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Taking and Importing Marine Mammals; Taking Marine Mammals Incidental to the U.S. Navy Operations of Surveillance Towed Array Sensor System Low Frequency Active Sonar; Final Rule

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

50 CFR Part 216

[Docket No. 070703226–7461–02; I.D. 062206A]

RIN 0648–AT80

Taking and Importing Marine Mammals; Taking Marine Mammals Incidental to the U.S. Navy Operations of Surveillance Towed Array Sensor System Low Frequency Active Sonar

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

ACTION: Final rule.

SUMMARY: NMFS, upon application from the U.S. Navy, is issuing regulations to govern the unintentional taking of marine mammals incidental to Navy operation of the Surveillance Towed Array Sensor System Low Frequency Active (SURTASS LFA) Sonar. Issuance of regulations, and Letters of Authorization issued under these regulations, is required by the Marine Mammal Protection Act (MMPA) when the Secretary of Commerce (Secretary), after notice and opportunity for comment, finds, as here, that such takes will have a negligible impact on the affected species or stocks of marine mammals and will not have an unmitigable adverse impact on their availability for taking for subsistence uses. These regulations set forth the permissible methods of take and other means of effecting the least practicable adverse impact on the affected species or stocks of marine mammals and their habitat.

DATES: Effective from August 16, 2007, through August 15, 2012.

ADDRESSES: A copy of the application, containing a list of references used in this document, and other documents cited herein, may be obtained by writing to P. Michael Payne, Chief, Permits, Conservation and Education Division, Office of Protected Resources, National Marine Fisheries Service, 1315 East-West Highway, Silver Spring, MD 20910–3225, by telephoning one of the contacts listed under **FOR FURTHER INFORMATION CONTACT**, or at: *http://www.nmfs.noaa.gov/pr/permits/incidental.htm.*

A copy of the Navy's Final Supplemental Environmental Impact Statement (Final SEIS) and the Final Environmental Impact Statement (Final EIS) can be downloaded at: *http://www.surtass-lfa-eis.com.* Documents cited in this rule may also be viewed, by appointment, during regular business hours at this address.

FOR FURTHER INFORMATION CONTACT: Kenneth Hollingshead, NMFS, at 301–713–2289, ext 128.

SUPPLEMENTARY INFORMATION:

Background

Section 101(a)(5)(A) of the Marine Mammal Protection Act (16 U.S.C. 1361 *et seq.*) (MMPA) directs the Secretary of Commerce (Secretary) to allow, upon request, the incidental, but not intentional taking of marine mammals by U.S. citizens who engage in a military readiness activity if certain findings are made and regulations are issued.

The MMPA directs the Secretary to allow the requested incidental taking during periods of not more than 5 consecutive years each if the Secretary finds that the total taking will have a negligible impact on the affected species or stock(s), will not have an unmitigable adverse impact on the availability of the species or stock(s) for certain subsistence uses. The Secretary must also issue regulations setting forth the permissible methods of taking and other means of effecting the least practicable adverse impact, including a consideration of personnel safety, the practicality of implementation of any mitigation, and the impact on the effectiveness of the subject military readiness activity, and the requirements pertaining to the monitoring and reporting of such taking. These regulations do not themselves authorize the taking of marine mammals. NMFS authorizes the incidental take through ''letters of authorization'' (LOAs) (50 CFR 216.106). Prior to issuance of an LOA, NMFS conducts a review of the activity and its impact on marine mammals (via the required monitoring, reporting and research) to ensure that the MMPA findings continue to be valid.

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.'' For the purposes of ''military readiness activities'' harassment is defined as:

> (i) Any act that injures or has the significant potential to injure a marine mammal or marine mammal stock in the wild [Level A harassment]; or (ii) any act that disturbs or is likely to disturb a marine mammal or marine mammal stock in the wild by causing disruption of natural behavioral patterns, including, but not limited to, migration, surfacing, nursing, breeding, feeding, or sheltering, to a point where such behavioral patterns are abandoned or significantly altered [Level B harassment].

The term ''military readiness activity'' is defined in Public Law 107–314 (16 U.S.C. 703 note) to include all training and operations of the Armed Forces that relate to combat; and the adequate and realistic testing of military equipment, vehicles, weapons and sensors for proper operation and suitability for combat use. The term expressly does not include the routine operation of installation operating support functions, such as military offices, military exchanges, commissaries, water treatment facilities, storage facilities, schools, housing, motor pools, laundries, morale, welfare and recreation activities, shops, and mess halls; the operation of industrial activities; or the construction or demolition of facilities used for a military readiness activity.

Summary of Request

On May 12, 2006, NMFS received an application from the U.S. Navy requesting an authorization under section 101(a)(5)(A) of the MMPA for the taking of marine mammals by Level A and Level B harassment, incidental to deploying the SURTASS LFA sonar system for military readiness activities to include training, testing and routine military operations within the world's oceans (except for Arctic and Antarctic waters, coastal regions as specified in this rule, and offshore biologically important areas (OBIAs)) for a period of time not to exceed 5 years. According to the Navy's application, the Navy planned to operate the SURTASS LFA sonar system on a maximum of 4 ships in areas potentially including the Pacific, Atlantic, and Indian oceans and the Mediterranean Sea.

SURTASS LFA sonar provides the Navy with a reliable and dependable system for long-range detection of quieter, harder-to-find submarines. Low-frequency (LF) sound travels in seawater for greater distances than higher frequency sound used by most other active sonars. According to the Navy, the SURTASS LFA sonar system would meet the Navy's need for improved detection and tracking of new-generation submarines at a longer range. This would maximize the opportunity for U.S. armed forces to safely react to, and defend against, potential submarine threats while remaining a safe distance beyond a submarine's effective weapons range.

NMFS and the Navy have determined that the Navy's use of SURTASS LFA

sonar testing, training, and routine military operations constitute a military readiness activity because those activities constitute ''training and operations of the Armed Forces that relate to combat'' and constitute ''adequate and realistic testing of military equipment, vehicles, weapons and sensors for proper operation and suitability for combat use.''

NMFS' current regulations governing takings incidental to SURTASS LFA sonar activities and the current LOA extends through August 15, 2007.

On September 28, 2006 (71 FR 56965), NMFS published a Notice of Receipt of Application on the U.S. Navy application and invited interested persons to submit comments, information, and suggestions concerning the application and the structure and contents of regulations. These comments were considered in the development of the proposed and final rules.

Prior Litigation, Involving LFA Sonar

On August 7, 2002, the Natural Resources Defense Council, the U.S. Humane Society and four other plaintiffs filed suit against the Navy and NMFS over SURTASS LFA sonar use and permitting. The U.S. District Court for the Northern District of California (Court) issued its Opinion and Order on the parties' motions for summary judgment in the SURTASS LFA sonar litigation on August 26, 2003. The Court found deficiencies in Navy and NMFS compliance with the MMPA, Endangered Species Act (ESA), and National Environmental Policy Act (NEPA). The Court determined that an injunction was warranted but did not order a complete ban on the use of SURTASS LFA sonar. Specifically, the Court found that a total ban on the employment of SURTASS LFA sonar would interfere with the Navy's ability to ensure military readiness and to protect those serving in the military against the threat posed by hostile submarines. The Court directed the parties to meet and confer on the scope of a tailored permanent injunction, which would allow for continued operation of the system with additional mitigation measures. The parties entered into a Stipulation Regarding Permanent Injunction that allowed the Navy to operate SURTASS LFA sonar from both *R/V Cory Chouest* and USNS IMPECCABLE (T–AGOS 23) in stipulated portions of the Northwest Pacific/Philippine Sea, Sea of Japan, East China Sea, and South China Sea with certain year-round and seasonal restrictions. The Court entered the Stipulation as an Order on October 14, 2003. On July 7, 2005, following mediation by the parties, the Court amended the injunction at Navy's request to expand the potential areas of operation based on real-world contingencies. The Navy began work on an SEIS, in response to the Court's ruling on the motion for preliminary injunction. The Navy's Final SEIS, which was completed in April 2007, not only addresses, the concerns identified by the Court in its ruling on the merits of the parties' summary judgment motions, but it also provides additional information regarding the environment that could potentially be affected by the SURTASS LFA sonar systems, and additional information related to mitigation.

A detailed description of the operations is contained in the Navy's application (DON, 2006) and the Final SEIS (DON, 2007) which are available upon request (see **ADDRESSES**).

Description of the Activity

The SURTASS LFA sonar system is a long-range, LF sonar (between 100 and 500 Hertz (Hz)) that has both active and passive components. It does not have to rely on detection of noise generated by the target. The active component of the system is a set of up to 18 LF acoustic transmitting source elements (called projectors) suspended from a cable underneath a ship. The projectors are devices that transform electrical energy to mechanical energy by setting up vibrations, or pressure disturbances, with the water to produce the pulse or ping. The SURTASS LFA sonar acoustic transmission is an omnidirectional (full 360 degrees) beam in the horizontal. A narrow vertical beamwidth can be steered above or below the horizontal. The source level (SL) of an individual projector in the SURTASS LFA sonar array is approximately 215 decibels (dB), and because of the physics involved in beam forming and transmission loss processes, the array can never have a sound pressure level (SPL) higher than the SPL of an individual projector. The expected water depth at the center of the array is 400 ft (122 m) and the expected minimum water depth at which the SURTASS LFA sonar vessel will operate is 200 m (656.2 ft).

The typical SURTASS LFA sonar signal is not a constant tone, but rather a transmission of various signal types that vary in frequency and duration (including continuous wave (CW) and frequency-modulated (FM) signals). A complete sequence of sound transmissions is referred to by the Navy as a ''ping'' and can last as short as 6 seconds (sec) to as long as 100 sec, normally with no more than 10 sec at any single frequency. The time between pings is typically from 6 to 15 minutes. Average duty cycle (ratio of sound ''on'' time to total time) is less than 20 percent; however, the duty cycle, based on historical operating parameters, is normally 7.5 percent.

The passive, or listening, component of the system is SURTASS, which detects returning echoes from submerged objects, such as submarines, through the use of hydrophones. The hydrophones are mounted on a horizontal array that is towed behind the ship. The SURTASS LFA sonar ship maintains a minimum speed of 3.0 knots (5.6 km/hr; 3.4 mi/hr) in order to keep the array deployed.

Because of uncertainties in the world's political climate, a detailed account of future operating locations and conditions cannot be predicted. However, for analytical purposes, a nominal annual deployment schedule and operational concept have been developed, based on current LFA sonar operations since January 2003 and projected Fleet requirements. The Navy anticipates that a normal SURTASS LFA sonar deployment schedule for a single vessel would involve about 294 days/year at sea. A normal at-sea mission would occur over a 49-day period, with 40 days of operations and 9 days transit. Based on a 7.5-percent duty cycle, the system would actually be transmitting for a maximum of 72 hours per 49-day mission and 432 hours per year for each SURTASS LFA sonar system in operation. (In actuality however, the combined number of transmission hours for LFA sonar employed on both the *R/V Cory Chouest* and the USNS IMPECCABLE (TAGOS 23) did not exceed 174 hours annually between August 16, 2002, and August 15, 2006 (Table 4 in the Navy's Final Comprehensive Report (Navy, 2007)).

Annually, each vessel will be expected to spend approximately 54 days in transit and 240 days performing active operations. Between missions, an estimated 71 days will be spent in port for upkeep and repair. The nominal SURTASS LFA Sonar annual and 49-day deployment schedule for a single ship can be seen in Table 2–1 of the Final SEIS.

