proposed collection of information; (c) ways to enhance the quality, utility, and clarity of the information to be collected; and (d) ways to minimize the burden of the collection of information on respondents, including through the use of automated collection techniques or other forms of information technology.

Comments submitted in response to this notice will be summarized and/or included in the request for OMB approval of this information collection; they also will become a matter of public record.

Dated: September 22, 2004.

Gwellnar Banks,

Management Analyst, Office of the Chief Information Officer.

[FR Doc. 04–21971 Filed 9–29–04; 8:45 am]

BILLING CODE 3510–22–S

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

[I.D. 070104A]

Small Takes of Marine Mammals Incidental to Specified Activities; Marine Seismic Survey in the Eastern Tropical Pacific Ocean off Central America

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

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

SUMMARY: NMFS has received an application from the Lamont-Doherty Earth Observatory (L-DEO), a part of Columbia University, for an Incidental Harassment Authorization (IHA) to take small numbers of marine mammals, by harassment, incidental to conducting oceanographic seismic surveys in the eastern tropical Pacific Ocean (ETPO) off Central America. Under the Marine Mammal Protection Act (MMPA), NMFS is requesting comments on its proposal to issue an authorization to L-DEO to incidentally take, by harassment, small numbers of several species of cetaceans and pinnipeds for a limited period of time within the next year.

DATES: Comments and information must be received no later than November 1, 2004.

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, or by telephoning the contact listed here. The mailbox address for providing email comments is *PR1.070104A@noaa.gov*. Include in the subject line of the e-mail comment the following document identifier: 070104A. 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 this address or by telephoning the contact listed here and is also available at: *http://www.nmfs.noaa.gov/prot__res/PR2/Small__Take/smalltake__info.htm#applications*.

FOR FURTHER INFORMATION CONTACT: Kenneth Hollingshead, Office of Protected Resources, NMFS, (301) 713–2322, ext 128.

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.

Permission may be granted if NMFS finds that the taking will have a negligible impact on the species or stock(s) and will not have an unmitigable adverse impact on the availability of the species or stock(s) for subsistence uses 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 June 28, 2004, NMFS received an application from L-DEO for the taking, by harassment, of several species of marine mammals incidental to conducting a marine seismic survey program during a four-week period beginning in late November 2004 in the Exclusive Economic Zones of El Salvador, Honduras, Nicaragua, and Costa Rica. The purpose of the seismic survey is to investigate stratigraphic development in the presence of tectonic forcing in the Sandino basin off Nicaragua and Costa Rica. Because of the variations in subsidence/uplift histories within the Sandino Basin, and the inability to provide whole-basin coverage during a research cruise of reasonable length, data will be collected in two primary grids in the Sandino Basin and a third, smaller grid off Nicoya Peninsula. Grid descriptions are provided in L-DEO's application.

Description of the Activity

The seismic survey will involve one vessel. The source vessel, the *R/V Maurice Ewing*, will deploy three low-energy GI airguns as an energy source, with a total discharge volume of up to 315 in^3. As the airguns are towed along the survey lines, the towed hydrophone system will receive the returning acoustic signals.

The program will consist of a maximum of 6048 km (3266 nm) of surveys. Water depths within the survey area are up to 5000 m (16,400 ft); most of the survey will be conducted in water depths less than 2000 m (6560 ft). The area to be surveyed extends from approximately 4 to 150 km (2 to 80 nm) offshore. The airguns may also be operated closer to, and farther from, shore while the ship is maneuvering toward or between survey lines.

The proposed program will use conventional seismic methodology with a small towed array of three GI airguns as the energy source, and a towed hydrophone streamer as the receiver system. The energy to the airguns is compressed air supplied by compressors on board the source vessel. Seismic pulses will be emitted at intervals of 5 seconds. The 5–sec spacing corresponds to a shot interval of approximately 12.5 m (41 ft).

The generator chamber of each GI gun, the one responsible for introducing the sound pulse into the ocean, is 105 in^3. The injector chamber injects air into the previously generated bubble to maintain its shape, and does not introduce appreciably more sound into the water. The three 105–in^3 GI guns will be towed behind the *Ewing*, at a depth of 2.5 m (8.2 ft). Operating pressure will be 2000 psi. The GI guns will be 7.8 m (25.6 ft) apart and will be towed 37 m (121.4 ft) behind the *Ewing*. The *Ewing* will also tow a hydrophone streamer that is up to 1500 m (4922 ft) long. As the airguns are operated along the survey lines, the hydrophone receiving system will receive and record the returning acoustic signals.

General-Injector Airguns

Three GI-airguns will be used from the *Ewing* during the proposed program. These 3 GI-airguns have a zero to peak (peak) source output of 240.7 dB re 1 microPascal-m (10.8 bar-m) and a peak-to-peak (pk-pk) level of 246 dB (21 bar-m). However, these downward-directed source levels 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 (3.3 ft) from a hypothetical point source emitting the same total amount of sound as is emitted by the combined airguns in the airgun array. The actual received level at any location in the water near the airguns will not exceed the source level of the strongest individual source and actual levels experienced by any organism more than 1 m (3.3 ft) from any GI gun will be significantly lower.

Further, the root mean square (rms) received levels that are used as impact criteria for marine mammals (see Richardson *et al.*, 1995) are not directly comparable to these peak or pk-pk values that are normally used to characterize source levels of airgun arrays. The measurement units used to describe airgun sources, peak or pk-pk decibels, are always higher than the rms decibels referred to in biological literature. For example, 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 pk-pk measurement of about 176 to 178 decibels, as measured for the same pulse received at the same location (Greene, 1997; McCauley *et al.* 1998, 2000). 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 an airgun-type source.

The depth at which the sources are towed has a major impact on the maximum near-field output, because the energy output is constrained by ambient pressure. The normal tow depth of the sources to be used in this project is 2.5 m (6.7 ft), where the ambient pressure is approximately 3 decibars. This also limits output, as the 3 decibars of confining pressure cannot fully constrain the source output, with the result that there is loss of energy at the sea surface. Additional discussion of the characteristics of airgun pulses is provided later in this document (see Characteristics of Airgun Pulses).

For the GI-airguns, the sound pressure field has been modeled by L-DEO in relation to distance and direction from the airguns, and in relation to depth. Table 1 shows the maximum distances from the airguns where sound levels of 190-, 180-, 170- and 160–dB re 1 microPa (rms) are predicted to be received.

Some empirical data concerning the 180, 170 and 160 dB distances have been acquired for several airgun configurations, including two GI-guns, based on measurements during an acoustic verification study conducted by L-DEO in the northern Gulf of Mexico from 27 May to 3 June 2003 (see Tolstoy *et al.*, 2004). Although the results are limited and do not include measurements for three GI-guns, the data for other airgun configurations showed that water depth affected the radii around the airguns where the received level would be 180 dB re 1 microPa (rms), NMFS' current injury threshold safety criterion applicable to cetaceans (NMFS, 2000). Similar depth-related variation is likely in the 190–dB distances applicable to pinnipeds. Water depths within the survey area are up to 5000 m (16400 ft), but most of the survey will be conducted in water depths less than 2000 m (6560 ft), as shown in Table 1, column 3.

TABLE 1. Estimated distances to which sound levels ≥190, 180, 170 and 160 dB re 1 μPa (rms) might be received from ***(A)*** three 105 in^3 GI guns and ***(B)*** one of those guns, as planned for the seismic survey off the west coast of Central America during November–December 2004. Distance estimates are given for operations in deep, intermediate, and shallow water. The 180- and 190-dB distances are the safety radii to be used during the survey. Three GI guns will be used for the survey and one GI gun will be used during power down.

Airgun configuration	Water depth	% of seismic survey conducted	Estimated distances at received levels (m)			
			190 dB	180 dB	170 dB	160 dB
A. 3 GI guns	>1000 m	11.6	26	82	265	823
	100–1000 m	57.9	39	123	398	1235
	<100 m	30.6	390	574	1325	2469
B. 1 GI gun	>1000 m		10	27	90	275
	100–1000 m		15	41	135	413
	<100 m		150	189	450	825

The empirical data indicate that, for deep water (greater than 1000 m (3281 ft)), the L-DEO model for the airguns 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, L-DEO and NMFS propose that the mitigation safety radii during airgun operations in deep water will be the values predicted by L-DEO's model (see Table 1).

The 180- and 190–dB radii were not measured for three GI- guns operating in shallow water (less than 100 m (328 ft)). However, the measured 180–dB radius for the 6–airgun array operating in shallow water was 6.8x that predicted by L-DEO's model for operation of the six-airgun array in deep water. The conservative correction factor is applied to the model estimates to predict the radii for the three GI-guns in shallow water, as shown in Table 1.

Empirical measurements were not conducted for intermediate depths (100–1000 m (328–3281 ft)). On the expectation that results will be intermediate between those from shallow and deep water, a 1.5x correction factor is applied to the estimates provided by the model for deep water situations, as shown in Table 1. This is the same factor that was applied to the model estimates during L-DEO cruises in 2003.

Bathymetric Sonar and Sub-bottom Profiler

In addition to the 3 GI-airguns, a multibeam bathymetric sonar and a low-energy 3.5–kHz sub-bottom profiler will be used during the seismic profiling and continuously when underway.

