and Engås and Løkkeborg, (2002).

In summary, fish often react to sounds, especially strong and/or intermittent sounds of low frequency. Sound pulses at received levels of 160 dB re 1 microPa (peak) may cause subtle changes in behavior. Pulses at levels of 180 dB (peak) may cause noticeable changes in behavior (Chapman and Hawkins, 1969; Pearson *et al.*, 1992; Skalski *et al.*, 1992). It also appears that fish often habituate to repeated strong sounds rather rapidly, on time scales of minutes to an hour. However, the habituation does not endure, and resumption of the disturbing activity may again elicit disturbance responses from the same fish.

Fish near the GI guns are likely to dive or exhibit some other kind of behavioral response. That might have short-term impacts on the ability of cetaceans to feed near the survey area. However, only a small fraction of the available habitat would be ensonified at any given time, and fish species would return to their pre-disturbance behavior once the seismic activity ceased. Thus, the proposed survey would have little impact on the abilities of marine mammals to feed in the area where seismic work is planned. Some of the fish that do not avoid the approaching GI guns (probably a small number) may be subject to auditory or other injuries.

Zooplankton that are very close to the source may react to the shock wave. They have an exoskeleton and no air sacs. Little or no mortality is expected. Many crustaceans can make sounds, and some crustaceans and other invertebrates have some type of sound receptor. However, the reactions of zooplankton to sound are not known. Some mysticetes feed on concentrations of zooplankton. A reaction by zooplankton to a seismic impulse would only be relevant to whales if it caused a concentration of zooplankton to scatter. Pressure changes of sufficient magnitude to cause that type of reaction probably would occur only very close to the source. Impacts on zooplankton behavior are predicted to be negligible, and that would translate into negligible impacts on feeding mysticetes. Furthermore, in the proposed project area, mysticetes are expected to be rare.

The effects of the planned activity on marine mammal habitats and food resources are expected to be negligible, as described above. A small minority of the marine mammals that are present near the proposed activity may be temporarily displaced as much as a few kilometers by the planned activity.

The proposed activity is not expected to have any habitat-related effects that could cause significant or long-term consequences for individual marine mammals or their populations, since operations at the various sites will be limited in duration.

Potential Effects on Subsistence Use of Marine Mammals

There is no known legal subsistence hunting for marine mammals in the ETP near the survey area, so the proposed activities will not have any impact on the availability of the species or stocks for subsistence users.

Mitigation

For the proposed seismic survey in the ETP during March–April 2006, SIO will deploy a pair of GI guns as an energy source, with a total discharge volume of 90 in^3. The energy from the GI guns will be directed mostly downward. The small size of the GI guns to be used during the proposed study is an inherent and important mitigation measure that will reduce the potential for effects relative to those that might occur with large airgun array.

Received sound levels have been estimated by L–DEO in relation to distance from two 105 in^3 GI guns, but not two 45 in^3 GI guns. The radii around two 105 in^3 GI guns where received levels would be 180 and 190 dB re 1 microPa (rms) are small (54 and 17 m (155 ft and 45 ft), respectively), especially in the deep waters (>4,000 m (11,494 ft)) of the survey area. The 180 and 190 dB levels are shut-down criteria applicable to cetaceans and pinnipeds, respectively, as specified by NMFS (2000).

Vessel-based observers will watch for marine mammals near the GI guns when they are in use. Proposed mitigation and monitoring measures for the seismic survey have been developed and refined in cooperation with NMFS during previous SIO seismic studies and associated EAs, IHA applications, and IHAs. The mitigation and monitoring measures described herein represent a combination of the procedures required by past IHAs for other SIO and L–DEO projects. The measures are described in detail below.

The number of individual animals expected to be approached closely during the proposed activity will be small in relation to regional population sizes. With the proposed monitoring, ramp-up, and shut-down provisions (see below), any effects on individuals are expected to be limited to behavioral disturbance. That is expected to have negligible impacts on the species and stocks.

The following subsections provide more detailed information about the mitigation measures that are an integral part of the planned activity.

Vessel-based observers will monitor marine mammals near the seismic source vessel during all daytime GI gun operations and during any nighttime start ups of the GI guns. The observations will provide the real-time data needed to implement some of the key mitigation measures. When marine mammals are observed within, or about to enter, designated safety zones (see below) where there is a possibility of significant effects on hearing or other physical effects, GI gun operations will be shut down immediately. During daylight, vessel-based observers will watch for marine mammals near the seismic vessel during all periods while operating airguns and for a minimum of 30 min prior to the planned start of GI gun operations after an extended shut down.