The two existing operational LFA sonar systems are installed on the SURTASS vessels: *R/V Cory Chouest* and USNS IMPECCABLE (T–AGOS 23). To meet future undersea warfare requirements, the Navy is working to develop and introduce a compact active system deployable from existing, smaller SURTASS Swath-P ships. This smaller system is known as Compact

LFA, or CLFA sonar. CLFA sonar consists of smaller, lighter-weight source elements than the current LFA sonar system, and will be compact enough to be installed on the existing SURTASS platforms, VICTORIOUS Class (T–AGOS 19) vessels. The Navy indicates that the operational characteristics of the compact system are comparable to the existing LFA sonar systems as presented in Subchapter 2.1 of the Final EIS and Final SEIS. Consequently, the potential impacts from CLFA sonar will be similar to the effects from the existing SURTASS LFA sonar systems. Three CLFA sonar systems are planned for installation on T–AGOS 20, 21, and 22. With the *R/V Cory Chouest* retiring in FY 2008, the Navy estimates that there will be two systems in operation in FY 2008 and FY 2009, 3 in FY 2010 and 4 systems in FY 2011 and FY 2012. At no point are there expected to be more than four systems in use, and thus this rule analyzes the impacts on marine mammals due to the deployment of up to three LFA sonar systems through FY 2010 and four systems in FY 2011 and FY 2012.

The SURTASS LFA sonar vessel will operate independently of, or in conjunction with, other naval air, surface or submarine assets. The vessel will generally travel in straight lines or racetrack patterns depending on the operational scenario.

Description of Acoustic Propagation

The following is a very basic and generic description of the propagation of LFA sonar signals in the ocean and is provided to facilitate understanding of this action. However, because the actual physics governing the propagation of SURTASS LFA sound signals is extremely complex and dependent on numerous in-situ environmental factors, the following is for illustrative purposes only.

In actual SURTASS LFA sonar operations, the crew of the SURTASS LFA sonar platform will measure oceanic conditions (such as sea water temperature and salinity versus depth) prior to and during transmissions and at least every 12 hours, but more frequently when meteorological or oceanographic conditions change. These technicians will then use U.S. Navy sonar propagation models to predict and/or update sound propagation characteristics. The short time periods between actual environmental observations and the subsequent model runs further enhance the accuracy of these predictions. Fundamentally, these models are used to determine what path the LF signal will take as it travels through the ocean and how strong the sound signal will be at given ranges along a particular transmission path.

Accurately determining the speed at which sound travels through the water is critical to predicting the path that sound will take. The speed of sound in seawater varies directly with depth, temperature, and salinity. Thus, an increase in depth or temperature or, to a lesser degree, salinity, will increase the speed of sound in seawater. However, the oceans are not homogeneous, and the contribution of each of these individual factors is extremely complex and interrelated. The physical characteristics that determine sound speed change with depth, and in the case of temperature and salinity, season, geographic location, and locally, with time of day. After accurately measuring these factors, mathematical formulas or models can be used to generate a plot of sound speed versus water depth. This type of plot is generally referred to as a sound speed profile (SSP).

Near the surface (variable within the top 1000 ft (305 m)), ocean near-surface water mixing results in a fairly constant temperature and salinity. Below the mixed layer, sea temperature drops rapidly in an area referred to as the thermocline. In this region, temperature influences the SSP, and speed decreases with depth because of the large decrease in temperature (sound speed decreases with decreasing temperature). Finally, beneath the thermocline, the temperature becomes fairly uniform and increasing pressure causes the SSP to increase with depth.

One way to envision sound traveling through the sea is to think of the sound as ''rays.'' As these rays travel through the sea, their direction of travel changes as a result of speed changes, bending, or refracting, toward areas of lower speed and away from areas of higher speed. Depending on environmental conditions, refraction can either be toward or away from the surface. Additionally, the rays can be reflected or absorbed when they encounter the surface or the bottom. For example, under certain environmental conditions, near-surface sound rays can repeatedly be refracted upward and reflected off the surface and thus become trapped in a duct.

Some of the more prevalent acoustic propagation paths in the ocean include: acoustic ducting; convergence zone (CZ); bottom interaction; and shallow-water propagation.

Acoustic Ducting

There are two types of acoustic ducting: surface ducts and sound channels.

Surface Ducts

As previously discussed, the top layer of the ocean is normally well mixed and has relatively constant temperature and salinity. Because of the effect of depth (pressure), surface layers exhibit a slightly positive sound speed gradient (that is, sound speed increases with depth). Thus, sound transmitted within this layer is refracted upward toward the surface. If sufficient energy is subsequently reflected downward from the surface, the sound can become ''trapped'' by a series of repeated upward refractions and downward reflections. Under these conditions, a surface duct, or surface channel, is said to exist. Sound trapped in a surface duct can travel for relatively long distances with its maximum range of propagation dependent on the specifics of the SSP, the frequency of the sound (e.g., there is a low-frequency cutoff dependent on the thickness of the duct), and the reflective characteristics of the surface. As a general rule, surface duct propagation will improve as the temperature uniformity and depth of the layer increase. For example, transmission is improved when cloudy, windy conditions create a well-mixed surface layer or in high-latitude midwinter conditions where the mixed layer extends to several hundred feet deep.

Sound Channels

Variation of sound speed, or velocity, with depth causes sound to travel in curved paths. A sound channel is a region in the water column where sound speed first decreases with depth to a minimum value, and then increases. Above the depth of minimum value, sound is refracted downward; below the depth of minimum value, sound is refracted upward. Thus, much of the sound starting in the channel is trapped, and any sound entering the channel from outside its boundaries is also trapped. This mode of propagation is called sound channel propagation. This propagation mode experiences the least transmission loss along the path, thus resulting in long-range transmission.

At low and middle latitudes, the deep sound channel axis varies from 1,970 to 3,940 ft (600 to 1,200 m) below the surface. It is deepest in the subtropics and comes to the surface in the high latitudes, where sound propagates in the surface layer. Because propagating sound waves do not interact with either the sea surface or seafloor, sound

propagation in sound channels does not attenuate as rapidly as bottom- or surface-interacting paths. The most common sound channels used by SURTASS LFA sonar are convergence zones (CZs).

Convergence Zones

CZs are special cases of the sound-channel effect. When the surface layer is narrow or when sound rays are refracted downward, regions are created at or near the ocean surface where sound rays are focused, resulting in elevated sound levels. The existence of CZs depends on the SSP and the depth of the water. Due to downward refraction at shorter ranges, sound rays leaving the near-surface region are refracted back to the surface because of the positive sound speed gradient produced by the greater pressure at deep ocean depths. These deep-refracted rays often become concentrated at or near the surface at some distance from the sound source through the combined effects of downward and upward refraction, thus causing a CZ. CZs may exist whenever the sound speed at the ocean bottom, or at a specific depth, exceeds the sound speed at the source depth. Depth excess, also called sound speed excess, is the difference between the bottom depth and the limiting, or critical depth.

CZs vary in range from approximately 18 to 36 nautical miles (nm) (33 to 67 km), depending upon the SSP. The width of the CZ is a result of complex interrelationships and cannot be correlated with any specific factor. In practice, however, the width of the CZ is usually on the order of 5 to 10 percent of the range. For optimum tactical performance, CZ propagation of SURTASS LFA sonar signals is desired and expected in deep open ocean conditions.

Bottom Interaction

Reflections from the ocean bottom and refraction within the bottom can extend propagation ranges. For mid- to high-level frequency sonars (greater than 1,000 Hz), only minimal energy enters into the bottom; thus reflection is the predominant mechanism for energy return. However, at low frequencies, such as those used by the SURTASS LFA sonar source, significant sound energy can penetrate the ocean floor, and refraction within the seafloor, not reflection, dominates the energy return. Regardless of the actual transmission mode (reflection from the bottom or refraction within the bottom), this interaction is generally referred to as ''bottom-bounce'' transmission.

Major factors affecting bottom-bounce transmission include the sound frequency, water depth, angle of incidence, bottom composition (e.g., sediments), and bottom roughness. A flat ocean bottom produces the greatest accuracy in estimating range and bearing in the bottom-bounce mode.

For SURTASS LFA sonar transmissions between 100 and 500 Hz, bottom interaction would generally occur in areas of the ocean where depths are between approximately 200 m (660 ft) (average minimum water depth for SURTASS LFA sonar deployment) and 2,000 m (6,600 ft).

Shallow Water Propagation

In shallow water, propagation is usually characterized by multiple reflection paths off the sea floor and sea surface. Thus, most of the water column tends to become ensonified by these overlapping reflection paths. As LFA sonar signals approach the shoreline, they will be affected by shoaling, experiencing high transmission losses through bottom and surface interactions. Therefore, LFA sonar would be less effective in shallow, coastal waters.

In summary, for the SURTASS LFA sonar signal in low- and mid-latitudes, the dominant propagation paths for LFA sonar signals are CZ and bottom interaction (at depths less than 2000 m (6,600 ft)). In high-latitudes, surface ducting provides the best propagation. In most open ocean water, CZ propagation will be most prominent. The SURTASS LFA sonar signals will interact with the bottom, but due to high bottom and surface losses, SURTASS LFA sonar signals will not penetrate coastal waters with appreciable signal strengths.

Comments and Responses

On September 28, 2006 (71 FR 56965), NMFS published a Notice of Receipt of Application on the U.S. Navy SURTASS LFA sonar MMPA application and invited interested persons to submit comments, information, and suggestions concerning the application and the structure and contents of regulations. Those comments were considered in the development of the proposed rule. A proposed rule for renewal of the regulations governing SURTASS LFA sonar MMPA authorization was published on July 9, 2007 (72 FR 37404) with a 15-day public comment period. During the two comment periods, comments were received from a large number of organizations and individuals. Those organizations include the Marine Mammal Commission (Commission), the Natural Resources Defense Council (NRDC), Earth Island Institute (EII), Acoustic Ecology Institute (AEI), Animal Welfare Society (AWI), Cetacean Society Institute (CSI), Seaflow, International Ocean Noise Coalition, Olympic Coast Alliance, Citizens Opposing Active Sonar Threats, Ocean Care, Gesselschaft zur Rettung der Delphine, SBOOHER, Ocean Conservation Research, Friends of the San Juans, World Society for the Protection of Animals. We have addressed all comments on the proposed rule. We also responded to comments that appear to be directed solely at the draft SEIS, although we did not address comments strictly related to non-marine mammal issues. See the Navy's Final SEIS, which NMFS has adopted under NEPA.

Activity Concerns

Comment 1: The U.S. Navy seeks a blanket exemption to do harm to all marine animals in 80 percent of the world oceans with only minor mitigation measures taken. Expanding the SURTASS program into 80 percent of the world's oceans would make the task of monitoring the impacts impossible. An LOA granted would not meet the ''negligible impact'' condition and would violate the ''unmitigable adverse impact'' constraints indicated in the MMPA LOA process.

Response: The Navy is not seeking a ''blanket exemption'' from the MMPA, but rather is requesting that NMFS issue regulations to govern the incidental take of marine mammals under Section 101(a)(5)(A) of the MMPA. Under these regulations the Navy must apply annually for a letter of authorization (LOA) that would exempt the taking of marine mammals incidental to the Navy's use of SURTASS LFA sonar from the MMPA's general moratorium on the taking of marine mammals for that year, as long as the sonar use was consistent with these regulations and the terms of the LOA. In its LOA application, the Navy must specify where it will operate SURTASS LFA sonar for that year and take authorization would be limited to that area. Under the regulations, the total area that would be available for SURTASS LFA sonar operations over the five-year period is about 70–75 percent of the world's oceans. This in no way equates to LFA sonar operations affecting even close to 70–75 percent of the world's ocean area at any given time. Each year, based on its projected operational needs, the Navy will identify for which particular geographic areas, out of the total available area, it is requesting take authorization through an LOA. The first authorization is for only two SURTASS LFA sonar vessels both operating in the Western Pacific Ocean. Eventually, the Navy plans to have 4 vessels in operation, but even if

all 4 vessels operated in 4 different oceans, the area ensonified would come nowhere close to 70–75 percent of the world's ocean area. Therefore, SURTASS LFA sonar sound will not simultaneously affect 70–75 percent of the world's oceans. In addition, NMFS has determined that incidental harassment takings by SURTASS LFA sonar operations during the effective time period (1 year) of any LOA issued to the Navy pursuant to these regulations must not exceed 12 percent of any marine mammal stock.