Bathymetric Sonar-Atlas Hydrosweep-The 15.5–kHz Atlas Hydrosweep sonar is mounted on the hull of the *Maurice Ewing*, and it operates in three modes, depending on the water depth. There is one shallow water mode and two deep-water modes: an Omni mode (similar to the shallow-water mode but with a source output of 220 dB (rms)) and a Rotational Directional Transmission (RDT) mode. The RDT mode is normally used during deep-water operation and has a 237–dB rms source output. In the RDT mode, each ''ping'' consists of five successive transmissions, each ensonifying a beam that extends 2.67 degrees fore-aft and approximately 30 degrees in the cross-track direction. The five successive transmissions (segments) sweep from port to starboard with minor overlap, spanning an overall cross-track angular extent of about 140 degrees, with small (much less than 1 millisec) gaps between the pulses for successive 30–degree segments. The total duration of the ''ping,'' including all five successive segments, varies with water depth, but is 1 millisec in water depths less than 500 m and 10 millisec in the deepest water. For each segment, ping duration is 1/5 of these values or 2/5 for a receiver in the overlap area ensonified by two beam segments. The ''ping'' interval during RDT operations depends on water depth and varies from once per second in less than 500 m (1640.5 ft) water depth to once per 15 seconds in the deepest water. During the proposed project, the Atlas Hydrosweep will generally be used in waters greater than 800 m (2624.7 ft), but whenever water depths are less than 400 m (1312 ft) the source output is 210 dB re 1 microPa-m (rms) and a single 1–ms pulse or ''ping'' per second is transmitted.

Sub-bottom Profiler-The sub-bottom profiler is normally operated to provide information about the sedimentary features and the bottom topography that is simultaneously being mapped by the Hydrosweep. The energy from the sub-bottom profiler is directed downward by a 3.5–kHz transducer mounted in the hull of the *Ewing*. The output varies with water depth from 50 watts in shallow water to 800 watts in deep water. Pulse interval is 1 second (s) but a common mode of operation is to broadcast five pulses at 1–s intervals followed by a 5–s pause. The beamwidth is approximately 30° and is directed downward. Maximum source output is 204 dB re 1 microPa (800 watts) while nominal source output is 200 dB re 1 microPa (500 watts). Pulse duration will be 4, 2, or 1 ms, and the bandwith of pulses will be 1.0 kHz, 0.5 kHz, or 0.25 kHz, respectively.

Although the sound levels have not been measured directly for the sub-bottom profilers used by the *Ewing*, Burgess and Lawson (2000) measured sounds propagating more or less horizontally from a sub-bottom profiler similar to the L-DEO unit with similar source output (i.e., 205 dB re 1 microPa m). For that profiler, 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) respectively, assuming spherical spreading. Thus the received level for the L-DEO sub-bottom profiler would be expected to decrease to 160 and 180 dB about 160 m (525 ft) and 16 m (52 ft) below the transducer, respectively, assuming spherical spreading. Corresponding distances in the horizontal plane would be lower, given the directionality of this source (300 beamwidth) and the measurements of Burgess and Lawson (2000).

Characteristics of Airgun Pulses

Airguns function by venting high-pressure air into the water. The pressure signature of an individual airgun consists of a sharp rise and then fall in pressure, followed by several positive and negative pressure excursions caused by oscillation of the resulting air bubble. The resulting downward-directed pulse has a duration of only 10 to 20 ms, with only one strong positive and one strong negative peak pressure (Caldwell and Dragoset, 2000). Most energy emitted from airguns is at relatively low frequencies. For example, typical high-energy airgun arrays emit most energy at 10–120 Hz. However, the pulses contain some energy up to 500–1000 Hz and above (Goold and Fish, 1998).

The pulsed sounds associated with seismic exploration have higher peak levels than other industrial sounds to which whales and other marine mammals are routinely exposed. As mentioned previously, the pk-pk source levels of the 2 GI-gun array that will be used for the ETPO project are 231 dB re 1 microPa (peak) and 237 dB re 1 microPa (pk-pk). However, the effective source level for horizontal propagation will be lower and actual levels experienced by any marine mammal more than 1 m (3.3 ft) from either GI-gun will be significantly lower.

Several important factors need to be considered when assessing airgun impacts on the marine environment. (1) Airgun arrays produce intermittent sounds, involving emission of a strong sound pulse for a small fraction of a second followed by several seconds of near silence. In contrast, some other acoustic sources produce sounds with lower peak levels, but their sounds are continuous or discontinuous but continuing for much longer durations than seismic pulses. (2) Airgun arrays are designed to transmit strong sounds downward through the seafloor, and the amount of sound transmitted in near-horizontal directions is considerably reduced. Nonetheless, they also emit sounds that travel horizontally toward non-target areas. (3) An airgun array is a distributed source, not a point source. The nominal source level is an estimate of the sound that would be measured from a theoretical point source emitting the same total energy as the airgun array. That figure is useful in calculating the expected received levels in the far field (i.e., at moderate and long distances). Because the airgun array is not a single point source, there is no one location within the near field (or anywhere else) where the received level is as high as the nominal source level.

The strengths of airgun pulses can be measured in different ways, and it is important to know which method is being used when interpreting quoted source or received levels. Geophysicists usually quote pk-pk levels, in bar-meters or dB re 1 microPa-m. The peak level for the same pulse is typically about 6 dB less. In the biological literature, levels of received airgun pulses are often described based on the ''average'' or ''root-mean-square'' (rms) level over the duration of the pulse. The rms value for a given pulse is typically about 10 dB lower than the peak level, and 16 dB lower than the Pk-pk value (Greene, 1997; McCauley *et al.*, 1998; 2000). A fourth measure that is being used more frequently is the energy level, in dB re 1 microPa^2.s. Because the pulses are less than 1 sec in duration, the numerical value of the energy is lower than the rms pressure level, but the units are different. Because the level of a given pulse will differ substantially depending on which of these measures is being applied, it is important to be aware which measure is in use when interpreting any quoted pulse level. NMFS commonly references the rms levels when discussing levels of pulsed sounds that might harass marine mammals.

Seismic sound received at any given point will arrive via a direct path, indirect paths that include reflection from the sea surface and bottom, and often indirect paths including segments through the bottom sediments. Sounds propagating via indirect paths travel longer distances and often arrive later than sounds arriving via a direct path. These variations in travel time have the effect of lengthening the duration of the received pulse. At the source, seismic pulses are about 10 to 20 ms in duration. In comparison, the pulse as received at long horizontal distances can have a much longer duration.

Another important aspect of sound propagation is that received levels of low-frequency underwater sounds diminish close to the surface because of pressure-release and interference phenomena that occur at and near the surface (Urick, 1983, Richardson *et al.*, 1995). Paired measurements of received airgun sounds at depths of 3 m (9.8 ft) vs. 9 or 18 m (29.5 or 59 ft) have shown that received levels are typically several decibels lower at 3 m (9.8. ft)(Greene and Richardson, 1988). For a mammal whose auditory organs are within 0.5 or 1 m (1.6 or 3.3 ft) of the surface, the received level of the predominant low-frequency components of the airgun pulses would be further reduced.

Pulses of underwater sound from open-water seismic exploration are often detected 50 to 100 km (30 to 54 nm) from the source location (Greene and Richardson, 1988; Burgess and Greene, 1999). At those distances, the received levels on an approximate rms basis are low (below 120 dB re 1 microPa). However, faint seismic pulses are sometimes detectable at even greater ranges (e.g., Bowles *et al.*, 1994; Fox *et al.*, 2002). Considerably higher levels can occur at distances out to several kilometers from an operating airgun array. Additional information is contained in the L-DEO application, especially in Appendix A (see **ADDRESSES**).

Description of Habitat and Marine Mammals Affected by the Activity

A detailed description of the ETPO area and its associated marine mammals can be found in the L-DEO application and a number of documents referenced in the L-DEO application, and is not repeated here. Thirty-four species of cetaceans are known to occur in the ETPO, belonging to two taxonomic groups: odontocetes (sperm whale (*Physeter macrocephalus*), dwarf sperm whale (*Kogia sima*), pygmy sperm whale (*K. breviceps*), Cuvier's beaked whale (*Ziphius cavirostris*), Longman's beaked whale (Indopacetus pacificus), pygmy beaked whale (*Mesoplodon peruvianus*), gingko-toothed beaked whale (*M. ginkgodens*), Blainville's beaked whale (*M. densirostris*), rough-toothed dolphin (*Steno bredanensis*), bottlenose dolphin (*Tursiops truncatus*), pantropical spotted dolphin (*Stenella attenuata*), spinner dolphin (*S. longirostris*), striped dolphin (*S. coeruleoalba*), short-beaked common dolphin (*Delphinus delphis*), Fraser's dolphin (*Lagenodelphis hosei*), Risso's dolphin (*Grampus griseus*), melon-headed whale (*Peponocephala electra*), pygmy killer whale (*Feresa attenuata*), false killer whale (*Pseudorca crassidens*), killer whale (*Orcinus orca*), and short-finned pilot whale (*Globicephala macrorhynchus*)); and mysticetes humpback whale (*Megaptera* *novaeangliae*), minke whale (*Balaenoptera acutorostrata*), sei whale (*B. borealis*), fin whale (*B. physalus*), Bryde's whale (*B. edeni*), and blue whale (*B. musculus*). Of these 34 species, L-DEO states that 27 cetacean species are likely to occur in the proposed survey area. These 27 species are shown in Table 2 of this document and are described in L-DEO (2004)).