SIO proposes to conduct nighttime as well as daytime operations. Observers dedicated to marine mammal observations will not be on duty during ongoing seismic operations at night. At night, bridge personnel will watch for marine mammals (insofar as practical at night) and will call for the GI guns to be shut down if marine mammals are observed in or about to enter the safety radii. If the GI guns are started up at night, two marine mammal observers will monitor marine mammals near the source vessel for 30 min prior to start up of the GI guns using (aft-directed) ship's lights and night vision devices.

Proposed Safety Radii

Received sound levels have been modeled by L–DEO for two 105 in^3 GI guns, but not for the 45 in^3 GI guns, in relation to distance and direction from the source. The model does not allow for bottom interactions, and is most directly applicable to deep water. Based on the modeling, estimates of the maximum distances from the GI guns where sound levels of 160, 180, and 190 dB re 1 microPa (rms) are predicted to be 510, 54, and 17 m (1466, 155, 49 ft), respectively. Because the model results are for the larger 105 in^3 GI guns, those distances are overestimates of the distances for the 45 in^3 GI guns used in this study.

Empirical data concerning the 160-, and 180-dB distances have been acquired based on measurements during the acoustic verification study conducted by L–DEO in the northern Gulf of Mexico from 27 May to 3 June 2003, using the larger 105 in^3 GI guns (Tolstoy *et al.*, 2004). Although the results are limited, the data showed that radii around the GI guns where the received level would be 180 dB re 1 microPa (rms), the safety criteria applicable to cetaceans (NMFS, 2000), vary with water depth. Similar depth-related variation is likely in the 190 dB distances applicable to pinnipeds. Correction factors were developed for water depths 100–1,000 m (328–3,281 ft). The proposed survey will occur in depths 4,000–5,000 m (13,123–16,400 ft), so those correction factors are not relevant here.

The empirical data indicate that, for deep water (>1000 m (>3281 ft)), the L–DEO model tends to overestimate the received sound levels at a given distance (Tolstoy *et al.*, 2004). However, to be precautionary pending acquisition of additional empirical data, it is proposed that safety radii during GI gun operations in deep water will be the values predicted by L–DEO's model. Therefore, the assumed 180– and 190–dB radii are 54 m (177 ft) and 17 m (56 ft), respectively.

The GI guns would be shut down immediately when cetaceans or pinnipeds are detected within or about to enter the appropriate 180-dB (rms) or 190-dB (rms) radius, respectively. The 180-; and 190-dB shut-down criteria are consistent with guidelines listed for cetaceans and pinnipeds, respectively, by NMFS (2000) and other guidance by NMFS.

Operational Mitigation Measures

In addition to marine mammal monitoring, the following mitigation measures will be adopted during the proposed seismic program, provided that doing so will not compromise operational safety requirements. Although power-down procedures are often standard operating practice for seismic surveys, they will not be used here because powering down from two GI guns to one GI gun would make only a small difference in the 180- or 190-dB radius, probably not enough to allow continued one-gun operations if a mammal came within the safety radius for two guns. Mitigation measures that will be adopted are

—Speed or course alteration;
—Ramp-up and shut-down procedures;
—Specific start-up measures for night operations;
—Operation of GI guns only in water greater than 3,000 m (8,621 ft) deep.

Speed or Course Alteration—If a marine mammal is detected outside the safety radius and, based on its position and the relative motion, is likely to enter the safety radius, the vessel's speed and/or direct course may, when practical and safe, be changed in a manner that also minimizes the effect on the planned science objectives. The marine mammal activities and movements relative to the seismic vessel will be closely monitored to ensure that the animal does not approach within the safety radius. If the animal appears likely to enter the safety radius, further mitigative actions will be taken, *i.e.*, either further course alterations or shut down of the GI guns.

Shut-down Procedures—If a marine mammal is detected outside the safety radius but is likely to enter the safety radius, and if the vessel's course and/or speed cannot be changed to avoid having the animal enter the safety radius, the GI guns will be shut down before the animal is within the safety radius. Likewise, if a marine mammal is already within the safety radius when first detected, the GI guns will be shut down immediately.