The sound pressure level (SPL) that is capable of potentially causing injury to an animal is within approximately 1 km (0.54 nm) of the ship. For the purposes of analyses using the Acoustic Integration Model (AIM) and the risk continuum, there is a 50 percent risk of significant change in a biologically important behavior for a marine mammal exposed to a received level (RL) of 165 dB RMS. The range from the SURTASS LFA sonar vessel for this received level, which could cause behavioral disruption but not injury, could extend to 25 to 65 km (13.5 to 35.1 nm). The received level at the surface along any straight path away from the ship would not decline logarithmically over distance, as would be expected if the sound spread by spherical spreading alone. The reason is that, for CZ propagation, the sound moves in an undulating path with turning points near the surface and near the bottom, where sound is refracted either downward (near surface) or upward (near bottom). Turning points near the surface, termed caustics, occur approximately every 30 nm (56 km). The received level at the surface would be high at the caustics but low in between them because most of the sound energy there would be found at great depth. While the regulations permit the Navy to seek authorization through an LOA to take marine mammals while operating SURTASS LFA sonar in many of the world's oceans and SURTASS LFA sonar signal can be detected at several hundred miles using sophisticated listening gear, SURTASS LFA sonar's potential to cause injury or affect behavior is limited to relatively close to the ship. Thus, the impact of SURTASS LFA sonar is not global in scope. Moreover, monitoring to ensure that marine mammals are not injured is not impossible, as the commenter suggests, given the limited area around the vessel that is ensonified at decibel levels up to 180 dB, and the demonstrated effectiveness of the Navy's tripartite (visual, acoustic, and HF/M3) monitoring scheme.

Since the SURTASS LFA sonar will not operate in Arctic waters, there will not be an unmitigable adverse impact on relevant subsistence uses of marine mammals. That determination is provided later in this document. NMFS also believes the negligible impact standard has been met, as described in this final rule.

Comment 2: The Navy is proposing to expand the use of LFA sonar, both through expansion of use areas geographically throughout the world's oceans and through doubling the number of LFA sonar array ships. The Navy is also admitting to the use of CLFA sonar in ''shallow littoral ocean regions'' and do not discuss the characteristics of CLFA sonar in the Final SEIS.

Response: While the number of SURTASS LFA sonar vessels will increase from 2 to 4 vessels over the course of the five-year rule, the Navy is not increasing the number of SURTASS LFA sonar systems beyond what was analyzed in the January 2001 Final EIS. That document analyzed the potential impacts of up to four SURTASS LFA sonar systems. As stated in the Navy's Record of Decision (ROD) (67 FR 48145, July 23, 2002), the Navy determined that only two of the four systems would be operational during the timeframe of the 2002–2007 regulations governing the taking of marine mammals incidental to LFA sonar testing and training. For that reason, NMFS addressed taking marine mammals incidental to operation of only two systems under the initial five year Final Rule in 2002. Installation and deployment of the third and fourth LFA sonar systems were postponed until after FY 2007. Because of this delay, the decision in the Navy Record of Decision (ROD) and NMFS' MMPA determinations covered the employment of only two SURTASS LFA sonar systems. Therefore, the use of SURTASS LFA sonar, analyzed here, does not exceed the originally analyzed four systems during the timeframe of the requested second five year set of MMPA regulations.

In addition, the Navy's proposal to deploy SURTASS LFA sonar in a number of oceans is not new. The Navy's Final EIS proposed, and NMFS original Final Rule and regulations addressed, deployment of SURTASS LFA sonar throughout most of the world's oceans. As stated in the Final SEIS, these systems will be employed as required for security operations in the oceanic areas as presented in Figure 1–1 of the Final EIS. Potential operations could occur in the Pacific, Atlantic, and Indian Oceans, and the Mediterranean Sea. Large oceanic areas are restricted from operations, including the Arctic and Antarctic Ocean areas, as are all offshore areas within 12 nm (22 km) of land, and OBIAs (Table 2–4 of the SEIS). The limitation of SURTASS LFA operation to the Western Pacific Ocean was a product of the parties' negotiations over the Stipulated Permanent Injunction.

Nevertheless, while the number of systems may increase under this Final Rule and the Navy may seek authorization to use SURTASS LFA sonar in more places than it could under the terms of the permanent injunction, the maximum permissible impact to any particular species or stock remains the same, since the Navy's overall use of SURTASS LFA sonar can have no more than a negligible impact on marine mammal species and stocks. Consistent with its findings in the original rule, NMFS has determined that takings by SURTASS LFA sonar operations during the effective time period (1 year) of any LOA issued to the Navy pursuant to these regulations must not exceed 12 percent of any marine mammal stock.

As stated in the Final SEIS Subchapter 1.2.3 and 2.1, compact LFA sonar (CLFA sonar) sonar is an upgrade and modification to the SURTASS LFA sonar system necessary to install and operate on the smaller VICTORIOUS Class T–AGOS 19 Class ocean surveillance ships. The operational characteristics of the active system components installed, or to be installed, on the *R/V Cory Chouest,* USNS IMPECCABLE, and VICTORIOUS Class vessels are provided in Final SEIS Subchapter 2.1.1. The characteristics of LFA sonar and the upgrade and modifications for the T–AGOS 19 installations are essentially the same. The frequency requirements for the CLFA to be installed onboard the VICTORIOUS Class (T–AGOS 19 Class) vessels are within the 100 to 500 Hz range for LFA sonar and the transmit array also consists of 18 transducers with a similar source level.

Subchapter 1.1.3 of the Final SEIS provides a definition of the term ''littoral'' as used by the U.S. Navy and explains the ways in which the use of the term as a tactical designation differs from its use as a geographic term. The littoral operating environment does not necessarily include or exclude any waters because of depth; it can include both deep and shallow water. However, under any of the alternatives analyzed in the Final SEIS, LFA sonar would not operate inside of 12 nm (22 km) from any coastline. The use of SURTASS LFA sonar in coastal environments was discussed in Response to Comments (RTCs) 1–1.4 and 3–2.8 in the Final EIS.

Comment 3: With regard to noise-producing activities, NMFS must describe source levels, frequency ranges, duty cycles, and other technical parameters relevant to determining the potential impacts of an MMPA authorization.

Response: The NMFS action is the issuance of regulations and LOAs to the Navy for taking marine mammals incidental to SURTASS LFA sonar operations and determining whether SURTASS LFA sonar is having a negligible impact on affected marine mammal species and stocks, not whether LFA sonar operations and other noise producing activities are having a negligible impact on affected species and stocks of marine mammals (and species/stocks not affected by LFA sonar, but potentially by other noise-producing activities). In that regard, all technical parameters relevant to the impact analysis, including those listed by the commenter, were provided in the project descriptions for SURTASS LFA sonar in both the Final EIS (DON, 2001) Subchapters 2.1.1 and 2.3.2.2 and in RTCs 2–1.1 and 2–1.2a; and in the Final SEIS Subchapter 2.1.1.

Comment 4: There are at least five Navy SWATH vessels already built and outfitted with operational LFA sonars.

Response: Four VICTORIOUS class Ocean Surveillance ships were built between 1991 and 1993. As stated in the SEIS Subchapter 2.1, there are no LFA sonar systems deployed on these vessels at this time. The projected LFA sonar/CLFA sonar system availabilities are shown in the Final SEIS Figure 2–2, which includes future installations onboard the VICTORIOUS Class vessels.

Comment 5: It is only a matter of time before many other industrialized nations follow suit and the oceans become a cacophony of LFA sonar systems using loud noise to try and find each other in an increasingly loud environment. The U.S. should re-examine this ''need'' and come up with a better way to find these quiet submarines.

Response: This comment is beyond the scope of this rulemaking. As explained in the Final EIS, subchapter 1.2.1, the Navy has considered other alternatives and determined that SURTASS LFA sonar best addresses its need for reliable long-range detection of potentially hostile quiet submarines.

Comment 6: At peak power, the Navy's LFA sonar system sends out pulses of sound underwater at least the equivalent of standing five feet away from the Saturn rocket on liftoff.

Response: While an accurate source level of the Saturn V is not known, the comparison of this, or any other rocket, to LFA sonar is inappropriate. The sound generated by a Saturn V rocket, or any rocket in general, is broadband and generates a different frequency spectrum than that of LFA sonar, and travels in a significantly different transmission pattern. The Saturn C 1 rocket (a predecessor to the Saturn I rocket, which had about 1,600,000 lbs of thrust) was projected to have produced acoustic levels as high as 205 dB (in air) from a distance of 305 meters. Some sources suggest that the sound levels produced by the Saturn V (during the launch of Apollo 15, the first stage of the Saturn V generated 7,823,000 lbs of liftoff thrust) may have been as high as 220 dB (in air) (Benson and Faherty, 1978). As sound is perceived differently underwater than it is in air, sound propagation and transmission losses in each case are subject to differing factors, including terrain, wind, and air temperature, and in the case of LFA, water salinity, temperature and depth. Furthermore, sound levels are typically provided with a reference level, which depends on whether the sound is in air (reference of 20 microPascals) or water (reference of 1 microPascal). Despite it being inappropriate to compare a sound level in air with that in water (or vice versa), some simplified conversion or correction factors are available to provide a very generic comparison. Therefore, when corrected to the equivalent sound levels in water (based on pressure and impedance differences of the two media), the above acoustic levels of 205 dB in air and 220 dB in air would be approximately 266.5 and 281.5 dB in water, respectively (Please see Final EIS Appendix B, Subchapter B.3.2). These sound levels are 100 to 10,000 times louder than the LFA sonar source.

Comment 7: NMFS should require that the U.S. Navy avoid or eliminate triangulation of sonar whether they are doing exercises with other U.S. Navy ships or with those from other nations.

Response: Triangulation is only necessary for passive acoustics. Triangulation is not necessary for active acoustics because it gives the operator range and bearing. However, the focus of the comment seems to be on the use of multiple LFA sonar ships, which is discussed in the Final SEIS, (Subchapters 4.4.4 and 4.6.1.2) and in the Final EIS (Subchapter 4.2.7.4). The Final EIS states that the vast majority of operations will involve only one ship. This is due to the limited number of ships of SURTASS LFA sonar systems planned to be built and the limited operational conditions that could warrant the use of two sources in proximity to each other. The remote possibility exists that operational requirements or training exercises could require two sources simultaneously in one geographic region, for example the Northwest Pacific Ocean where LFA sonar vessels have been operating. The effect of the presence of two sources transmitting in one area can be conservatively approximated by doubling the single source potential effects provided for that site. An example of these effects can be seen in Table 4–2.13 of the Final EIS. However, even if more than one source operates in a single geographic area, impacts to marine mammals remain capped by the negligible impact requirement. To ensure that SURTASS LFA sonar operations have no more than a negligible impact over five years, not more than 12 percent of any marine mammal stock may be taken, by harassment, in a single year, regardless of how many SURTASS LFA sonar sources are operating in the area.

Comment 8: There are plenty of safe alternatives to active sonar that the Navy could pursue, such as passive sonar, non-acoustic sensors, and Integrated Sensory Networks.