Seven cetacean species (Pacific white-sided dolphin (*Lagenorhynchus obliquidens*), Baird's beaked whale (*Berardius bairdii*), long-beaked common dolphin (*Delphinus capensis*), dusky dolphin (*Lagenorhynchus obscurus*), southern right whale dolphin (*Lissodelphis peronii*), Burmeister's porpoise (*Phocoena spinipinnis*), and long-finned pilot whale (*Globicephala melas*)) although present in the wider ETPO, are unlikely to be found in L-DEO's proposed survey area (L-DEO, 2004). These species are mentioned briefly in L-DEO's application, but are unlikely to be taken by incidental harassment and therefore are not analyzed further in this document.

Six species of pinnipeds are known to occur in the ETPO: Guadalupe fur seal (*Arctocephalus townsendi*), California sea lion (*Zalophus californianus*), Galapagos sea lion (*Z. wollebaeki*), Galapagos fur seal (*A. galapagoensis*), southern sea lion (*Otaria flavescens*), and South American fur seal (*A. australis*). The last four species could potentially occur within the proposed seismic survey area, but they are expected to be, at most, uncommon. Ranges of the first two species are substantially north of the proposed seismic survey area and, therefore, unlikely to be taken by incidental harassment.

More detailed information on these species is contained in the L-DEO application, which is available at: *http://www.nmfs.noaa.gov/prot__res/PR2/Small__Take/smalltake__info.htm#applications*.

Potential Effects on Marine Mammals

As outlined in several previous NMFS documents, the effects of noise on marine mammals are highly variable, and can be categorized as follows (based on Richardson *et al*., 1995):

(1) The noise may be too weak to be heard at the location of the animal (i.e., lower than the prevailing ambient noise level, the hearing threshold of the animal at relevant frequencies, or both);

(2) The noise may be audible but not strong enough to elicit any overt behavioral response;

(3) The noise may elicit reactions of variable conspicuousness and variable relevance to the well being of the marine mammal; these can range from temporary alert responses to active avoidance reactions such as vacating an area at least until the noise event ceases;

(4) Upon repeated exposure, a marine mammal may exhibit diminishing responsiveness (habituation), or disturbance effects may persist; the latter is most likely with sounds that are highly variable in characteristics, infrequent and unpredictable in occurrence, and associated with situations that a marine mammal perceives as a threat;

(5) Any anthropogenic noise that is strong enough to be heard has the potential to reduce (mask) the ability of a marine mammal to hear natural sounds at similar frequencies, including calls from conspecifics, and underwater environmental sounds such as surf noise;

(6) If mammals remain in an area because it is important for feeding, breeding or some other biologically important purpose even though there is chronic exposure to noise, it is possible that there could be noise-induced physiological stress; this might in turn have negative effects on the well-being or reproduction of the animals involved; and

(7) Very strong sounds have the potential to cause temporary or permanent reduction in hearing sensitivity. In terrestrial mammals, and presumably marine mammals, received sound levels must far exceed the animal's hearing threshold for there to be any temporary threshold shift (TTS) in its hearing ability. For transient sounds, the sound level necessary to cause TTS is inversely related to the duration of the sound. Received sound levels must be even higher for there to be risk of permanent hearing impairment. In addition, intense acoustic or explosive events may cause trauma to tissues associated with organs vital for hearing, sound production, respiration and other functions. This trauma may include minor to severe hemorrhage.

Effects of Seismic Surveys on Marine Mammals

The L-DEO application provides the following information on what is known about the effects on marine mammals of the types of seismic operations planned by L-DEO. The types of effects considered here are (1) tolerance, (2) masking of natural sounds, (2) behavioral disturbance, and (3) potential hearing impairment and other non-auditory physical effects (Richardson *et al*., 1995). Given the relatively small size of the airguns planned for the present project, its effects are anticipated to be considerably less than would be the case with a large array of airguns. L-DEO and NMFS believe it is very unlikely that there would be any cases of temporary or especially permanent hearing impairment, or non-auditory physical effects. Also, behavioral disturbance is expected to be limited to distances less than 823 m (2700 ft) in deep water and 2469 m (8100 ft) in shallow water, the zones calculated for 160 dB or the onset of Level B harassment. Additional discussion on species specific effects can be found in the L-DEO application.

Tolerance

Numerous studies (referenced in L-DEO, 2004) have shown that pulsed sounds from airguns are often readily detectable in the water at distances of many kilometers, but 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. However, most measurements of airgun sounds that have been reported concerned sounds from larger arrays of airguns, whose sounds would be detectable farther away than that planned for use in the proposed survey. 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 airgun source planned for use in this project, mammals are expected to tolerate being closer to this source than would be the case for a larger airgun source typical of most seismic surveys.

Masking

Masking effects of pulsed sounds on marine mammal calls and other natural sounds are expected to be limited (due in part to the small size of the GI airguns), although there are very few specific data on this. Given the small source planned for use in the ETPO, there is even less potential for masking of baleen or sperm whale calls during the present research than in most seismic surveys (L-DEO, 2004). Seismic sounds are short pulses generally occurring for less than 1 sec every 5 seconds or so. The 5–sec spacing corresponds to a shot interval of approximately 12.5 m (41 ft). Sounds from the multibeam sonar are very short pulses, occurring for 1–10 msec once every 1 to 15 sec, depending on water depth. (During operations in deep water, the duration of each pulse from the multibeam sonar as received at any one location would actually be only 1⁄5 or at most 2⁄5 of 1–10 msec, given the segmented nature of the pulses.)

Some whales are known to continue calling in the presence of seismic pulses. Their calls can be heard between the seismic pulses (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 continued calling in the presence of seismic pulses (Madsen *et al.*, 2002). Given the relatively small source planned for use during this survey, there is even less potential for masking of 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 airguns to be used in the ETPO. Also, the sounds important to small odontocetes are predominantly at much higher frequencies than are airgun sounds.

Most of the energy in the sound pulses emitted by airgun arrays is at low frequencies, with strongest spectrum levels below 200 Hz and considerably lower spectrum levels above 1000 Hz. These low frequencies are mainly used by mysticetes, but generally not by odontocetes or pinnipeds. An industrial sound source will reduce the effective communication or echolocation distance only if its frequency is close to that of the marine mammal signal. If little or no overlap occurs between the industrial noise and the frequencies used, as in the case of many marine mammals relative to airgun sounds, communication and echolocation are not expected to be disrupted. Furthermore, the discontinuous nature of seismic pulses makes significant masking effects unlikely even for mysticetes.

A few cetaceans are known to increase the source levels of their calls in the presence of elevated sound levels, or possibly to shift their peak frequencies in response to strong sound signals (Dahlheim, 1987; Au, 1993; Lesage *et al.*, 1999; Terhune, 1999; as reviewed in Richardson *et al.*, 1995). These studies involved exposure to other types of anthropogenic sounds, not seismic pulses, and it is not known whether these types of responses ever occur upon exposure to seismic sounds. If so, these adaptations, along with directional hearing, pre-adaptation to tolerate some masking by natural sounds (Richardson *et al.*, 1995) and the relatively low-power acoustic sources being used in this survey, would all reduce the importance of masking marine mammal vocalizations.

Disturbance by Seismic Surveys

Disturbance includes a variety of effects, including subtle changes in behavior, more conspicuous dramatic changes in activities, and displacement. However, there are difficulties in defining which marine mammals should be counted as ''taken by harassment''. For many species and situations, scientists do not have detailed information about their reactions to noise, including reactions to seismic (and sonar) pulses. Behavioral reactions of marine mammals to sound are difficult to predict. 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, the impacts of the change may not rise to the level of a disruption of a behavioral pattern. However, if a sound source would displace marine mammals from an important feeding or breeding area, such a disturbance would constitute Level B harassment under the MMPA. Given the many uncertainties in predicting the quantity and types of impacts of noise on marine mammals, scientists often resort to estimating how many mammals may be present within a particular distance of industrial activities or exposed to a particular level of industrial sound. With the possible exception of beaked whales, NMFS believes that this is a conservative approach and likely overestimates the numbers of marine mammals that are affected in some biologically important manner.