GI gun activity will not resume until the animal has cleared the safety radius. The animal will be considered to have cleared the safety radius if it is visually observed to have left the safety radius, or if it has not been seen within the radius for 15 min (small odontocetes and pinnipeds) or 30 min (mysticetes and large odontocetes, including sperm, pygmy sperm, dwarf sperm, beaked, and bottlenose whales).

Ramp-up Procedures—A modified ''ramp-up'' procedure will be followed when the GI guns begin operating after a period without GI gun operations. The two GI guns will be added in sequence 5 minutes apart. During ramp-up procedures, the safety radius for the two GI guns will be maintained.

Night Operations—At night, vessel lights and/or night vision devices (NVDs) will be used to monitor the safety radius for marine mammals while airguns are operating. Nighttime start up of the GI guns will only occur in situations when the entire safety radius is visible for the entire 30 minutes prior to start-up.

Monitoring

SIO proposes to sponsor marine mammal monitoring during the present project, in order to implement the proposed mitigation measures that require real-time monitoring, and to satisfy the anticipated monitoring requirements of the Incidental Harassment Authorization. SIO's proposed Monitoring Plan is described here.

The monitoring work has been planned as a self-contained project independent of any other related monitoring projects that may be occurring simultaneously in the same regions. SIO is prepared to discuss coordination of its monitoring program with any related work that might be done by other groups insofar as this is practical and desirable.

Vessel-Based Visual Monitoring

Either dedicated marine mammal observers (MMOs) or other vessel-based personnel will watch for marine mammals near the seismic source vessel during all daytime and nighttime GI gun operations. GI gun operations will be suspended when marine mammals are observed within, or about to enter, designated safety radii where there is a possibility of significant effects on hearing or other physical effects. At least one dedicated vessel-based MMO will watch for marine mammals near the seismic vessel during daylight periods with seismic operations, and two MMOs will watch for marine mammals for at least 30 min prior to start-up of GI gun operations. Observations of marine mammals will also be made and recorded during any daytime periods without GI gun operations. At night, the forward-looking bridge watch of the ship's crew will look for marine mammals that the vessel is approaching and execute avoidance maneuvers; the 180dB/190dB safety radii around the GI guns will be continuously monitored by an aft-looking member of the scientific party, who will call for shutdown of the guns if mammals are observed within the safety radii. Nighttime observers will be aided by (aft-directed) ship's lights and NVDs.

Observers will be on duty in shifts usually of no longer than two hours in duration. Use of two simultaneous observers prior to start up will increase the detectability of marine mammals present near the source vessel, and will allow simultaneous forward and rearward observations. Bridge personnel additional to the dedicated marine mammal observers will also assist in detecting marine mammals and implementing mitigation requirements, and before the start of the seismic survey will be given instruction in how to do so.

Standard equipment for marine mammal observers will be 7 × 50 reticle binoculars and optical range finders. At night, night vision equipment will be available. The observers will be in wireless communication with ship's officers on the bridge and scientists in the vessel's operations laboratory, so they can advise promptly of the need for avoidance maneuvers or GI gun power-down or shut-down.

The vessel-based monitoring will provide data required to estimate the numbers of marine mammals exposed to various received sound levels, to document any apparent disturbance reactions, and thus to estimate the numbers of mammals potentially ''taken'' by harassment. It will also provide the information needed in order to shut down the GI guns at times when mammals are present in or near the safety zone. When a mammal sighting is made, the following information about the sighting will be recorded:

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

2. Time, location, heading, speed, activity of the vessel (shooting or not), sea state, visibility, cloud cover, and sun glare.

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

All mammal observations and GI gun shutdowns will be recorded in a standardized format. Data will be entered into a custom database using a notebook computer when observers are off duty. The accuracy of the data entry will be verified by computerized data validity checks as the data are entered, and by subsequent manual checking of the database. Those procedures will allow initial summaries of data to be prepared during and shortly after the field program, and will facilitate transfer of the data to statistical, graphical, or other programs for further processing and archiving.

Results from the vessel-based observations will provide:

1. The basis for real-time mitigation (GI gun shut down).

2. Information needed to estimate the number of marine mammals potentially taken by harassment.

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

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

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

Reporting

A report will be submitted to NMFS within 90 days after the end of the ETP cruise, which is predicted to occur around 01 April, 2006. The report will describe the operations that were conducted and the marine mammals that were detected near the operations. The report will be submitted to NMFS, providing full documentation of methods, results, and interpretation pertaining to all monitoring. The 90-day report will summarize the dates and locations of seismic operations, marine mammal sightings (dates, times, locations, activities, associated seismic survey activities), and estimates of the amount and nature of potential ''take'' of marine mammals by harassment or in other ways.