Response: The comment is beyond the scope of NMFS' rulemaking for this action. Non-acoustic alternative underwater detection technologies are discussed in the Final EIS, Subchapter 1.2.1.

MMPA Concerns

Comment 9: NMFS should consolidate all necessary and relevant information from the multiple existing sources of information describing the proposed actions in the proposed rule.

Response: NMFS does not consider it necessary to consolidate all necessary and relevant information on LFA sonar and its impacts on marine mammals into the proposed and/or final rules. In the proposed and final rules, NMFS has continued and updated the information contained in the preamble to the 2002 final rule. NMFS believes that this information provides the necessary level of detail needed for it to make the determinations required under the MMPA and for the public to review this information. This document also reflects the findings of the Final EIS, with the data and findings of the Final SEIS. These documents and others, which are available on the Navy SURTASS LFA sonar homepage (see ADDRESSES) provide the ''consolidated information'' that the commenter requested.

Comment 10: The Commission states that any regulations proposing to issue an incidental taking authorization should include information on specified geographic locations where sonar is

expected to be deployed and the species and number of marine mammals that may be taken in each of those locations.

Response: While the NDAA removed references to the specified geographical region and small numbers requirements for military readiness activities, NMFS still needs to know where activities would take place and the estimated level of take to inform its negligible impact determination. In order to do so, NMFS considered ''worst-case'' estimates for purposes of the negligible impact determination as well as an annual 12 percent per-stock ''cap'' for marine mammals regardless of where and when LFA sonar will be operating (or even how many LFA sonar systems are in operation annually). This rulemaking also considered the oceans and areas where LFA sonar may and may not operate. The rule does not specify the specific location where LFA sonar will be deployed and the number of marine mammals that may be taken in those locations because these are determined annually through various inputs such as mission duration and season of operation [which are calculated in the annual applications for LOAs].

Comment 11: The Commission recommends the existing annual review process for LOAs should be expanded to include public review and comment. The NRDC believes issuance of LOAs without notice and comment violates MMPA section 101(a)(5)(A) because, it says, each year's authorization will involve new take and negligible impact analyses and potentially new exercise areas that are not modeled in the Navy's SEIS.

Response: NMFS does not agree. Under section 101(a)(5)(A), notice and opportunity for public comment must be afforded before the Secretary authorizes the incidental take of marine mammals, makes a negligible impact determination, and issues the required regulations. NMFS published the proposed regulations on July 9, 2007 (72 FR 37404), providing the required notice and opportunity for public comment. That proposed rule contained NMFS' negligible impact determination for the five-year period and proposed mitigation, monitoring, and reporting requirements. It also considered the Navy's estimates of take for the five-year rule period. Section 101(a)(5)(A) of the MMPA does not require the regulations to specify the number of marine mammals that may be taken, only the permissible methods of taking and means of effecting the least practicable adverse impact.

As stated in the proposed rule and the Navy's Final EIS, estimates were derived based on modeling sites, since it was not practical to model all areas where the system might be operated. Final EIS p. 4.2–1. These sites represented the upper bound of impacts expected from operation of SURTASS LFA sonar. Final EIS p. 4.2–3; see Final EIS tables 4.2–1, 4.2–4, 4.2–10, 4.2–11, and 4.2–12. If LFA sonar operations occur in a non-modeled area, the take estimates would most likely be less than those obtained from the most similar site that was modeled. Final EIS p. 4.2–3. As stated in the SEIS, the assumptions of the Final EIS are still valid and have been incorporated by reference into the SEIS p. 4–39, 40. Moreover there are no new data that contradict the assumptions or conclusions made in subchapter 4.2 of the FEIS. Thus, it was not necessary to reanalyze potential acoustic impacts in the SEIS.

The risk assessment for each planned mission site for each vessel is performed annually and is part of the Navy's annual mission intention (LOA application) letter. In its annual LOA applications, the Navy must project where it intends to operate during the period of the annual LOAs and provide NMFS with reasonable and realistic risk estimates of the marine mammal stocks in the proposed areas of operations. This process utilizes the best available data and is detailed in the SEIS including a case study. SEIS pp. 4–37 to 4–51. During the initial steps of the risk analysis process, if the take estimates exceed those required under the regulations (including the annual 12 percent per-stock cap), than the mission areas are changed or refined and the analysis is reinitiated. After receipt of an LOA application, NMFS reviews the activity (and previous annual reports) to ensure it remains within the parameters of the rule and the negligible impact assessment.

NMFS' general implementing regulations for section 101(a)(5)(A) of the MMPA, which have been in effect since 1982 and which governed the last rulemaking for SURTASS LFA sonar incidental take, set up the framework under which NMFS issues LOAs that an applicant must obtain before any incidental take is authorized. 50 CFR 216.106(a). The purpose of the requirement for obtaining LOAs is to ensure the authorized taking will be consistent with the original findings. See 47 FR 21248, 21251 (May 18, 1982). Therefore, issuance of an LOA is based on a determination that the level of taking will be consistent with the findings made for the total taking allowable under the specific regulations for the specified activity. 50 CFR 216.106(b). The reporting requirements under these specific SURTASS LFA sonar regulations and LOAs require the Navy to provide both quarterly and annual reports to NMFS. In these reports, the Navy must provide estimated percentages of marine mammal species/stocks potentially affected for each quarter and annually. NMFS' general implementing regulations do not require the agency to provide notice and comment for LOAs. However, if NMFS were to obtain information that calls into question the validity of its determinations in this rule, the agency could withdraw or suspend authorization to take marine mammals if the Secretary, through the Assistant Administrator for Fisheries, finds, after notice and opportunity for public comment, that the regulations are not being substantially complied with, or the taking allowed pursuant to the regulations is having or may have more than a negligible impact on marine mammal species or stocks. 50 CFR 216.106(e). The requirement for notice and comment does not apply if an emergency exists that poses a significant risk to the wellbeing of the species or stocks of marine mammals concerned. 50 CFR 216.106(f).

Comment 12: The Commission states that NMFS should address the requirement of the NDAA that personnel safety, practicality of implementation, and impact on the effectiveness of the military readiness activity be considered in making a ''least practicable adverse impact'' determination in the proposed rulemaking.

Response: NMFS agrees with the Commission and added a discussion of the NDAA in the proposed and final rules.

Comment 13: The NRDC states the Navy fails to present evidence of negligible impact. Agencies must make every attempt to obtain and disclose data necessary to their analysis. This is important when the program's impacts depend on newly emerging data. The Navy fails to take account of significant new information that has emerged since January 2001 concerning marine mammal thresholds of injury, hearing loss, and significant behavioral change.

Response: NMFS believes the MMPA requires a determination of negligible impact to be based on the best available data. NMFS believes the best available data were used in the Final SEIS, NMFS' 2002 final rule, the Navy 2006 MMPA application and this final rule, to estimate the potential impacts on the environment. Information that the commenter (and others) believe

contradict this determination by NMFS is addressed throughout this document.

Comment 14: A number of commenters were of the opinion that a 15-day comment period for the proposed rule is too short to review the material and not in compliance with the Administrative Procedure Act (APA).

Response: The 15-day comment period on the proposed rule provided an adquate opportunity for public comment. In addition to the comment period on the proposed rule, members of the public had a 30-day public comment period on the Navy's application for renewal of NMFS' regulations (71 FR 56965, September 28, 2006) and a 92-day public comment period (including three public hearings) for the Navy's Draft SEIS on SURTASS LFA sonar (which contains much of the underlying analysis for this proposed rule, affording significant opportunity for public participation). In addition, the proposed rule is substantially similar to the 2002–2007 rule, which underwent a 75-day public comment period, including public hearings in Los Angeles, CA, Honolulu, HI, and Silver Spring, MD. There have been no significant scientific advancements or other developments since the previous rule that would necessitate a longer period for public comment.

Comment 15: It is well-established that mid-frequency (MF) sonar negatively impacts marine mammals, even resulting in fatalities, with the U.S. Navy having admitted direct responsibility for past beachings. The effects of LF sonar appear to be less understood at this time, but the enormous range of ocean impacted by sonar makes it incumbent upon us to fully understand its effects before authorizing its widescale use. The Precautionary Principle should be applied before issuing a permit.

Response: NMFS used conservative assumptions for identifying and analyzing potential impacts to the environment, including marine mammals. SURTASS LFA sonar has been operating under NMFS regulations for the last five years without any reports of Level A harassment. The evidence to date, including recent scientific reports, supports the conclusion that operation of the U.S. Navy's LFA sonar does not result in marine mammal strandings. For further information on strandings and MF sonar, please see comments 8, 32, 33, 47, and 49 for further analyses on strandings.

Comment 16: I request a moratorium on any use of this technology in the oceans, at the levels currently used, until further tests are conducted on the foundational species in the food chain of the marine environment.

Response: Research using LFA sonar technology has been conducted on several species in the food chain, including whales (blue, fin, grey, and humpback whales) and on fish (catfish, a hearing specialist, and trout; reference species for salmon and a hearing generalist). This research is discussed later in this document (see Research Concerns). NMFS believes the data are sufficient to go forward, recognizing that more research would be valuable.

Marine Mammal Impact Concerns

Comment 17: The NRDC states that the Navy sets its threshold for hearing loss or ''threshold shift'' at 180 dB re: 1 microPa (RMS) for a single 100-second ''ping'' of exposure. The analysis is based on data from humans and other terrestrial mammals and relies on a limited set of data on marine mammals. The Navy has established a sliding scale for behavioral impacts. The Final SEIS fails to incorporate several recent studies on the effects of low-frequency sound on various marine mammal species. Also, the Navy's standard fails to take proper account of chronic impacts, from behavioral changes as well as from certain non-auditory physiological impacts such as stress. The Final SEIS and MMPA application disregard recent evidence indicated the potential for masking to interfere with long-distance mating behavior in mysticetes. The Navy standard is out of step with how the potential for behavioral impacts has been assessed in other contexts. Last, the Navy does not consider the impact that behavioral changes in species such as fish may have on marine mammals foraging.

Response: NMFS believes that the latest information on impacts of underwater sounds on marine mammals and fish is contained in the Navy's Draft and Final SEIS, and summarized in the Navy's application. NMFS addresses the masking issue in comment 19 and elsewhere in this document.

As stated in the Final EIS, the 180-dB criterion for the purpose of SURTASS LFA sonar analysis is that all marine animals exposed to received levels (RLs) greater than 180-dB rms are evaluated as if they are injured. In its 2002 Final Rule for SURTASS LFA sonar, NMFS stated that temporary threshold shift (TTS) is not an injury. Since the boundary line between TTS and permanent threshold shift (PTS) is neither clear, definitive, nor predictable for marine mammals, NMFS has adopted (as a conservative estimate) 20 dB of TTS to define the onset of PTS (i.e., a temporary shift of 20 dB in hearing threshold) (67 FR 46711, July 16, 2002). As noted in Schlundt *et al.* (2000), bottlenose dolphins and belugas exposed to 1-sec signals at 400 Hz did not exhibit TTS after exposures to maximum RLs of 193-dB sound exposure level (SEL)) (which would be equivalent to a received level of 193 dB re: 1 microPascal (RMS) since the duration is 1-sec). The point must be made that while dolphins and belugas responses at 400 Hz are valid for those species, these results probably do not generalize to large whales (e.g., baleen whales).