The sound exposure criteria used to estimate how many marine mammals might be harassed behaviorally by the seismic survey are based on behavioral observations during studies of several species. However, information is lacking for many species. Detailed information on potential disturbance effects on baleen whales, toothed whales, and pinnipeds can be found on pages 35–37 and Appendix A in L-DEO's ETPO 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 precautionarily sets impulsive sounds equal to or greater than 180 and 190 dB re 1 microPa (rms) as the exposure thresholds for onset of Level A harassment for cetaceans and pinnipeds, respectively (NMFS, 2000). Those criteria have been used in defining the safety (shut-down) radii for seismic surveys. 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 the L-DEO application and summarized here,

1. 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.
2. 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.
3. 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 3 105 in^3 GI-airguns, 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 even the mildest (and reversible) form of hearing impairment. Several aspects of the planned monitoring and mitigation measures for this project are designed to detect marine mammals occurring near the 3 GI-airguns (and multibeam bathymetric sonar), and to avoid exposing them to sound pulses that might (at least in theory) cause hearing impairment. In addition, research and monitoring studies on gray whales, bowhead whales and other cetacean species indicate that many cetaceans are likely to show some avoidance of the area with ongoing seismic operations. In these 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 in mammals close to a strong sound source 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, L-DEO and NMFS believe that it is especially unlikely that any of these non-auditory effects would occur during the proposed survey given the small size of the sources, the brief duration of exposure of any given mammal, and the planned mitigation and monitoring measures. The following paragraphs discuss the possibility of TTS, permanent threshold shift (PTS), and non-auditory physical effects.

TTS

TTS is the mildest form of hearing impairment that can occur during exposure to a strong sound (Kryter, 1985). When an animal experiences TTS, its 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. Richardson et al. (1995) note that the magnitude of TTS depends on the level and duration of noise exposure, among other considerations. For sound exposures at or somewhat above the TTS threshold, hearing sensitivity recovers rapidly after exposure to the noise ends. Little data on sound levels and durations necessary to elicit mild TTS have been obtained for marine mammals.

For toothed whales exposed to single short pulses, the TTS threshold appears to be, to a first approximation, a function of the energy content of the pulse (Finneran et al., 2002). Given the available data, the received level of a single seismic pulse might need to be on the order of 210 dB re 1 microPa rms (approx. 221 226 dB pk pk) in order to produce brief, mild TTS. Exposure to several seismic pulses at received levels near 200 205 dB (rms) might result in slight TTS in a small odontocete, assuming the TTS threshold is (to a first approximation) a function of the total received pulse energy (Finneran *et al.*, 2002). Seismic pulses with received levels of 200 205 dB or more are usually restricted to a zone of no more than 100 m (328 ft) around a seismic vessel operating a large array of airguns. Such sound levels would be limited to distances within a few meters of the small airguns planned for use during 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. However, TTS is not expected to occur during this survey given the small size of the source, and the strong likelihood that baleen whales would avoid the approaching airguns (or vessel) before being exposed to levels high enough for there to be any possibility of TTS.

TTS thresholds for pinnipeds exposed to brief pulses (single or multiple) have not been measured, although exposures up to 183 dB re 1 microPa (rms) have been shown to be insufficient to induce TTS in California sea lions (Finneran *et al.*, 2003). 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; Au *et al.*, 2000).

A marine mammal within a zone of less than 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. Also, around smaller arrays, such as the 3 GI-airgun array proposed for use during this survey, a marine mammal would need to be even closer to the source to be exposed to levels greater than or equal to 205 dB, at least in waters greater than 100 m (328 ft) deep. However, as noted previously, most cetacean species tend to avoid operating airguns, although not all individuals do so. In addition, ramping up airgun arrays, which is now standard operational protocol for L-DEO and other seismic operators, should allow cetaceans to move away from the seismic source and to avoid being exposed to the full acoustic output of the airgun array. It is unlikely that these cetaceans would be exposed to airgun pulses at a sufficiently high level for a sufficiently long period to cause more than mild TTS, given the relative movement of the vessel and the marine mammal. However, TTS would be more 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. During this project, the bow of the *Ewing* will be 107 m (351 ft) ahead of the airguns and the 205–dB zone would be less than 100 m (328 ft). Thus, TTS would not be expected in the case of odontocetes bow riding during airgun operations and if some cetaceans did incur TTS through exposure to airgun sounds, it would very likely be a temporary and reversible phenomenon.

Currently, NMFS believes that, to avoid Level A harassment, cetaceans should not be exposed to pulsed underwater noise at received levels exceeding 180 dB re 1 microPa (rms). The corresponding limit for pinnipeds has been set at 190 dB. The predicted 180- and 190–dB distances for the airgun arrays operated by L-DEO during this activity are summarized in Table 1 in this document. These sound levels are not considered to be the levels at or above which TTS might occur. Rather, they are the received levels above which, in the view of a panel of bioacoustics specialists convened by NMFS (at a time before TTS measurements for marine mammals started to become available), one could not be certain that there would be no injurious effects, auditory or otherwise, to marine mammals. As noted here, TTS data that are now available imply that, at least for dolphins, TTS is unlikely to occur unless the dolphins are exposed to airgun pulses substantially stronger than 180 dB re 1 microPa (rms).

It has also been shown that most whales tend to avoid ships and associated seismic operations. Thus, whales will likely not be exposed to such high levels of airgun sounds. Because of the slow ship speed, any whales close to the trackline could move away before the sounds become sufficiently strong for there to be any potential for hearing impairment. Therefore, there is little potential for whales being close enough to an array to experience TTS. In addition, as mentioned previously, ramping up the airgun array, which has become standard operational protocol for many seismic operators including L-DEO, should allow cetaceans to move away from the seismic source and to avoid being exposed to the full acoustic output of the GI airguns.

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. Although there is no specific evidence that exposure to pulses of airgun sounds can cause PTS in any marine mammals, even with the largest airgun arrays, physical damage to a mammal's hearing apparatus can potentially occur if it is exposed to sound impulses that have very high peak pressures, especially if they have very short rise times (time required for sound pulse to reach peak pressure from the baseline pressure). Such damage can result in a permanent decrease in functional sensitivity of the hearing system at some or all frequencies.

Single or occasional occurrences of mild TTS are not indicative of permanent auditory damage in terrestrial mammals. However, very prolonged exposure to sound strong enough to elicit TTS, or shorter-term exposure to sound levels well above the TTS threshold, can cause PTS, at least in terrestrial mammals (Kryter, 1985). Relationships between TTS and PTS thresholds have not been studied in marine mammals but are assumed to be similar to those in humans and other terrestrial mammals. The low-to-moderate levels of TTS that have been induced in captive odontocetes and pinnipeds during recent controlled studies of TTS have been confirmed to be temporary, with no measurable residual PTS (Kastak *et al.*, 1999; Schlundt et al., 2000; Finneran *et al.*, 2002; Nachtigall *et al.*, 2003). In terrestrial mammals, the received sound level from a single non-impulsive sound exposure must be far above the TTS threshold for any risk of permanent hearing damage (Kryter, 1994; Richardson et al., 1995). For impulse sounds with very rapid rise times (e.g., those associated with explosions or gunfire), a received level not greatly in excess of the TTS threshold may start to elicit PTS. Rise times for airgun pulses are rapid, but less rapid than for explosions.

Some factors that contribute to onset of PTS are as follows: (1) exposure to single very intense noises, (2) repetitive exposure to intense sounds that individually cause TTS but not PTS, and (3) recurrent ear infections or (in captive animals) exposure to certain drugs.

Cavanagh (2000) has reviewed the thresholds used to define TTS and PTS. Based on his review and SACLANT (1998), it is reasonable to assume that PTS might occur at a received sound level 20 dB or more above that which induces mild TTS. However, for PTS to occur at a received level only 20 dB above the TTS threshold, it is probable that the animal would have to be exposed to the strong sound for an extended period.

Sound impulse duration, peak amplitude, rise time, and number of pulses are the main factors thought to determine the onset and extent of PTS. Based on existing data, Ketten (1994) has noted that the criteria for differentiating the sound pressure levels that result in PTS (or TTS) are location and species-specific. PTS effects may also be influenced strongly by the health of the receiver's ear.

Given that marine mammals are unlikely to be exposed to received levels of seismic pulses that could cause TTS, it is highly unlikely that they would sustain permanent hearing impairment. If we assume that the TTS threshold for odontocetes for exposure to a series of seismic pulses may be on the order of 220 dB re 1 microPa (pk-pk) (approximately 204 dB re 1 microPa rms), then the PTS threshold might be about 240 dB re 1 microPa (pk-pk). In the units used by geophysicists, this is 10 bar-m. Such levels are found only in the immediate vicinity of the largest airguns (Richardson et al., 1995; Caldwell and Dragoset, 2000). However, it is very unlikely that an odontocete would remain within a few meters of a large airgun for sufficiently long to incur PTS. The TTS (and thus PTS) thresholds of baleen whales and pinnipeds may be lower, and thus may extend to a somewhat greater distance from the source. However, baleen whales generally avoid the immediate area around operating seismic vessels, so it is unlikely that a baleen whale could incur PTS from exposure to airgun pulses. Some pinnipeds do not show strong avoidance of operating airguns. In summary, it is highly unlikely that marine mammals could receive sounds strong enough (and over a sufficient period of time) to cause permanent hearing impairment during this project. In the proposed project marine mammals are unlikely to be exposed to received levels of seismic pulses strong enough to cause TTS, and because of the higher level of sound necessary to cause PTS, it is even less likely that PTS could occur. This is due to the fact that even levels immediately adjacent to the 3 GI-airguns may not be sufficient to induce PTS because the mammal would not be exposed to more than one strong pulse unless it swam alongside an airgun for a period of time.