Endangered Species Act

Under section 7 of the ESA, the National Science Foundation (NSF) has begun consultation on this proposed seismic survey. NMFS will also consult on the issuance of an IHA under section 101(a)(5)(D) of the MMPA for this activity. Consultation will be concluded prior to a determination on the issuance of an IHA. Preliminarily, NMFS believes that the only ESA listed species that may experience Level B Harassment is the sperm whale.

National Environmental Policy Act (NEPA)

In 2003, NSF prepared an Environmental Assessment (EA) for a marine seismic survey by the R/V *Maurice Ewing* in the Hess Deep Area of the Eastern Tropical Pacific Ocean. This EA addressed the potential effects of a much larger airgun array (10 airguns, total volume 3005 in^3) being operated in the same part of the ocean as is proposed for the R/V *Roger Revelle* in this application. NMFS has posted this EA on the NMFS Web site and solicits public comments regarding impacts to marine mammals with respect to this proposed IHA. NMFS will review the EA and the public comments on the IHA application and subsequently either adopt the existing EA or prepare its own NEPA document before making a determination on the issuance of an IHA. The aforementioned EA is available upon request or on the NMFS Web site (see **ADDRESSES**). Comments regarding impacts to marine mammals may be submitted by mail, fax, or e-mail (see **ADDRESSES**). All other comments should be addressed to SIO or the National Science Foundation.

Preliminary Conclusions

NMFS has preliminarily determined that the impact of conducting the seismic survey in the ETP may result, at worst, in a temporary modification in behavior by certain species of marine mammals. This activity is expected to result in no more than a negligible impact on the affected species or stocks.

For reasons stated previously in this document, this preliminary determination is supported by: (1) The likelihood that, given sufficient notice through slow ship speed and ramp-up, marine mammals are expected to move away from a noise source that is annoying prior to its becoming potentially injurious; (2) recent research that indicates that TTS is unlikely (at least in delphinids) until levels closer to 200–205 dB re 1 microPa are reached rather than 180 dB re 1 microPa; (3) the fact that 200–205 dB isopleths would be well within 15 m (41 ft) of the vessel; and (4) the likelihood that marine mammal detection ability by trained observers is close to 100 percent during daytime and remains high at night to that distance from the seismic vessel. As a result, no take by injury or death is anticipated, and the potential for temporary or permanent hearing impairment is very low and will be avoided through the incorporation of the proposed mitigation measures mentioned in this document.

NMFS has preliminarily determined that small numbers of 12 species of cetaceans may be taken by Level B harassment. While the number of incidental harassment takes will depend on the distribution and abundance of marine mammals in the vicinity of the survey activity, the estimated number of potential harassment takings is not expected to greater than 0.72 percent of the population of any of the stocks affected (see Table 1). In addition, the proposed seismic program will not interfere with any legal subsistence hunts, since seismic operations will not be conducted in the same space and time as the hunts in subsistence whaling and sealing areas and will not adversely affect marine mammals used for subsistence purposes.

Proposed Authorization

NMFS proposes to issue an IHA to SIO for conducting a low-intensity oceanographic seismic survey in the ETP, provided the previously mentioned mitigation, monitoring, and reporting requirements are incorporated. NMFS has preliminarily determined that the proposed activity would result in the harassment of small numbers of marine mammals; would have no more than a negligible impact on the affected marine mammal stocks; and would not have an unmitigable adverse impact on the availability of species or stocks for subsistence uses.

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Table 1. Species expected to be impacted by the seismic survey in the ETP, their estimated abundance in the area, and the estimated amount of takes by Level B Harassment expected to occur during the seismic survey in the ETP.