In the Schlundt *et al.* (2000) research, dolphins and belugas did not have TTS in response to 400 Hz at RLs of 193 dB SEL, but they did have TTS in response to higher frequencies (where they are more sensitive) at the same level. It is reasonable to assume that the TTS threshold value from odontocetes at their frequency of highest sensitivity is applicable to larger animals and lower frequencies that are in the range of their best hearing sensitivity. This extrapolation is based on the fundamental similarity of cochlear structure between odontocetes and mysticetes. As a result, if it were assumed that 193 dB SEL was the onset of TTS (a conservative assumption because TTS was not observed at an RL of 193 dB SEL), then onset of PTS would be 20 dB above that, at 213 dB RL (SEL). This number is based on a signal of one second in duration. Using a 10 Log (T/Ti) where Ti is 1 second, then for a maximum 100-sec LFA sonar signal, a 20-dB adjustment must be made, meaning that the onset of PTS would be 193 dB RL (SEL). This value is above the conservative LFA sonar criterion of 180 dB for injury. A more detailed discussion is provided in the Final EIS RTCs 4–6.13 and 4–6.38 and the 2002 Final Rule RTCs MMIC8, MMIC9, SIC40, SIC58, and SIC59.

In addition, recent data on critical ratios (CRs) in pinnipeds is discussed in the Final SEIS Subchapter 4.3.5. A CR is the difference between sound level for a barely audible tone and the spectrum level of background noise at nearby frequencies (Richardson *et al.*, 1995). These data indicate that the CRs for pinnipeds are lower in magnitude than for terrestrial animals (Southall *et al.* 2003). Southall *et al.* (2003), in describing their CR results, state that ''It is reasonable to speculate that acoustic signal production and reception in typically noisy marine environments have led to selection for enhanced ability to detect signals in noise.'' Therefore these new CR data indicate that pinnipeds may be pre-adapted for detecting biologically important signals in high noise environments.

Furthermore, the lower critical bandwidths of the pinniped auditory filters has the effect of decreasing the probability of masking of signals by noise at a different frequency (Southall *et al.*, 2000). Nevertheless, NMFS believes pinnipeds remain as susceptible as any species to masking of signals by noise in the same frequency band.

The Final SEIS also considered recent studies on LF sound and injury. In regard to injury, the issue of resonance is addressed in the Final SEIS (RTC 2.5.2). The analysis by the Navy (Cudahy and Ellison, 2002), reports on two workshops on acoustic impacts (DOC, 2002: Cox, *et al.* 2006), and the National Research Council (NRC) Ocean Studies Board (NRC, 2003) support the conclusion that resonance from LFA sonar operations is not a ''reasonably foreseeable'' impact. Cox *et al.* (2006) stated that gas-bubble disease, induced in supersaturated tissues by a behavioral response to acoustic exposure, is a plausible pathologic mechanism for the morbidity and mortality seen in cetaceans associated with MF sonar exposure. They also stated that it is premature to judge acoustically mediated bubble growth as a potential mechanism and recommended further studies to investigate the possibility.

The NRC Report (2003) discusses acoustically-induced stress in marine mammals. The NRC stated that sounds resulting from one-time exposure are less likely to have population-level effects than sounds that animals are exposed to repeatedly over extended periods of time. The NRC also cited controlled laboratory investigations of the response of cetaceans to noise that have shown cardiac responses (Miksis *et al.*, 2001 IN: NRC, 2003) but have not shown any evidence of physiological effects in the blood chemistry parameters measured. Beluga whales exposed for 30 minutes to 134–153 dB received level (RL) playbacks of noise with a synthesized spectrum matching that of a semisubmersible oil platform (Thomas *et al.*, 1990b IN: NRC, 2003) showed no short-term behavioral responses and no changes in standard blood chemistry parameters or in catecholamines. Preliminary results from exposure of a beluga whale and bottlenose dolphin to a seismic watergun with peak pressure of 226 dB source level (SL) showed no changes in catecholamines, neuroendocrine hormones, serum chemistries, lymphoid cell subsets, or immune function (Romano *et al.*, 2001 IN: NRC, 2003).

The NRC Report (2003) also stated that although techniques are being developed to identify indicators of stress in natural populations, determining the contribution of noise exposure to those stress indicators will be very difficult, but important, to pursue in the future when the techniques are fully refined. There are scientific data gaps regarding the potential for LFA sonar to cause stress in marine animals. Even though an animal's exposure to LFA sonar may be more than one time, the intermittent nature of the LFA sonar signal, its low duty cycle, and the fact that both the vessel and animal are moving, means that there is a very small chance that LFA sonar exposure for individual animals and stocks would be repeated over extended periods of time, such as those caused by shipping noise. There is sufficient information available to permit analysis and decision making. Therefore, impacts from stress are not a reasonably foreseeable significant adverse impact on marine mammals from exposure to LFA sonar.

In studying potential alerting stimuli for North Atlantic right whales, Nowacek *et al.* (2003) found that underwater sounds with an acoustic structure similar to their alert stimulus at RLs of 133–148 dB are likely to disrupt feeding behavior for the duration of the sound exposure, with return to normal behavior within minutes of when the sound was turned off. Their results are consistent with those of the LFS Scientific Research Program (SRP), which exposed baleen whales to RLs ranging from 120 to 155 dB, detecting only minor, short-term behavioral responses (please see Final EIS, Subchapter 4.2.4.3 for more information). The LFA sonar risk function is based on the LFS SRP results.

Concern that the LFA sonar signal may cause right whales to surface and thus be more vulnerable to ship strikes is not well founded because the vessels only move at about 5.6 km/hr (3 knots) (significantly lower than normal ship speeds) and LFA sonar mitigation measures will detect any large whales well before they enter the LFA sonar zone, at which time LFA sonar operations would be suspended.

Comment 18: A number of incidents of whales becoming stranded and dying have occurred around the world linked with the use of very loud military sonars. To date, none of the many incidents involve LFA sonar, although (1) LFA sonar has not been used in close proximity to whale populations and (2) the Navy continues to deny that any military sonar impacts marine life. EII believes LFA sonar may have more lethal impact over longer distances due to the nature of low frequency sound transmission underwater. The Draft SEIS claims that the association between marine mammal stranding events and military sonar is an issue of ''public perception'' and specifically that ''[a]lthough much of the public have the impression that military sonar usage is a principle cause of marine mammal strandings, the facts that are available indicate otherwise.'' While this might be true for mass stranding events of a non-anthropogenic origin, it is a grossly misleading statement. The Navy ignores the scientific record.

Response: Data indicate that the area in which LFA sonar has been operating (Northwestern Pacific Ocean) has relatively abundant populations of marine mammals, as presented in the SEIS as shown in Tables 4.4–2 to 4.4–10. During the LFS SRP in 1997 and 1998, LFA sonar sources were operated in proximity to marine mammals with only minor behavioral effects. As detailed in SEIS RTC 4.3.1 and later in this document, LFA sonar is not known to have caused any marine mammal strandings or injuries.

The ''public perception'' referred to in the Draft SEIS (p. 4–55) was one that views LFA sonar the same as any other sonar. The intent of the statement was that there is a public perception that the effects of LFA sonar are the same as any other naval, or loud, sonars. As noted in the discussion in the Final SEIS RTC 4.3.1, the potential for impacts from LFA sonar differs from that of mid-frequency active sonar. The best available scientific evidence to date does not indicate that LFA sonar has the potential to cause strandings based on analyses of existing strandings (ICES, 2005; Cox *et al.*, 2006). This paragraph was rewritten in the Final SEIS based on the latest available scientific data (see SEIS RTC 4.4.13).

Comment 19: Given the relatively long duration of SURTASS LFA sonar ''pings'' masking may be more of an issue than it is with impulsive noise sources. While the average signal length is 60 seconds—which is a very long time—for an extremely loud noise each can be up to 90 seconds long and can occur as often as every six minutes. This also does not take into account reverberation which can significantly increase the duty cycles and could result in a near continuous signal. Even temporary masking can be significant as it can compromise an animal's ability to avoid predators, communicate, track and catch food, and avoid dangerous environments such as areas of high intensity noise.

Response: The masking effects of the SURTASS LFA sonar signal are expected to be limited for a number of

reasons. First, the frequency range (bandwidth) of the system is limited to about 30 Hz, and the instantaneous bandwidth at any given time of the signal is small, on the order of 10 Hz. Second, the average duty cycle is always less than 20 percent and based on past LFA sonar operational parameters (2003 to 2007) is nominally 7.5 to 10 percent, as stated in Chapter 2 of the Final SEIS. Also, given the average maximum pulse length (60 seconds), and the fact that the signals vary and do not remain at a single frequency for more than 10 seconds, SURTASS LFA sonar is not likely to cause significant masking. An analysis of marine mammal hearing and masking are in Subchapter 4.6.1.2 of the Final SEIS. In other words, the LFA sonar transmissions are coherent, narrow bandwidth signals of 6 to 100 seconds in length followed by a quiet period of 6 to 15 minutes. Therefore, the effect of masking will be limited because animals that use this frequency range typically use broader bandwidth signals. As a result, the chances of an LFA sonar sound actually overlapping whale calls at levels that would interfere with their detection and recognition would be extremely low.

It is also unlikely that reverberation will significantly increase the duty cycles and result in a continuous signal. As a general rule, reverberation ''dies off'' or decreases with distance from the source as an exponent of time after sound transmission. However, this is not instantaneous and, depending on propagation and ocean boundary conditions, reverberation can linger in an area for seconds or minutes after a sound transmission, but at greatly reduced SPLs until it fades into background noise. In special cases (i.e., locations with the correct bathymetry, propagation conditions and signal repetition rates), the reverberation may not completely die off before the next transmission. Generally, however, the reverberation levels several seconds after transmission are so much less than the original signal, (i.e., approaching ambient noise levels) that they do not ''add to the duty cycle.'' LFA sonar signals have sufficient time to significantly decrease to levels much less than 120 dB in the vicinity of the source, prior to the transmission of the next signal. Additionally, reverberation away from the source's location starts at an even lower level than near the source and generally decreases faster than in proximity of the source, so it is always less than near the source (see Final SEIS comment 4.3.39).

Comment 20: The Draft SEIS sets a threshold SPL of 145 dB for diving and recreational sites, which is an attempt to be precautionary to humans. This is over 1,000 times less intense than the threshold set for marine mammals. It is irrational to assume that marine mammals are less sensitive to sound in water than humans are. It would make far better sense to adopt a 145 dB as the threshold for all animals, including humans. Human exposure guidelines ''were established based on psychological aversion testing,'' exposure limits for cetaceans are based on avoiding only physiological injury (TTS) or the most dramatic behavioral responses. What basis justifies providing more protection to humans engaging in recreational diving than to native inhabitants of the sea?

Response: These values represent different criteria: psychological aversion (a behavioral reaction) from direct measurements using human divers (Technical Report #3 of the Final EIS), and the exposure level at or above an RL of 180 dB, for which all marine mammals are evaluated as if they are injured (Final EIS Subchapter 1.4). However, humans are performing in a foreign medium compared to marine mammals. This suggests that the risk to marine mammals for a psychological response would be less than for humans. Furthermore, data cited in the Final EIS suggest that when operating in the presence of a biological imperative such as feeding, migrating or mating, such sound levels are insufficient to make the marine mammal discontinue their behavior (Technical Report #1 LFS SRP). Behavioral responses for marine mammals utilizing the risk continuum (see Final EIS Subchapter 4.2.3) demonstrate the potential for significant biologically important behavioral reactions from RLs from 120 to 179 dB, but with fewer significant behavioral responses at levels around 145 dB. Therefore, NMFS believes the 145-dB criterion for divers is consistent with the estimates of behavioral reactions to marine mammals, but at this time, it is unnecessary to consider this SPL as being warranted for marine mammals since the LFS SRP indicated that there were no significant behavioral reactions at these low levels and no indication that marine mammals might be seriously injured or killed by LFA sonar.