Strandings and Mortality

Marine mammals close to underwater detonations of high explosives 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. While there is no documented evidence that airgun arrays can cause serious injury, death, or stranding, the association of mass strandings of beaked whales with naval exercises and, recently, an L-DEO seismic survey have raised the possibility that beaked whales may be especially susceptible to injury and/or stranding when exposed to strong pulsed sounds.

In March 2000, several beaked whales that had been exposed to repeated pulses from high intensity, mid-frequency military sonars stranded and died in the Providence Channels of the Bahamas Islands, and were subsequently found to have incurred cranial and ear damage (NOAA and USN, 2001). Based on post-mortem analyses, it was concluded that an acoustic event caused hemorrhages in and near the auditory region of some beaked whales. These hemorrhages occurred before death. They would not necessarily have caused death or permanent hearing damage, but could have compromised hearing and navigational ability (NOAA and USN, 2001). The researchers concluded that acoustic exposure caused this damage and triggered stranding, which resulted in overheating, cardiovascular collapse, and physiological shock that ultimately led to the death of the stranded beaked whales. During the event, five naval vessels used their AN/SQS–53C or -56 hull-mounted active sonars for a period of 16 hours. The sonars produced narrow (<100 Hz) bandwidth signals at center frequencies of 2.6 and 3.3 kHz (-53C), and 6.8 to 8.2 kHz (-56). The respective source levels were usually 235 and 223 dB re 1 μ Pa, but the -53C briefly operated at an unstated but substantially higher source level. The unusual bathymetry and constricted channel where the strandings occurred were conducive to channeling sound. This, and the extended operations by multiple sonars, apparently prevented escape of the animals to the open sea. In addition to the strandings, there are reports that beaked whales were no longer present in the Providence Channel region after the event, suggesting that other beaked whales either abandoned the area or perhaps died at sea (Balcomb and Claridge, 2001).

Other strandings of beaked whales associated with operation of military sonars have also been reported (e.g., Simmonds and Lopez-Jurado, 1991; Frantzis, 1998). In these cases, it was not determined whether there were noise-induced injuries to the ears or other organs. Another stranding of beaked whales (15 whales) happened on 24–25 September 2002 in the Canary Islands, where naval maneuvers were taking place. Jepson *et al.* (2003) concluded that cetaceans might be subject to decompression injury (the bends or air embolism) in some situations. If so, this might occur if the mammals ascend unusually quickly when exposed to aversive sounds. Previously, it was widely assumed that diving marine mammals are not subject to decompression injury.

It is important to note that seismic pulses and mid-frequency sonar pulses are quite different. Sounds produced by the types of airgun arrays used to profile sub-sea geological structures are broadband with most of the energy below 1 kHz. Typical military mid-frequency sonars operate at frequencies of 2 to 10 kHz, generally with a relatively narrow bandwidth at any one time (though the center frequency may change over time). Because seismic and sonar sounds have considerably different characteristics and duty cycles, 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 hearing damage and, indirectly, mortality suggests that caution is warranted when dealing with exposure of marine mammals to any high-intensity pulsed sound.

In addition to the sonar-related strandings, there was a September, 2002 stranding of two Cuvier's beaked whales in the Gulf of California (Mexico) when a seismic survey by the *Ewing* was underway in the general area (Malakoff, 2002). The airgun array in use during that project was the *Ewing's* 20–gun 8490–in^3 array. This might be a first indication that seismic surveys can have effects, at least on beaked whales, similar to the suspected effects of naval sonars. However, the evidence linking the Gulf of California strandings to the seismic surveys is inconclusive, and to date is not based on any physical evidence (Hogarth, 2002; Yoder, 2002). The ship was also operating its multi-beam bathymetric sonar at the same time but this sonar had much less potential than these naval sonars to affect beaked whales. Although the link between the Gulf of California strandings and the seismic (plus multi-beam sonar) survey is inconclusive, this plus the various incidents involving beaked whale strandings associated with naval exercises suggests a need for caution in conducting seismic surveys in areas occupied by beaked whales.

Non-auditory Physiological Effects

Possible types of non-auditory physiological effects or injuries that might theoretically occur in marine mammals exposed to strong underwater sound might include stress, neurological effects, bubble formation, resonance effects, and other types of organ or tissue damage. There is no evidence that any of these effects occur in marine mammals exposed to sound from airgun arrays. However, there have been no direct studies of the potential for airgun pulses to elicit any of these 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.

Long-term exposure to anthropogenic noise may have the potential to cause physiological stress that could affect the health of individual animals or their reproductive potential, which could theoretically cause effects at the population level (Gisner (ed.), 1999). However, there is essentially no information about the occurrence of noise-induced stress in marine mammals. Also, it is doubtful that any single marine mammal would be exposed to strong seismic sounds for sufficiently long that significant physiological stress would develop. This is particularly so in the case of the proposed L-DEO project where the airguns are small.

Gas-filled structures in marine animals have an inherent fundamental resonance frequency. If stimulated at this frequency, the ensuing resonance could cause damage to the animal. There may also be a possibility that high sound levels could cause bubble formation in the blood of diving mammals that in turn could cause an air embolism, tissue separation, and high, localized pressure in nervous tissue (Gisner (ed), 1999; Houser *et al.*, 2001). In 2002, NMFS held a workshop (Gentry (ed.) 2002) to discuss whether the stranding of beaked whales in the Bahamas in 2000 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. Among other reasons, the air spaces in marine mammals are too large to be susceptible to resonant frequencies emitted by mid- or low-frequency sonar; lung tissue damage has not been observed in any mass, multi-species stranding of beaked whales; and the duration of sonar pings is likely too short to induce vibrations that could damage tissues (Gentry (ed.), 2002). Opinions were less conclusive about the possible role of gas (nitrogen) bubble formation/growth in the Bahamas stranding of beaked whales. Workshop participants did not rule out the possibility that bubble formation/growth played a role in the stranding and participants acknowledged that more research is needed in this area. The only available information on acoustically-mediated bubble growth in marine mammals is modeling that assumes prolonged exposure to sound.

Until recently, it was assumed that diving marine mammals are not subject to the bends or air embolism. However, a 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. However, the interpretation that the effect was related to decompression injury is unproven (Piantadosi and Thalmann, 2004; Fernandez *et al.*, 2004). Even if that effect can occur during exposure to mid-frequency sonar, there is no evidence that this type of effect occurs in response to low-frequency airgun sounds. It is especially unlikely in the case of the proposed L-DEO survey which involves only three GI-guns.

In summary, little is known about the potential for seismic survey sounds to cause either auditory impairment or other non-auditory physical effects in marine mammals. Available data suggest that such effects, if they occur at all, would be limited to short distances from the sound source. However, the available data do not allow for meaningful quantitative predictions of the numbers (if any) of marine mammals that might be affected in these ways. Marine mammals that show behavioral avoidance of seismic vessels, including most baleen whales, some odontocetes, and some pinnipeds, are unlikely to incur auditory impairment or other physical effects. Also, the planned mitigation and monitoring measures are expected to minimize any possibility of serious injury, mortality or strandings.

Possible Effects of Mid-frequency Sonar Signals

A multi-beam bathymetric sonar (Atlas Hydrosweep DS–2 (15.5–kHz) and a sub-bottom profiler will be operated from the source vessel essentially continuously during the planned survey. Details about these sonars were provided previously in this document.

Navy sonars that have been linked to avoidance reactions and stranding of cetaceans generally (1) are more powerful than the Atlas Hydrosweep sonars, (2) have a longer pulse duration, and (3) are directed close to horizontally (vs. downward for the Atlas Hydrosweep). The area of possible influence for the *Ewing's* sonars is much smaller - a narrow band below the source vessel. For the Hydrosweep there is no horizontal propagation as these signals project at an angle of approximately 45 degrees from the ship. For the deep-water mode, under the ship the 160- and 180–dB zones are estimated to be 3200 m (10500 ft) and 610 m (2000 ft), respectively. However, the beam width of the Hydrosweep signal is only 2.67 degrees fore and aft of the vessel, meaning that a marine mammal diving could receive at most 1–2 signals from the Hydrosweep and a marine mammal on the surface would be unaffected. Marine mammals that do encounter the bathymetric sonars 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 and vessel speed. Therefore, as harassment or injury from pulsed sound is a function of total energy received, the actual harassment or injury threshold for the bathymetric sonar signals (approximately 10 ms) would be at a much higher dB level than that for longer duration pulses such as seismic signals. As a result, NMFS believes that marine mammals are unlikely to be harassed or injured from the multibeam sonar.

Masking by Mid-frequency Sonar Signals

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

For the sub-bottom profiler, marine mammal communications will not be masked appreciably because of their relatively low power output, low duty cycle, directionality (for the profiler), and the brief period when an individual mammal may be within the sonar's beam. In the case of most odonotocetes, the sonar signals from the profiler do not overlap with the predominant frequencies in their calls. In the case of mysticetes, the pulses from the pinger do not overlap with their predominant frequencies.

Behavioral Responses Resulting from Mid-Frequency Sonar Signals

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 strandings by beaked whales. Also, Navy personnel have described observations of dolphins bow-riding adjacent to bow-mounted mid-frequency sonars during sonar transmissions. However, all of these observations are of limited relevance to the present situation. Pulse durations from these sonars were much longer than those of the L-DEO multibeam sonar, and a given mammal would have received many pulses from the naval sonars. During L-DEO's operations, the individual pulses will be very short, and a given mammal would not receive many of the downward-directed pulses as the vessel passes by.