Species	Habitat	Abundance Estimate	Harrassmt. Estimate	Estimated % Stock Harass'd
Odontocetes				
Sperm whale* (*Physeter macrocephalus*)	Usually pelagic and deep seas	26,053	20	0.08
Pygmy sperm whale (*Kogia breviceps*)	Deeper waters off the shelf	N.A.	0	0
Dwarf sperm whale (*Kogia sima*)	Deeper waters off the shelf	11,200	145	1.29
Cuvier's beaked whale (*Ziphius cavirostris*)	Pelagic	20,000	0	0
Longman's beaked whale (*Indopacetus pacificus*)	Pelagic	N.A.	0	0
Pygmy beaked whale (*Mesoplodon peruvianus*)	Deep waters	25,300	0	0
Ginkgo-toothed beaked whale (*Mesoplodon ginkgodens*)	Likely pelagic	25,300	0	0
Blainville's beaked whale (*Mesoplodon densirostris*)	Pelagic	25,300	182	0.72
Rough-toothed dolphin (*Steno bredanensis*)	Mostly pelagic	145,900	0	0
Bottlenose dolphin (*Tursiops truncatus*)	Coastal and oceanic	243,500	285	0.12
Pantropical spotted dolphin (*Stenella attenuata*)	Coastal and pelagic	2,059,100	3,424	0.17
Spinner dolphin (*Stenella longirostris*)	Coastal and pelagic	1,651,100	627	0.04
Striped dolphin (*Stenella coeruleoalba*)	Off the continental shelf	1,918,000	694	0.04
Short-beaked common dolphin (*Delphinus delphis*)	Continental shelf and pelagic waters	3,093,300	5,275	0.17
Pacific white-sided dolphin (*Lagenorhynchus obliquidis*)	Coastal waters	N.A.	0	0
Dusky Dolphin (*Lagenorhynchus obscurus*)	Coastal and continental shelf waters	N.A.	0	0
Fraser's dolphin (*Lagenodelphis hosei*)	Water deeper than 1000 m	289,300	808	0.28
Risso's dolphin (*Grampus griseus*)	Waters deeper than 1000 m	175,800	573	0.33
Melon-headed whale (*Peponocephala electra*)	Oceanic	45,400	0	0
Pygmy killer whale (*Feresa attenuata*)	Deep, pantropical waters	38,900	0	0
False killer whale (*Pseudorca crassidens*)	Pelagic	39,800	0	0
Killer whale (*Orcinus orca*)	Widely distributed	8,500	8	0.09
Short-finned pilot whale (*Globicephala macrorhynchus*)	Mostly pelagic	160,200	105	0.07
Mysticetes				
Humpback whale* (*Megaptera novaeangliae*)	Mainly near-shore waters and banks	N.A.	0	0
Minke whale (*Balaenoptera acutorostrata*)	Continental shelf, coastal waters	N.A.	0	0
Bryde's whale (*Balaenoptera edeni*)	Pelagic and coastal	13,000	4	0.03
Sei whale* (*Balaenoptera borealis*)	Primarily offshore, pelagic	N.A.	0	0
Fin whale* (*Balaenoptera physalus*)	Continental slope, mostly pelagic	N.A.	0	0
Blue whale* (*Balaenoptera musculus*)	Pelagic and coastal	1400	0	0

* Listed as Endangered under the Endangered Species Act

Dated: January 16, 2006.

James H. Lecky,

Director, Office of Protected Resources, National Marine Fisheries Service.

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DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

[I.D. 120605B]

Vessel Monitoring Systems; Additional Approved Mobile Transmitting Units for Use in the Fisheries Off the West Coast States and in the Western Pacific; Pacific Coast Groundfish Fishery

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

ACTION: Notice; additional approval of vessel monitoring systems.

SUMMARY: This document provides notice of vessel monitoring systems (VMS) approved by NOAA for use by vessels participating in the Pacific Coast Groundfish Fishery and sets forth relevant features of the VMS.

ADDRESSES: To obtain copies of the list of NOAA-approved VMS mobile transmitting units and NOAA-approved VMS communications service providers, or information regarding the status of VMS systems being evaluated by NOAA for approval, write to NOAA Fisheries Office for Law Enforcement (OLE), 8484 Georgia Avenue, Suite 415, Silver Spring, MD 20910.

To submit a completed and signed checklist, mail or fax it to NOAA Enforcement, 7600 Sand Point Way, Seattle, WA 98115, fax 206–526–6528. For more addresses regarding approved VMS, see the **SUPPLEMENTARY INFORMATION** section, under the heading VMS Provider Addresses. The public may acquire this notice, installation checklist, and relevant updates by calling 301–427–2300.