Comment 21: The Draft SEIS minimizes impacts by emphasizing the small number of SURTASS LFA sonar systems to be employed and the narrow bandwidth of the active sonar signal. It is the intensity and pervasiveness of the SURTASS LFA sonar systems that is important in the discussion of impacts. The fact that there is more than one system merely compounds the problem. To declare that the low number and narrow bandwidth are mitigation measures is ludicrous.

Response: Even though the source level of SURTASS LFA sonar is similar in intensity to many anthropogenic underwater sound sources, such as air gun arrays and other military sonars, there are significant differences in their operational characteristics. Table 1 illustrates these differences. Also, please see the Final SEIS RTC 4.3.1 for more information.

In a recent analysis for the Policy on Sound and Marine Mammals: An International Workshop sponsored by the Marine Mammal Commission (U.S.) and the Joint Nature Conservation Committee (UK) in 2004, Dr. John Hildebrand provided a comparison of anthropogenic underwater sound sources by their annual energy output. Dr. Hildebrand reported that the most energetic regularly operated sound sources are seismic air gun arrays from approximately 90 vessels with typically 12 to 48 individual guns per array, firing about every 10 seconds. There are approximately 11,000 super tankers worldwide, each operating 300 days per year, producing constant LF noise at source levels of 198 dB (SEL) (Hildebrand, 2005). Conversely, LFA sonar signals are transmitted for a maximum of 432 hours (18 days) per vessel per year. The signal length is between 6 to 100 seconds with 6 to 15 minutes between transmissions with individual elements source levels of 215 dB. Therefore, LFA sonar contributes less acoustic energy to the oceans than other sources. For more detailed discussions on Hildebrand's (2004) analysis, please see SEIS RTCs 4.6.4 and 4.6.5.

Even though LFA sonar signals are long range, LFA sonar cannot be considered to be pervasive (pervasive means to permeate or be present throughout) because of the nominal 7.5 to 10 percent duty cycle, meaning that during any given mission LFA sonar is not transmitting 90 to 92.5 percent of the time. Moreover, impacts to marine mammals species and stocks must remain negligible and, in that regard, taking by behavioral harassment may not exceed 12 percent of a marine mammal stock in any given year.

Comment 22: Throughout the document, the Draft SEIS claims that impacts will be negligible because there is no contradictory data. The absence of evidence does not equate to evidence of absence. In the absence of data, precaution should prevail.

Response: The absence of evidence regarding effects of these actions on marine mammals does not mean we can assume they have not occurred, and will

not occur in the future. However, we are not relying solely on absence of evidence. The agencies used the best information currently available to analyze the impacts to marine mammals as shown in this document and in more detail in Chapter 4.0 of the Final SEIS. Some of the new information used by NMFS to make its determinations under the MMPA are discussed and summarized in this **Federal Register** notice. That evidence includes a 5-year track record of using SURTASS LFA in an area rich in marine life without incident. In addition, NMFS requires the Navy to conduct mitigation and monitoring, including research to further clarify impacts on marine mammals from LFA sonar.

Comment 23: Throughout the Draft SEIS, the Navy states that the SURTASS LFA sonar ships move in two dimensions, whereas marine animals move in three dimensions. It uses this logic to state that the amount of time that an animal would be in the sonar transit beam is very low. A ship does move in two dimensions, so if ship strikes were the only concern, then this rationale would work. However, sound propagates in three dimensions so the logic is flawed.

Response: The Navy has clarified the intent of this statement in the Final SEIS. The statement now reads: ''[A] Slowly moving ship, coupled with low system duty cycle, would mean that fish and sea turtles would spend less time in the LFA sonar mitigation zone (180 dB sound field); therefore, with a ship speed of less than 5 knots, the potential for animals being in the sonar transmit beam during the estimated 7.5 to 10 percent of the time the sonar is actually transmitting is very low.''

Comment 24: In its discussion of acoustic impacts, the Draft SEIS is flawed because it centers its entire analysis on a questionable premise, an SPL threshold of 180 dB RL for marine animal impact.

Response: The SPL threshold of 180 dB RL was only for potential injury impacts and not for other impacts, such as significant behavioral modifications. Please see Final SEIS Comment 4.0.1 for more information.

Comment 25: In its discussion of acoustic impacts the Draft SEIS is flawed because it chooses to base its entire evaluation of the potential acoustic impacts to marine mammals on selective data, while ignoring more timely, widely accepted and peer reviewed science, including applicability of actual stranding events. In its discussion of acoustic impacts the Draft SEIS is flawed because it chooses to dismiss evidence suggesting behavioral reaction to sound can produce Level ''A'' harassment.

Response: The scientific evidence supporting findings that marine mammals will not be injured at received levels less than 180 dB by SURTASS LFA sonar is provided in the Final SEIS (RTCs 4.0.3, 4.3.1, and 4.3.7 through 4.3.15). LFA sonar has not been implicated in any known marine mammal strandings as discussed elsewhere in this **Federal Register** notice and in the Final SEIS RTC 4.4.9 through 4.4.26. NMFS and the Navy have determined that the potential for injury to marine mammals by exposure to LFA sonar signals at received levels below 180 dB is unlikely.

Even though there is the potential for the LFA sonar signal to injure marine mammals at RLs greater than 180 dB, that possibility is highly unlikely given the reliability of the Navy's tripartite monitoring scheme and, in particular, the demonstrated effectiveness of the HF/M3. NMFS does not dismiss the possibility that behavioral reactions to sound can possibly produce Level A harassment; however, the best available scientific evidence strongly suggests that this is a concern primarily for certain species of odontocetes when exposed under particular conditions to mid-frequency sonar. The results of the LFS-SRP strongly indicate that the behavioral reactions of baleen whales, which hear best in the low frequency range, when exposed to SURTASS LFA sonar are minimal. Although there is no evidence that LF sound can cause biologically significant behavioral responses in odontocetes, and several factors including the inability of such species to hear well in the low frequency range contraindicate such responses, NMFS presumes that, while unlikely, it has the potential to occur. As a result, the Navy is presently planning its 2007–2008 field research for deep diving marine mammal behavioral response studies in an attempt to scientifically address this issue for LFA sonar, MFA, and seismic sources. This is discussed later in this document (see Research).

Comment 26: The ''Determination of Risk Function,'' suggests that there is a continuum of severity of behavioral responses to SURTASS LFA sonar signals, ranging from 95 percent of those exposed to 180 dB having significant (if temporary) change in biologically important behavior, down to the first evidence of ''significant'' change occurring at 119 dB. If SURTASS LFA sonar signals are arriving at the 22-km (12-nm) offshore line at a level of just under 180 dB, then it is likely that near shore areas will be experiencing sound levels significantly above 120 dB. It would be helpful in making more biologically sound decisions if NMFS or the Navy clarified the radius within which received levels could be expected to be 120 dB, 145 dB, and/or 160 dB. The AEI suggests these radii not because these numbers have special or well defined significance, but to suggest that such information would give regulators and researchers a better sense of the likely zones of influence within which behavioral responses might be expected to increase or decrease in severity. At the least, AEI would suggest a lower allowable threshold of received levels at 22 km from shore, to protect these biologically important areas from behavioral disruptions in response to moderate noise levels.

Response: The AEI is correct that the risk continuum provides a method to determine effects from sound exposure based on the fact that various animals will react differently to LFA sonar signals. The data from the LFS SRP support a linear dose response function, also known as the LFA sonar risk continuum, for sound exposure and the potential for significant behavioral effects. This risk continuum was an integral part of the analysis in the Final EIS and 2002 Final Rule of the potential for SURTASS LFA sonar operations to cause significant behavioral effects in marine mammals. The ranges to RL isopleths and the ocean volumes they would encompass vary under different oceanographic conditions and were analyzed in the Final EIS. Detailed results of these analyses are presented in Subchapter 4.2 of the Final EIS and in Technical Report #2 (Acoustic Modeling Results). Figures B–1 through B–31 of TR 2 provide the parabolic equation (PE) transmission loss (TL) plots for each of the 31 sites. These plots provide TL as a function of depth and range from the source. The analysis determined that there is the potential for marine mammals to be affected by SURTASS LFA sonar.

However, an analysis summarized in Final SEIS Subchapter 4.7.6 indicates that, while increasing the coastal standoff range from 12 nm (22 km) to 25 nm (46 km) decreases exposure to higher RLs for marine animals closest to the shore (shelf species), it does so at the expense of increasing exposure levels for shelf break species and pelagic species.

As a result of the Final EIS analysis, mitigation protocols were developed to prevent injury to marine mammals. Mitigation protocols were not deemed necessary or practical for other than Level A harassment (injury) takes. Results from operations under the initial

5-year set of regulations for LFA sonar are presented in the SURTASS LFA sonar Final Comprehensive Report (see **ADDRESSES** for availability) and indicate that the Level B harassment take numbers for individual stocks of marine mammals in the areas of operations are within the values from the Final EIS analyses.

Comment 27: The association between anthropogenic ocean noise and its impacts on marine mammals is well documented although there is still scientific uncertainty over the actual causal mechanisms of impacts. It is generally accepted that impacts can range from altered behavior through temporary injury to mortality. Altered behavior can include a startle response and can affect an animal's ability to: feed, find mates, stay on a migration path, communicate, stay at or return to a favored feeding area, nurse, care for young, catch prey and escape predators. Mortality can result directly from exposure to sound or indirectly as a consequence of altered behavior or temporary injury.

Response: While NMFS agrees with the statement, it cautions that it does not necessarily mean that all loud anthropogenic sounds will cause the stated reactions. NMFS details the relationship between events and LFA sonar throughout this document.

Comment 28: The Draft SEIS states that ''the operation of SURTASS LFA sonar with monitoring and mitigation will result in no lethal takes.'' The evidence obtained from actual mortality incidents associated with anthropogenic noise suggests that the mechanisms by which animals are impacted by noise are far less straightforward than the Draft SEIS suggests. There is now increasing evidence that non-auditory injury or permanent loss of hearing are not the only mechanisms by which mortality can result from exposure to noise. For example, an alteration of behavior (Level B) such as a startle response leading to breaching can result in death whereas a gash injury (Level A) can heal and have no long term impact. The Draft SEIS should concede that the knowledge base surrounding the causal mechanisms of marine mammal impacts is too scant to be so readily compartmentalized.

Response: See responses to Comments 24, 25 and 27. As related to LFA sonar, the Navy performed extensive research to determine the potential for LF transmissions to cause significant behavioral effects in whales (the LFS SRP). There is no indication during these tests that whales surfaced rapidly or dove prematurely in response to LFA sonar source transmissions. The mechanisms to cause such events are based on the theory that MF-naval sonar can cause rapid surfacing and diving, thus resulting in acoustically mediated bubble growth. Also please see the discussion in the Final SEIS (RTCs 4.0.3, 4.3.7, and 4.3.12).

Comment 29: The Draft SEIS uses 180-dB RL as the threshold for impacts to marine animals and persistently reminds the reader that this is a conservative figure. Field data suggest that this figure is much too high. In the Bahamas multi species mass stranding incident of 2000 estimates of the average sound exposure level that caused those animals to strand was around 140 dB re: 1 microPa. The Draft SEIS dismisses the Bahamas stranding event saying that the hemorrhaging in the stranded animals could have been caused by factors other than acoustic trauma. This is not consistent with the actual findings published in the Interim Report on the event which states ''all evidence points to acoustic or impulse trauma'' and identifies ''mid-range tactical Navy sonars operating in the area as the most plausible source of the acoustic or impulse trauma.''