Captive bottlenose dolphins and a white whale exhibited changes in behavior when exposed to 1–sec pulsed sounds at frequencies similar to those that will be emitted by the multi-beam sonar used by L-DEO 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 these data to free-ranging odontocetes is uncertain and in any case the test sounds were quite different in either duration or bandwidth as compared to those from a bathymetric sonar.

L-DEO and NMFS are not aware of any data on the reactions of pinnipeds to sonar sounds at frequencies similar to those of the 15.5 kHz frequency of the *Ewing's* multibeam sonar. Based on observed pinniped responses to other types of pulsed sounds, and the likely brevity of exposure to the bathymetric sonar sounds, pinniped reactions are expected to be limited to startle or otherwise brief responses of no lasting consequences to the individual animals. The pulsed signals from the sub-bottom profiler are much weaker than those from the airgun array and the multibeam sonar. Therefore, significant behavioral responses are not expected.

Hearing Impairment and Other Physical Effects

Given recent stranding events that have been associated with the operation of naval sonar, there is much concern that sonar noise can cause serious impacts to marine mammals (for discussion see Effects of Seismic Surveys on Marine Mammals). However, the multi-beam sonars proposed for use by L-DEO are quite different than sonars used for navy operations. Pulse duration of the bathymetric sonars is very short relative to the naval sonars. Also, at any given location, an individual marine mammal would be in the beam of the multi-beam sonar for much less time given the generally downward orientation of the beam and its narrow fore-aft beam-width. (Navy sonars often use near-horizontally-directed sound.) These factors would all reduce the sound energy received from the multi-beam sonar rather drastically relative to that from the sonars used by the Navy. Therefore, hearing impairment by multi-beam bathymetric sonar is unlikely.

Source levels of the sub-bottom profiler are much lower than those of the airguns and the multi-beam sonar. Sound levels from a sub-bottom profiler similar to the one on the *Ewing* were estimated to decrease to 180 dB re 1 microPa (rms) at 8 m (26 ft) horizontally from the source (Burgess and Lawson, 2000), and at approximately 18 m downward from the source. Furthermore, received levels of pulsed sounds that are necessary to cause temporary or especially permanent hearing impairment in marine mammals appear to be higher than 180 dB (see earlier discussion). Thus, it is unlikely that the sub-bottom profiler produces pulse levels strong enough to 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.

Estimates of Take by Harassment for the ETPO Seismic Survey

Although information contained in this document indicates that injury to marine mammals from seismic sounds potentially occurs at sound pressure levels significantly higher than 180 and 190 dB, NMFS' current criteria for onset of Level A harassment of cetaceans and pinnipeds from impulse sound are, respectively, 180 and 190 re 1 microPa rms. The rms level of a seismic pulse is typically about 10 dB less than its peak level and about 16 dB less than its pk-pk level (Greene, 1997; McCauley *et al.*, 1998; 2000a). The criterion for Level B harassment onset is 160 dB.

Given the proposed mitigation (see Mitigation later in this document), all anticipated takes involve a temporary change in behavior that may constitute Level B harassment. The proposed mitigation measures will minimize or eliminate the possibility of Level A harassment or mortality. L-DEO has calculated the ''best estimates'' for the numbers of animals that could be taken by level B harassment during the proposed ETPO seismic survey using data on marine mammal density and abundance from marine mammal surveys in the region, and estimates of the size of the affected area, as shown in the predicted RMS radii table (see Table 1).

These estimates are based on a consideration of the number of marine mammals that might be exposed to sound levels greater than 160 dB, the criterion for the onset of Level B harassment, by operations with the 3 GI-gun array planned to be used for this project. The anticipated zone of influence of the multi-beam sonar is less than that for the airguns, so it is assumed that any marine mammals close enough to be affected by the multi-beam sonar would already be affected by the airguns. Therefore, no additional incidental takings are included for animals that might be affected by the multi-beam sonar.

Table 2 explains the corrected density estimates as well as the best estimate of the numbers of each species that would be exposed to seismic sounds greater than 160 dB. A detailed description on the methodology used by L-DEO to arrive at the estimates of Level B harassment takes that are provided in Table 2 can be found in L-DEO's IHA application for the ETPO survey.

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TABLE 2. Estimates of the possible numbers of marine mammal exposures to the different sound levels, and the numbers of different individuals that might be exposed, during L-DEO's proposed seismic survey in the ETPO off the coast of Central America in November-December 2004. The proposed sound source is a 3-GI gun configuration with a total volume of 315 in^3. Received levels of airgun sounds are expressed in dB re 1 μPa (rms, averaged over pulse duration). Species in italics are listed under the U.S. ESA as endangered. The column of numbers in boldface shows the numbers of "takes" for which authorization is requested.

Species	Number of Exposures to Sound Levels >160 dB		Number of Individuals Exposed to Sound Levels >160 dB			
			Best Estimate			
	Best Estimate[a]	Maximum Estimate[a]	Number	% of Regional Pop'n[c]	Maximum Estimate	Requested Take Authorization
Physeteridae						
Sperm whale	*51*	*82*	*33*	*0.1*	*54*	**82**
Pygmy sperm whale	0	0	0	NA[b]	0	**5**
Dwarf sperm whale	404	503	265	2.4	330	**503**
Ziphiidae						
Cuvier's beaked whale	117	133	77	0.4	87	**133**
Tropical bottlenose whale	0	0	0	NA	0	**5**
Pygmy beaked whale	0	0	0	NA	0	**14**
Blainville's beaked whale	0	0	0	NA	0	**14**
Mesoplodon sp. (unidentified)	23	28	15	0.1	18	
Delphinidae						
Rough-toothed dolphin	181	269	119	0.1	177	**269**
Bottlenose dolphin	1011	1782	663	0.3	1169	**1782**
Spotted dolphin	3349	5829	2196	0.1	3821	**5829**
Spinner dolphin	2439	6215	1599	0.1	4074	**6215**
Costa Rican spinner dolphin	280	2657	184	NA	1742	**1540**
Clymene dolphin	0	0	0	NA	0	**10**
Striped dolphin	3457	5819	2266	0.1	3815	**5819**
Short-beaked common dolphin	2816	4620	1846	0.1	3029	**4620**
Fraser's dolphin	0	0	0	NA	0	**10**
Risso's dolphin	219	391	144	0.1	256	**391**
Melon-headed whale	38	189	25	0.1	124	**189**
Pygmy killer whale	74	176	49	0.1	115	**176**
False killer whale	0	0	0	0.0	0	**5**
Killer whale	3	4	2	0.0	2	**5**
Short-finned pilot whale	307	533	201	0.1	350	**533**
Balaenopteridae						
Humpback whale	*0*	*0*	*0*	*NA*	*0*	**2**
Minke whale	0	0	0	NA	0	**2**
Bryde's whale	4	13	3	0.0	8	**13**
Sei whale	*0*	*0*	*0*	*NA*	*0*	**2**
Fin whale	*0*	*0*	*0*	*NA*	*0*	**2**
Blue whale	*4*	*11*	*3*	*0.2*	*7*	**11**
Pinnipeds						
South American fur seal	0	0	0	NA	0	**10**
Southern sea lion	0	0	0	NA	0	**10**
Galapagos fur seal	0	0	0	NA	0	**10**
Galapagos sea lion	0	0	0	NA	0	**10**

a Best estimate and maximum estimate of densities are from Table 3 in L-DEO, 2004.
b NA indicates that regional population estimates are not available.
c Regional populations are given in Table 2 in L-DEO, 2004.

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Conclusions

Effects on Cetaceans

Strong avoidance reactions by several species of mysticetes to seismic vessels have been observed at ranges up to 6–8 km (3.2–4.3 nm) and occasionally as far as 20–30 km (10.8–16.2 nm) from the source vessel. However, reactions at the longer distances appear to be atypical of most species and situations, particularly when feeding whales are involved. Few mysticetes are expected to be encountered during the proposed survey in the ETPO (Table 2) and disturbance effects would be confined to shorter distances given the low-energy acoustic source to be used during this project. In addition, the estimated numbers presented in Table 2 are considered overestimates of actual numbers that may be harassed.

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 as well as some other types of odontocetes sometimes show avoidance responses and/or other changes in behavior when near operating seismic vessels.

Taking into account the small size and the relatively low sound output of the 3 GI-guns to be used, and the mitigation measures that are planned, effects on cetaceans are generally expected to be limited to avoidance of a small 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 the affected populations.