FOR FURTHER INFORMATION CONTACT: For current listing information contact Mark Oswell, Outreach Specialist, phone 301–427–2300, fax 301–427–2055. For questions regarding VMS installation, activation checklists, and status of evaluations, contact Jonathan Pinkerton, National VMS Program Manager, phone 301–427–2300; fax 301–427–2055. For questions regarding the checklist, contact Joe Albert, Northwest Divisional VMS Program Manager, NMFS Office for Law Enforcement, Northwest Division, phone 206–526–6135.

SUPPLEMENTARY INFORMATION:

I. VMS Mobile Transceiver Units

BOATRACS - Fisheries Mobile Communications Terminal with GPS

The Boatracs satellite communications VMS transmitting unit that meets the minimum technical requirements for the Pacific Coast Groundfish Fishery is the BOATRACS - FMTC/G. The address for the Boatracs distributor is provided under the heading VMS Provider Addresses.

The FMTC/G is an integrated GPS two-way satellite communications system, consisting of two major hardware components, the Mobile Communication Transceiver (MCT) and the Enhanced Display Unit (EDU). The MCT contains the antenna and integrated GPS that communicates with the satellite and contains the operating circuitry and memory. The EDU is a shock and splash-resistant display and keyboard unit consisting of, a liquid crystal display, keyboard, with adjustable contrast, brightness, and audible alerts. A backlight illuminates the display for night view. The EDU has message waiting, no signal, and audible message received indicators.

The MCT is 6.7 inches high by 11.4 inches wide and weighs 11 pounds. The base of the unit is 6.595 inches in diameter. The MCT draws approximately 2.3 amps of current from the power supply while transmitting and 1.2 amps when the vessel is idle.

The EDU is a hardened and splash proof keyboard display unit with a 15–line X 40–character screen that allows for both text and graphics. It is 12.72 inches wide by 9.3 inches long by 2.21 inches in depth, and weighs 3 pounds and is holster-mounted in the cabin.

II. Satellite Communication Services

The FMTC/G utilizes KU band geostationary satellite to provide two-way date services. The data satellite transmits and receives all two-way message traffic between the vessel and NMFS, Shore Office, Network Operations Center or third party. The Satellite is located 22,300 miles over the equator at 103° W. long. (south of Florida).

Boatracs operates a redundant NOC. This facility is online 24 hours a day, 365 days a year, including holidays. Customer service representatives are available to relay messages and provide customer service. The NOC is also the facility that allows for automatic boat-to-boat, boat-to-e-mail, boat-to-fax, and e-mail-to-boat service. Data on demand and information services are also provided by the NOC.

Boatracs contracts their satellite communication services from QUALCOMM Corporation of California. QUALCOMM offers 24x7, 365 days a year network support, and operates fully redundant earth stations in California and Nevada.

VMS units must be installed in accordance with vendor instructions and specifications. All installation costs are paid by the owner. The vessel owner is required to fax or mail the Activation Fax directly to NOAA Enforcement, 7600 Sand Point Way, Seattle, WA 98115, fax 206–526–6528.

The owner must confirm the FMTC/G operation and communications service to ensure that position reports are automatically sent to and received by OLE before leaving on their first fishing trip requiring VMS. OLE does not regard the fishing vessel as meeting the requirements until position reports are automatically received. For confirmation purposes, owners must contact the NOAA Enforcement, 7600 Sand Point Way, Seattle, WA 98115, voice 206–526–6135, fax 206–526–6528.

III. VMS Provider Addresses

Boatracs corporate office address is 9155 Brown Deer Rd, Suite 8, San Diego, CA. 92121. The primary point of contact is Lauri Paul, Fisheries Market Segment Executive, e-mail *lpaul@boatracs.com*, direct telephone number (858)458–8113, and toll free (877)468–8722 ext 113. The alternate contact is David Brandos, e-mail *dbrandos@boatracs.com*, direct telephone number (858)458–8102, and toll free (877)468–8722 ext 102.

Dated: January 13, 2006.

William T. Hogarth,

Assistant Administrator for Fisheries, National Marine Fisheries Service.

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DEPARTMENT OF DEFENSE

Department of the Army; Corps of Engineers

Availability of Baltimore Harbor and Channels Dredged Material Management Plan and Final Tiered Environmental Impact Statement

AGENCY: Department of the Army, U.S. Army Corps of Engineers, DoD.

ACTION: Notice of availability.

SUMMARY: In accordance with the requirements of the National Environmental Policy Act, the U.S. Army Corps of Engineers (USACE), Baltimore District has prepared a Final