Response: First, the Bahamas 2000 stranding event did not involve LFA sonar. Based on the best information available at this time, NMFS believes LFA sonar operations will not cause injury to marine mammals at received levels below 180 dB. Second, the commenter's statement regarding the mid-frequency sonar decibel levels to which the stranded animals were exposed is incorrect. No one knows to what maximum decibel level the animals that ultimately stranded were exposed. Estimates were based on prior near-shore sightings of beaked whales at the locations where those whales were sighted, but they do not reflect the actual maximum received decibel levels of the particular animals that stranded. Third, the Bahamas interim report and further subsequent analysis of the event indicate that the strandings were likely caused by mid-frequency sonar in combination with a list of other contributing factors. The list of contributing factors is generally supported by the workshop on understanding the impacts of anthropogenic sound on beaked whales convened by the U.S. Marine Mammal Commission in 2004 (Cox *et al.*, 2006) and the analysis by D'Spain *et al.* (2006). Whether or not surface ducts, one of the listed contributing factors, occurred during other reported strandings is not relevant to LFA sonar operations. The LFA sonar signals are initially transmitted substantially below 10 m (32.8 ft) water depth and are not likely to have signal strength above 180 dB in the surface duct. To ensure a thorough environmental analysis, however, surface ducting conditions were analyzed in the Final EIS at a number of the 31 model sites. Therefore, with LFA sonar mitigation, no marine mammals, in waters either with or without a surface duct, are expected to be exposed to injurious levels by LFA sonar signals.

Comment 30: Since the FEIS was completed in January 2001, there have been at least five mass stranding incidents associated with ocean noise and several studies and papers related to the range of impacts of noise on marine mammals. To claim that none of this new data contradicts the assumptions or conclusions in the FEIS is questionable. There is more compelling evidence that: (1) The mechanisms by which animals strand as a result of a noise event are very complex; (2) different mechanisms can be involved and different impacts can result depending on the species and the circumstances; (3) the noise intensities at which animals strand are likely lower than those previously assumed; and (4) tissue injury is not necessary to cause animals to strand and die.

Response: The issue is not whether anthropogenic sound causes marine mammal strandings, but rather does LFA sonar cause marine mammal strandings. The evidence to date, supported by recent scientific reports, supports the conclusion that the U.S. Navy's LFA sonar is not likely to cause marine mammal strandings. However, an ad hoc committee of international experts under the auspices of the ICES has reviewed the impacts of sonar on cetaceans and fish. They concluded, ''No stranding, injury, or major behavioral change has yet been associated with the exclusive use of low frequency sonar'' (ICES, 2005). This is further supported by 36 scientists in their recently published paper which arose from the Marine Mammal Commission workshop on the impacts of anthropogenic noise on beaked whales (Cox *et al.*, 2006). Therefore, the statement that there are no new data contradicting the assumptions or conclusions in the Final EIS and Final SEIS remain correct. Moreover, five years of SURTASS LFA sonar use without evidence of strandings, injury, or other major behavioral changes support the conclusions of the Final OEIS/EIS and the Final Rule 2002. However, NMFS continues to view this issue seriously and does not dismiss it simply because a stranding has not been observed. For more detailed information, please see the Final SEIS

(RTCs 4.0.3, 4.3.1, 4.3.2, 4.3.7, 4.3.8, 4.3.9, and 4.3.12).

Comment 31: The Draft SEIS mentions only three noise related marine mammal stranding events under the heading ''Strandings potentially related to anthropogenic sound.'' There is irrefutable evidence that anthropogenic sound causes marine mammal strandings. What is not known with any scientific certainty is the actual causal mechanisms. In listing only three marine mammal stranding incidents potentially related to anthropogenic sound, the Draft SEIS is being disingenuous. Not only are there many more strandings, but when all atypical mass strandings are tabulated, the overwhelming majority is associated with naval maneuvers, and likely sonar usage. (The commenter also provided the table from the ICES (2005) Report of the Ad hoc Group on the Impact of Sonar on Cetaceans and Fish).

Response: The Navy's intention was to examine three of the more studied stranding events in which naval sonars were implicated as a potential cause. This subchapter has been expanded in the Final SEIS based on stranding event information cited in more recent reports, such as ICES AGISC Report (ICES, 2005), and reports on the potential causes presented by ICES (2005), Cox *et al.* (2006), and D'Spain *et al.* (2006). NMFS believes that this revision is adequate as related to the potential for SURTASS LFA sonar to cause strandings because LFA sonar was not considered causative in any of these events and, indeed, low frequency sonar has never been implicated in any stranding, with the possible exception of the Greece stranding in 1996, during which mid-frequency sonar was also employed.

Comment 32: The Navy has not reported any marine mammal stranding incident that has occurred in the vicinity of its activities. The Draft SEIS claims that SURTASS LFA sonar has not been implicated in any stranding event. This is not accurate. An LFA sonar system was implicated in the mass stranding of twelve Cuvier's beaked whales in 1996 in Greece though as the Draft SEIS states, the inner ears were not examined. This does not mean that LFA sonar use did not cause the animals to strand. The usage of LFA sonar has also been far more restricted than mid frequency sonar for which there are more associated mass stranding events.

Response: The Draft SEIS was correct. SURTASS LFA sonar have never been implicated in a stranding. While there was a LF component of the sonar potentially related to the Greek strandings in 1996, only MF components were implicated in the strandings in the Bahamas in 2000, Madeira 2002, and Canaries in 2002. This suggests that the LF component in the Greek strandings was not causative (Cox *et al.*, 2006; ICES, 2005). In its discussion of the Bahamas stranding, Cox *et al.* (2006) stated, ''The event raised the question of whether the mid-frequency component of the sonar in Greece in 1996 was implicated in the stranding, rather than the low frequency component proposed by Frantzis (1998).'' The ICES in its ''Report of the Ad Hoc Group on the Impacts of Sonar on Cetaceans and Fish'' is in agreement with Cox *et al.* (2006) stating that the association of MF sonar in the Bahamas, Madeira, and Canary Island strandings suggest that it was not the LF component in the NATO sonar that triggered the Greece stranding of 1996, but rather the MF component (ICES, 2005). The ICES (2005) report also concluded that no strandings, injury, or major behavioral change have yet to be associated with the exclusive use of LF sonar.

Since October 14, 2003, SURTASS LFA sonar use has been restricted under a permanent injunction to limited areas in the western Pacific Ocean (see Final SEIS, Subchapter 1–2.1, Figures 1–1 and 4–4.2). Since commencing operations in 2003, the *R/V Cory Chouest* and USNS IMPECCABLE have completed 40 missions from January 2003 to August 2006 under the first four LOAs (DON, 2007). The general areas are known to the public because they are based on the Court Order, published in the Draft and Final SEIS, and incorporated into the subsequent NMFS LOAs. The locations and times of LFA sonar active operations are reported to NMFS quarterly (classified report) as required in the Final Rule and annual LOAs. These operations, with mitigation, have produced no known Level A takes on marine mammals as reported in the Annual Reports (DON, 2003a; 2004a; 2005a; 2006a) and the Final Comprehensive Report (DON, 2007). Reviews of stranding reports in the LFA sonar operating area showed that there were a total of 19 strandings reported in Asia (four in Taiwan, nine throughout the Philippines, two in Thailand, two in Indonesia, and two in China) (The Cetacean Stranding Database, accessed: 11/28/2006). None of these strandings were coincident either temporally or spatially with LFA sonar operations.

Moreover, the Northwestern Pacific Ocean areas where SURTASS LFA sonar is presently operating are some of the most heavily populated areas in the world and cannot be considered ''remote.''

As to the possibility of unreported strandings, the NMFS and the Navy do not consider that this is a very likely scenario for LFA sonar operations. Even though a visual observer onboard the vessel will be unable to see an animal that strands on the shoreline due to operations being greater than 12 nm (22 km) from land, this is not relevant because LFA sonar is unlikely to cause injury beyond the 180-dB mitigation zone (normally 1 km (0.5 nm) radius). Level A (injury) harassments are determined based on actual observations/detections within the LFA sonar mitigation zone. With passive and active acoustic detection, the probability of detection within this zone is over 95 percent for a single marine mammal (see Final EIS, Subchapters 2.3.2.2 and 4.2.7.1.). For multiple animals, the value is nearly 100 percent. The area of the northwestern Pacific Ocean, where LFA sonar vessels are currently operating, is not a remote area and there are stranding networks in the region. A review of reported strandings in the area does not show any correlations to LFA sonar operations either spatially or temporally (see discussion later in this document on strandings in Taiwan).

Comment 33: The Draft SEIS states that no Level A harassment incidents have been reported in the area of usage; however, it does not relate the effort undertaken to search for such incidents or mention reports of Level ''B'' harassment incidents.

Response: See Comment 32.

Comment 34: The association between mid frequency sonar usage and strandings was not realized until decades after its introduction.

Response: NMFS agrees, noting that Balcomb and Claridge (2001) reported that beaked whale strandings have increased since the use of MF sonar in the 1960s. However, the association between MF-sonar and strandings appears limited to a confluence of factors. Stranding networks weren't active until much later than the 1960's, but have been active since SURTASS LFA sonar came into use. Certainly, SURTASS LFA sonar has received great scrutiny with respect to the potential for strandings and none have been observed.

Comment 35: The Draft SEIS appears to be only concerned about impacts producing Level A harassment which it claims will be negligible. The impacts from behavioral alteration to individual animals are dismissed as inconsequential. Behavioral impacts can not only produce level A harassment, but impacts to individuals are

significant especially for endangered populations, and can have population level consequences no matter what the status of the species.

Response: There are several types of Level B harassment that can result from anthropogenic sounds. Two types of behavioral effects that have potential for population level effects are masking and stress. These will be addressed here. (also see the Final SEIS RTCs 4.0.3 and 4.3.12 in Comment 1, SEIS RTC 4.3.17 in Comment 5, SEIS RTC 4.3.2 in Comment 6, and SEIS RTC 4.3.33 in Comment 7). Other potential Level B harassment effects are addressed elsewhere in this rulemaking document. Also, please see the Biological Opinion issued under section 7 of the ESA for this action by NMFS (see ESA later in this document).

In regard to masking, the commenter is confusing the avoidance response of migrating gray whales and bowhead whales with masking. There was no evidence of masking in any of the research on these two species. Certainly in the gray whale case, the interpretation by the scientists who conducted the research was that the whales responded but responses were not interpreted as having a significant behavioral impact. Furthermore, a received level of 120 dB for LFA sonar would not mask the species-specific sounds of any low frequency mysticete, although under certain, rare circumstances it might interfere with species recognition. The masking effects of the SURTASS LFA sonar signal are expected to be limited for a number of reasons. First, the frequency range (bandwidth) of the system is limited to about 30 Hz, and the instantaneous bandwidth at any given time of the signal is small, on the order of 10 Hz. Second, the LFA sonar signal is active (or on) only about 7.5 percent of the time (i.e., low duty cycle based on historical LFA sonar operations, but may be on for up to 20 percent of the time) and limited to periods during actual missions. Therefore, the effect of masking will be limited because animals that use this frequency region typically use broader bandwidth signals. As a result, the chances of an LFA sonar sound actually overlapping whale calls at levels that would interfere with their detection and recognition would be extremely low.

Regarding stress, stress can be defined as a threat to homeostasis (Fair and Becker, 2000) and is frequently measured with changes in blood chemistry (Thomas *et al.*, 1990; Romano *et al.*, 2004; Smith *et al.*, 2004a). Thomas *et al.* (1990) exposed captive belugas to recorded industrial noise for 30 minutes at a time, with a total exposure of 4.5 hours over 13 days with a source level of 153 dB. Catecholamine blood levels were checked both before and after noise exposure; however, no significant differences in blood chemistry were observed. Another experiment that measured blood chemistry, but also varied the sound level is described in Romano *et al.* (2004). In this experiment, a beluga whale was exposed to varying levels of an impulsive signal produced by a watergun. The levels of three stress related blood hormones (norepinephrine, epinephrine and dopamine) were measured after control, low level sound (171–181 dB SEL) exposure and high level (184–187 dB SEL) sound exposure. There were no significant differences between low level sound exposure and control, while the high level sound exposure did produce elevated levels for all three hormones. Furthermore, regression analysis demonstrated a linear trend for increased hormone level with sound level.