Based on the 160–dB criterion, the best estimates of the numbers of individual cetaceans that may be exposed to sounds ≥ 160 dB re 1 microPa (rms) represent 0 to approximately 0.4 percent (except for approximately 2.4 percent for dwarf sperm whales) of the regional ETPO species populations (Table 2). L-DEO also estimates that approximately 0.1 percent of the estimated (corrected) regional ETPO population of approximately 26,053 sperm whales (Table 2) would be exposed to sounds ≥ 160 dB re 1 microPa (rms). In the case of endangered balaenopterids, it is most likely that no humpback, sei, or fin whales will be exposed to seismic sounds ≥ 160 dB re 1 microPa (rms), based on the reported (corrected) densities of those species in the survey region. However, L-DEO has requested an authorization to expose up to 2 individuals of each of those species to seismic sounds of ≥ 160 dB during the proposed survey given the possibility of encountering one or more groups. Best estimates of blue whales are 3 individuals that might be potentially exposed to seismic pulses with received levels ≥ 160 dB re 1 microPa (rms), representing approximately 0.2 percent of the estimated regional ETP population of approximately 1400 blue whales (Table 2).

Larger numbers of delphinids may be affected by the proposed seismic surveys, but the population sizes of species likely to occur in the survey area are large, and the numbers potentially affected are small relative to population sizes (Table 2). The best estimates of the numbers of individual delphinids that will potentially be exposed to sounds ≥ 160 dB re 1 microPa (rms) represent less than 0.1 percent of the approximately 10,000,000 dolphins estimated to occur in the ETPO, and less than 0.3 percent of the bottlenose dolphin population occurring there (Table 2).

Mitigation measures such as controlled speed, course alteration, observers, use of the PAM system, non-pursuit, ramp ups, and power downs or shut downs when marine mammals are seen within defined ranges should further reduce short-term reactions, and minimize any effects on hearing. In all cases, the effects are expected to be short-term, with no lasting biological consequence. In light of the type of take expected and the small percentages of affected stocks of cetaceans, the action is expected to have no more than a negligible impact on the affected species or stocks of cetaceans.

Effects on Pinnipeds

It is unlikely that any pinnipeds will be encountered during the proposed survey. However, to ensure that the L-DEO project remains in compliance with the MMPA in the event that a few pinnipeds are encountered, L-DEO has requested an authorization to expose up to 10 individuals of each of four pinniped species to seismic sounds with rms levels ≥ 160 dB re 1 μPa. If pinnipeds are encountered, they will be stray individuals outside of their normal range. The proposed survey would have, at most, a short-term effect on their behavior and no long-term impacts on individual pinnipeds or their populations. Responses of pinnipeds to acoustic disturbance are variable, but usually quite limited. Effects are expected to be limited to short-term and localized behavioral changes falling within the MMPA definition of Level B harassment. As is the case for cetaceans, the short-term exposures to sounds from the three GI-guns are not expected to result in any long-term consequences for the individuals or their populations and the activity is expected to have no more than a negligible impact on the affected species or stocks of pinnipeds.

Potential Effects on Habitat

The proposed seismic survey will not result in any permanent impact on habitats used by marine mammals, or to the food sources they utilize. The main impact issue associated with the proposed activity will be temporarily elevated noise levels and the associated direct effects on marine mammals.

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 result in any appreciable fish kill. Various experimental studies showed that airgun discharges cause 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 fish hearing, may occur at 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 from the source. Also, many of the fish that might otherwise be within the injury-zone are likely to be displaced from this region prior to the approach of the airguns through avoidance reactions to the passing seismic vessel or to the airgun sounds as received at distances beyond the injury radius.

Fish often react to sounds, especially strong and/or intermittent sounds of low frequency. Sound pulses at received levels of 160 dB re 1 μPa (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 airguns are likely to dive or exhibit some other kind of behavioral response. This 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 surveys 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 airguns (probably a small number) may be subject to auditory or other injuries.

Zooplankton that are very close to the source may react to the airgun's shock wave. These animals have an exoskeleton and no air sacs; therefore, little or no mortality is expected. Many crustaceans can make sounds and some crustacea 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 this type of reaction would probably occur only very close to the source, so few zooplankton concentrations would be affected. Impacts on zooplankton behavior are predicted to be negligible, and this would translate into negligible impacts on feeding mysticetes.

Potential Effects on Subsistence Use of Marine Mammals

There is no legal subsistence hunting for marine mammals in the ETPO off Central America, so the proposed L-DEO activities will not have any impact on the availability of these species or stocks for subsistence users.

Mitigation

For the proposed seismic survey in the ETPO off Central America, L-DEO will deploy 3 GI-airguns as an energy source, with a total discharge volume of 315 in^3. The energy from the airguns will be directed mostly downward. The directional nature of the airguns to be used in this project is an important mitigating factor. This directionality will result in reduced sound levels at any given horizontal distance as compared with the levels expected at that distance if the source were omnidirectional with the stated nominal source level. Also, the small size of these airguns is an inherent and important mitigation measure that will reduce the potential for effects relative to those that might occur with large airgun arrays. This measure is in conformance with NMFS encouraging seismic operators to use the lowest intensity airguns practical to accomplish research objectives.

The following mitigation measures, as well as marine mammal visual monitoring (discussed later in this document), will be implemented for the subject seismic surveys: (1) Speed and course alteration (provided that they do not compromise operational safety requirements); (2) power-down and shut-down procedures; (3) ramp-up procedures, and (4) use of passive acoustics to detect vocalizing marine mammals.

Speed and Course Alteration

If a marine mammal is detected outside its respective safety zone (180 dB for cetaceans, 190 dB for pinnipeds) and, based on its position and the relative motion, is likely to enter the safety zone, the vessel's speed and/or direct course may, when practical and safe, be changed in a manner that also minimizes the effect to the planned science objectives. The marine mammal activities and movements relative to the seismic vessel will be closely monitored to ensure that the marine mammal does not approach within the safety zone. If the mammal appears likely to enter the safety zone, further mitigative actions will be taken (i.e., either further course alterations or shut down of the airguns).

Power-down and Shut-down Procedures

A power down involves decreasing the number of airguns in use such that the radius of the 180–dB (or 190–dB) zone is decreased to the extent that marine mammals are not in the safety zone. During a power down, one GI-airgun will continue to be operated. The continued operation of one airgun is intended to alert marine mammals to the presence of the seismic vessel in the area. In contrast, a shut down occurs when all airgun activity is suspended.

If a marine mammal is detected outside the safety radius but is likely to enter the safety radius, and if the vessel's speed and/or course cannot be changed to avoid having the mammal enter the safety radius, the GI-guns will be powered down before the mammal is within the safety radius. Likewise, if a mammal is already within the safety zone when first detected, the airguns will be powered down immediately. During a power down, one GI-airgun (i.e., 105 in^3) will be operated. If a marine mammal is detected within or near the smaller safety radius around that single GI-gun (Table 1), all guns will be shut down.

Following a power down, airgun activity will not resume until the marine mammal has cleared the safety zone. The animal will be considered to have cleared the safety zone if it (1) is visually observed to have left the safety zone, or (2) has not been seen within the zone for 15 min in the case of small odontocetes and pinnipeds, or (3) has not been seen within the zone for 30 min in the case of mysticetes and large odontocetes, including sperm, pygmy sperm, dwarf sperm, and beaked whales.

During airgun operations following a power-down whose duration has exceeded these specified limits, the airgun array will be ramped-up gradually. Ramp-up is described later in this document.

During a power down, the operating GI-airgun will be shut down if a marine mammal approaches and is about to enter the modeled safety radius for the operating single GI gun. For a 105 in^3 GI gun, the predicted 180–dB distances applicable to cetaceans are 27–189 m (89–620 ft), depending on water depth, and the corresponding 190–dB radii applicable to pinnipeds are 10–150 m (33–492 ft), depending on depth (Table 1). Airgun activity will not resume until the marine mammal has cleared the safety radius, as described for power-down situations.

Ramp-up Procedure

When airgun operations commence after a specified period without airgun operations, the number of guns firing will be increased gradually, or ''ramped up'' (also described as a ''soft start''). The specified period of time for the GI-airguns varies depending on the speed of the source vessel. Under normal operational conditions (vessel speed 4.9 knots or 9 km/h), the *Ewing* would travel 574 m (1476 ft) in about 4 minutes. The 574–m distance is the calculated 180–dB safety radius for the three GI-gun array operating in shallow water. Thus, a ramp up would be required after a power down or shut down period lasting about 4 minutes or longer if the *Ewing* was traveling at 4.9 knots and was towing the three GI-airgun array. Ramp up will begin with one of the 105–in^3 GI guns. The other two GI-guns will be added at 5 min intervals. During ramp up, the safety radius for the full gun array will be maintained.

During the day, ramp-up cannot begin from a shut-down unless the entire 180–dB safety radius has been visible for at least 30 minutes prior to the ramp up (i.e., no ramp-up can begin in heavy fog or high sea states). However, ramp up may occur from a power down in heavy fog or high sea states, as long as at least one GI gun has been maintained during the interruption of seismic activity.

During nighttime operations, if the entire safety radius is visible using vessel lights and night-vision devices (NVDs) (as may be the case in deep and intermediate waters), then start up of the airguns from a shut down may occur. However, lights and NVDs will probably not be very effective as a basis for monitoring the larger safety radii around the three GI-guns operating in shallow water. It is proposed that, in shallow water, nighttime start ups of the airguns will not be authorized. However, ramp-up may occur from a power-down at night, as long as at least one GI-gun has been maintained during the interruption of the seismic signal. Also, if the airgun array has been operational before nightfall, it can remain operational throughout the night, even though the entire safety radius may not be visible.

Comments on past IHAs raised the issue of prohibiting nighttime operations as a practical mitigation measure. However, this is not practicable due to cost considerations and ship time schedules. The daily cost to the federal government to operate vessels such as *Ewing* is approximately $33,000-$35,000 /day (Ljunngren, pers. comm. May 28, 2003). If the vessels were prohibited from operating during nighttime, each trip could require an additional three to five days to complete, or up to $175,000 more, depending on average daylight at the time of work.

If a seismic survey vessel is limited to daylight seismic operations, efficiency would also be much reduced. Without commenting specifically on how that would affect the present project, for seismic operators in general, a daylight-only requirement would be expected to result in one or more of the following outcomes: cancellation of potentially valuable seismic surveys; reduction in the total number of seismic cruises annually due to longer cruise durations; a need for additional vessels to conduct the seismic operations; or work conducted by non-U.S. operators or non-U.S. vessels when in waters not subject to U.S. law.

Marine Mammal Monitoring

L-DEO must have at least three visual observers on board the *Ewing*, and at least two must be an experienced marine mammal observer that NMFS has approved in advance of the start of the ETPO cruise. These observers will be on duty in shifts of no longer than 4 hours.

The visual observers will monitor marine mammals and sea turtles near the seismic source vessel during all daytime airgun operations, during any nighttime start-ups of the airguns and at night, whenever daytime monitoring resulted in one or more shut-down situations due to marine mammal presence. During daylight, vessel-based observers will watch for marine mammals and sea turtles near the seismic vessel during periods with shooting (including ramp-ups), and for 30 minutes prior to the planned start of airgun operations after a shut-down.

Use of multiple observers will increase the likelihood that marine mammals near the source vessel are detected. L-DEO bridge personnel will also assist in detecting marine mammals and implementing mitigation requirements whenever possible (they will be given instruction on how to do so), especially during ongoing operations at night when the designated observers are on stand-by and not required to be on watch at all times.

The observer(s) will watch for marine mammals from the highest practical vantage point on the vessel, which is either the bridge or the flying bridge. On the bridge of the *Ewing*, the observer's eye level will be 11 m (36 ft) above sea level, allowing for good visibility within a 210 arc. If observers are stationed on the flying bridge, the eye level will be 14.4 m (47.2 ft) above sea level. The observer(s) will systematically scan the area around the vessel with Big Eyes binoculars, reticle binoculars (e.g., 7 X 50 Fujinon) and with the naked eye during the daytime. Laser range-finding binoculars (Leica L.F. 1200 laser rangefinder or equivalent) will be available to assist with distance estimation. The observers will be used to determine when a marine mammal or sea turtle is in or near the safety radii so that the required mitigation measures, such as course alteration and power-down or shut-down, can be implemented. If the GI-airguns are powered-down or shut down, observers will maintain watch to determine when the animal is outside the safety radius.

Observers will not be on duty during ongoing seismic operations at night; bridge personnel will watch for marine mammals during this time and will call for the airguns to be powered-down or shut-down if marine mammals are observed in or about to enter the safety radii. However, a biological observer must be on standby at night and available to assist the bridge watch if marine mammals are detected. If the airguns are ramped-up at night (see previous section), two marine mammal observers will monitor for marine mammals for 30 minutes prior to ramp-up and during the ramp-up using either deck lighting or NVDs that will be available (ITT F500 Series Generation 3 binocular image intensifier or equivalent).

Post-Survey Monitoring

In addition, the biological observers will be able to conduct monitoring of most recently-run transect lines as the *Ewing* returns along a parallel transect track. A final post-survey transect will be conducted by the *Ewing* as it retrieves the hydrophone array. This will provide the biological observers with opportunities to look for injured or dead marine mammals (although no injuries or mortalities are expected during this research cruise).

Passive Acoustic Monitoring (PAM)

L-DEO has agreed to use the PAM system whenever the *Ewing* is operating in waters deep enough for the PAM hydrophone array to be towed. Passive acoustic equipment was first used on the *Ewing* during the 2003 Sperm Whale Seismic Study conducted in the Gulf of Mexico and subsequently was evaluated by L-DEO to determine whether it was practical to incorporate it into future seismic research cruises. The SEAMAP system has been used successfully in L-DEO's SE Caribbean study (69 FR 24571, May 4, 2004). The SEAMAP PAM system has four hydrophones, which allow the SEAMAP system to derive the bearing toward the a vocalizing marine mammal. In order to operate the SEAMAP system, the marine mammal monitoring contingent onboard the *Ewing* will be increased by 2 additional biologists/acousticians who will monitor the SEAMAP system. Verification of acoustic contacts will then be attempted through visual observation by the marine mammal observers. However, the PAM system by itself usually does not determine the distance that the vocalizing mammal might be from the seismic vessel. It can be used as a cue by the visual observers as to the presence of an animal and to its approximate bearing (with some ambiguity). At this time, however, it is doubtful if PAM can be used as a trigger to initiate power-down of the array. NMFS encourages L-DEO to continue to study the relationship between a signal on a passive acoustic array and distance from the array can be determined with sufficient accuracy to be used for this purpose without complementary visual observations.

Taking into consideration the additional costs of prohibiting nighttime operations and the likely impact of the activity (including all mitigation and monitoring), NMFS has preliminarily determined that the proposed mitigation and monitoring ensures that the activity will have the least practicable impact on the affected species or stocks. Marine mammals will have sufficient notice of a vessel approaching with operating seismic airguns, thereby giving them an opportunity to avoid the approaching array; if ramp-up is required, two marine mammal observers will be required to monitor the safety radii using shipboard lighting or NVDs for at least 30 minutes before ramp-up begins and verify that no marine mammals are in or approaching the safety radii; ramp-up may not begin unless the entire safety radii are visible. Therefore as mentioned earlier, it is likely that the 3 GI-airgun array will not be ramped-up from a shut-down at night when in waters shallower than 100 m (328 ft).

Reporting

L-DEO will submit a report to NMFS within 90 days after the end of the cruise, which is currently predicted to occur during November and December, 2004. The report will describe the operations that were conducted and the marine mammals that were detected. The report must provide full documentation of methods, results, and interpretation pertaining to all monitoring tasks. The 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 (ESA)

Under section 7 of the ESA, the National Science Foundation (NSF), the agency funding L-DEO, has begun consultation on the 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.

National Environmental Policy Act (NEPA)

The NSF has prepared an EA for the ETPO oceanographic surveys. NMFS is reviewing this EA and will either adopt it or prepare its own NEPA document before making a determination on the issuance of an IHA. A copy of the NSF EA for this activity is available upon request (see ADDRESSES).

Preliminary Conclusions

NMFS has preliminarily determined that the impact of conducting the seismic survey in the ETPO off Central America 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 it 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 100 m (328 ft) of the vessel even in shallow water; 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.

While the number of potential incidental harassment takes will depend on the distribution and abundance of marine mammals in the vicinity of the survey activity, the number of potential harassment takings is estimated to be small. In addition, the proposed seismic program will not interfere with any legal subsistence hunts, since seismic operations will not take place in subsistence whaling and sealing areas and will not affect marine mammals used for subsistence purposes.

Proposed Authorization

NMFS proposes to issue an IHA to L-DEO for conducting a oceanographic seismic survey in the ETPO off Central America, 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.

Information Solicited

NMFS requests interested persons to submit comments and information concerning this request (see ADDRESSES).

Dated: September 24, 2004.

Laurie K. Allen,

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

[FR Doc. 04–21973 Filed 9–29–04; 8:45 am]

BILLING CODE 3510–22–S

COMMITTEE FOR THE IMPLEMENTATION OF TEXTILE AGREEMENTS

Adjustment of an Import Sublimit for Certain Man-Made Fiber Textile Products Produced or Manufactured in Belarus

September 28, 2004.

AGENCY: Committee for the Implementation of Textile Agreements (CITA).

ACTION: Issuing a directive to the Commissioner, Bureau of Customs and Border Protection adjusting a sublimit.

EFFECTIVE DATE: September 30, 2004.

FOR FURTHER INFORMATION CONTACT: Naomi Freeman, International Trade Specialist, Office of Textiles and Apparel, U.S. Department of Commerce, (202) 482–4212. For information on the quota status of this sublimit, refer to the Quota Status Reports posted on the bulletin boards of each Customs port, call (202) 927–5850, or refer to the Bureau of Customs and Border Protection website at http://www.cbp.gov. For information on embargoes and quota re-openings, refer to the Office of Textiles and Apparel website at http://otexa.ita.doc.gov.

SUPPLEMENTARY INFORMATION:

Authority: Section 204 of the Agricultural Act of 1956, as amended (7 U.S.C. 1854); Executive Order 11651 of March 3, 1972, as amended.

The current sublimit for Category 622-N is being adjusted for carryforward. The limit and sublimit for 622 and 622-L remain unchanged.

A description of the textile and apparel categories in terms of HTS numbers is available in the CORRELATION: Textile and Apparel Categories with the Harmonized Tariff Schedule of the United States (see **Federal Register** notice 69 FR 4926, published on February 2, 2004). Also see 68 FR 70494, published on