Less relevant to marine mammals, but still informative, Smith *et al.* (2004a) exposed goldfish (a hearing specialist fish) to continuous background noise of 160–170 dB RL. There was a ''transient spike'' in blood cortisol levels within 10 minutes of the onset of noise that was loud enough to cause TTS. However, this cortisol spike did not persist and there was no long term physiological stress reaction in the animals.

These data support a linear dose response function (like the LFA sonar risk continuum) for sound exposure and the onset of stress, with only high levels of sound leading to a stress reaction. The extrapolation of the response thresholds from the Romano *et al.* (2004) experiment to the LFA sonar situation is tenuous because of the differences in the signals, but the relationship between sound level and stress is supported by several studies. As mentioned elsewhere, there are some recent data (e.g., Evans, 2003) implicating synergistic effects from multiple stressors, including noise. Although there are no data to support synergistic effects, similar impacts might occur with marine mammals, given the multiple stressors that often occur in their environment. This indicates to NMFS that while stress in marine animals could possibly be caused by operation of the LFA sonar source, it is likely to be constrained to an area much smaller than the zone of audibility, probably closer in size to the mitigation zone around the vessel.

Comment 36: The LFS SRP Phase II conducted by the Navy to determine LFA sonar impacts on migrating whales found that when the source was located in the whales' migratory path (approximately 1 km (0.54 nm) from shore), gray whales avoided levels below 150 dB. The SRP showed negligible avoidance by the whales when the source was located over 2 km (1.1 nm) from shore. From the results of the LFS SRP Phase II, the Navy concluded no biologically significant response. Perhaps in actuality more sensitive individuals or mother calf pairings tend to hug the coast during migration. For some groups, the most sensitive animals may be crucial to a group's survival as these may be the first individuals to become aware of predators or of dangerous situations. To lose sensitive animals or nursing mothers from a group could have population level consequences.

Response: NMFS believes the characterization of the Navy's conclusion is out of context. See the Final EIS Subchapter 4.2.4.3. NMFS does not believe that some whales ''hugged'' the coast of California during the LFS SRP. For this phase of the SRP, the sound source was moored offshore of the central California coast, near Point Buchon. Shore-based observers tracked whales using methods that provided highly sensitive measures for avoidance responses. These observers would have sighted whales along the coast line. Also, observers on the playback vessel also carefully monitored marine mammals in order to stop broadcasting in case of worrisome behavioral reactions or if any marine mammals were sighted at close enough range that the sound level to which they were exposed might exceed the maximum planned exposure level (155 dB).

The issue of potential calf strandings during the LFS SRP in Hawaii was addressed in the Final EIS RTC 4 5.25 where it was concluded that these events were not related to LFA sonar testing. Masking of communications could potentially affect the mother calf bond; however, masking effects from the SURTASS LFA sonar signal are extremely unlikely and are expected to be negligible considering the short duty cycle and other factors discussed in this document. The rationale for this is discussed in Final SEIS RTCs 4.3.23 and 4.3.36. Thus, LFA sonar signals are not expected to disrupt the mother calf bond.

Comment 37: An aversion response can occur many tens of miles from the source, and father away if it is in the direct path of the beam-formed or ducted signal.

Response: Given that the LFA sonar sound source can be detected at moderate to low levels over large areas of the ocean, the Navy (and NMFS) had concerns at the initiation of the NEPA process in 1996 that there was the potential for large percentages of species/stocks to be exposed; if animals would be disturbed at these moderate-to-low exposure levels such that they experience a significant change in a biologically important behavior, then such exposures could potentially have an impact on rates of reproduction or survival. Knowing that cetacean responses to LF sound signals needed to be better defined using controlled experiments, the Navy helped develop and supported the independent three-year LFS SRP beginning in 1997. The study analyzed the behavioral responses of whale species that have the greatest sensitivity to low frequency sounds and thus were believed to be the most vulnerable, potentially, to LFA sound. This field research program was designed to address three important behavioral contexts for baleen whales: (1) Blue and fin whales feeding in the southern California Bight, (2) gray whales migrating past the central California coast, and (3) humpback whales breeding off Hawaii. Taken together, the results from the three phases of the LFS SRP do not support the hypothesis that most baleen whales exposed to RLs near 140 dB would exhibit disturbance behavior and avoid the area. These experiments, which exposed baleen whales to RLs ranging from 120 to about 155 dB, detected only minor, short-term behavioral responses. Short-term behavioral responses do not necessarily constitute significant changes in biologically important behaviors.

These results have been supported by recent, peer-reviewed papers. Croll *et al.* (2001a) studied the effects of anthropogenic LF noise (SURTASS LFA sonar) on the foraging ecology of blue and fin whales off San Nicolas Island, California. Overall, the whale encounter rates and diving behavior appeared to be more strongly linked to changes in prey abundance associated with ocean parameters than to LFA sonar transmissions. In some cases, whale vocal behavior was significantly different between experimental and non-experimental periods. However, these differences were not consistent and did not appear to be related to LF sound transmissions. At the spatial and temporal scales examined, Croll *et al.* (2001a) stated that they found no obvious responses of whales to a loud, anthropogenic, LF sound.

Both Miller *et al.* (2000) and Fristrup *et al.* (2003) published on the results of tests conducted with male humpback singers off Hawaii in which they evaluated variation in song length as a function of exposure to LF sounds. In spite of methodological differences, the results of both studies indicated that humpback whales slightly increased their songs in response to LF broadcasts. Fristrup *et al.* (2003) found that the fraction of variation in song length that could be attributed to LF broadcast was low and concluded that the effects of LF broadcast did not impose a risk of dramatic changes in humpback whale singing behavior that would have demographic consequences. For more information please also see SEIS RTC 4.3.30.

Comment 38: SURTASS LFA sonar impacts the vocalizations and other behavior of humpback whales.

Response: NMFS does not disagree with the potential impacts of LFA sonar on vocalization and other behavior. The justification for the conclusion that the potential effects on the stocks of marine mammals from behavioral changes would be minimal is discussed in the Final SEIS in RTC 4.3.29. The potential effects of masking are discussed in the Final SEIS RTCs 4.3.1 and 4.3.23. The Miller *et al.* (2000) article ''Whale songs lengthen in response to sonar'' concerning observations of male humpback whales during Phase III of the LFS SRP was addressed in the Final EIS RTC 4–5.19 and in the NMFS Final Rule RTC SIC16 and SIC17. Fistrup *et al.* (2003) used a larger data set from Phase III to describe song length variability and to explain song length variation in relation to LF broadcasts. In spite of methodological and sample size differences, the results of the two analyses were generally in agreement, and both studies indicated that humpback whales tend to lengthen their songs in response to LF broadcasts.

Fristrup *et al.* (2003) provides a detailed picture of short-term response as compared to behavioral variation observed in the absence of stimuli. These responses were relatively brief in duration, with all observed effects occurring within 2 hours of the last LFA sonar source transmission. It should be noted that these effects were not salient to the acoustic observers on the scene, but were revealed by careful statistical analyses (Fristrup *et al.*, 2003). Aside from the delayed responses, other measures failed to indicate cumulative effects from LF broadcasts, with song-length response being dependent solely on the most recently LF transmission, and not the immediate transmission history. The modeled seasonal factors (changes in surface social activities) did not show trends that could be plausibly explained by cumulative exposure. Increases in song length from early morning to afternoon were the same on days with and without LF transmissions, and the fraction of variation in song length that could be attributed to LF broadcast was low. Fistrup *et al.* (2003) found high levels of natural variability in humpback song length and interpreted the whales' responses to LF broadcasts to indicate that exposure to LFA sonar would not impose a risk of dramatic changes in humpback whale singing behavior that would have demographic consequences.

Comment 39: It is impossible to comment fully on the Acoustic Integration Model (AIM), the program used by the Navy to calculate the system's impacts, because that model has not been released to the public. Disclosure of the model must occur for public comment to be meaningful under NEPA and the Administrative Procedure Act (APA) to be met.

Response: The Acoustic Integration Model (AIM) contains proprietary programming that prevents its release to the public. As a result, in response to a different incidental take application (Draft EIS for Gulf of Mexico Seismic Surveys), AIM recently underwent an independent scientific review by the NMFS-sponsored Center for Independent Experts (CIE). The CIE review took place September 25–27, 2006. A report from that review is publicly available on the NMFS Web site (*http://www.nmfs.noaa.gov/pr/permits/incidental.htm*). Additional documentation can be found on the SURTASS LFA sonar Web site (see **ADDRESSES**).

Comment 40: Models used by the Navy in its applications for LOAs to assess its actual work in the Pacific, and in its Final EIS to estimate impacts in sample coastal areas, in large part assume a fairly even distribution of marine mammals across a wide area of ocean, failing to take the possibility that certain animals, like beaked whales and sperm whales, may be concentrated in particular habitats. Specifically, the Navy has not conducted research on beaked whale habitat preferences. In the limited modeling we have seen, the Navy frequently assumes that populations of marine mammals are relatively unstructured, such that individual animals are improbably considered part of region-wide, basin-wide, or even worldwide stocks. The Navy's stock assessments in its LOA applications are based on incomplete and out-of-date information, leading to

a significant underestimation of species abundance and therefore impacts.

Response: When there is no specific data on marine mammal distribution, impact prediction modeling uses an even distribution over the ocean area, since offshore concentrations of animals are not fixed in space or time. Nearshore concentrations can be relatively fixed in time or space, due to physical forcing from the steep bathymetry and seasonal variations (*e.g.*, Monterey Canyon or Hudson Canyon). However, LFA sonar operates in deeper, offshore waters where the concentrations are fluid due to changing water mass conditions. Therefore an even distribution of animals is the one with the least assumptions. Basically, the model assumes that individuals of the species can occur anywhere within their ranges with equal probability over a long time. On any given day, the distribution of any given species is likely to be highly non-uniform. Over a long period of time the fluctuations in density are likely to even out. Therefore, assuming an even distribution for the purposes of assessing potential impacts is reasonable and appropriate.

NMFS believes that the latest information available is used by NMFS and the Navy when assessing impacts on marine mammals by LFA sonar. Regarding beaked whale research, NMFS notes that the Office of Naval Research (ONR) and SERDP (Strategic Environmental Research and Development Program) has funded the following beaked whale research:

MacLeod, C. D., and G. Mitchell. 2006. Key areas for beaked whales worldwide. J. Cetacean Res. Manage. 7(3):309–322.

MacLeod, C. D., W. F. Perrin, R. Pitman, J. Barlow, L. Balance, A. D'Amico, T. Gerrodette, G. Joyce, K. D. Mullin, D. L. Palka, and G. T. Waring. 2006. Known and inferred distributions of beaked whale species (Cetacea: Ziphiidae). J. Cetacean Res. Manage. 7(3):271–286.

Redfern, J. V., M. C. Ferguson, E. A. Becker, K. D. Hyrenbach, C. Good, J. Barlow, K. Kaschner, M. F. Baumgartner, K. A. Forney, L. T. Ballance, P. Fauchald, P. Halpin, T. Hamazaki, A. J. Pershing, S. S. Qian, A. Read, S. B. Reilly, L. Torres, and F. Werner. 2006. Techniques for cetacean-habitat modeling. MEPS 310:271–295.

Ferguson, M. C., J. Barlow, B., S. B. Reilly, and T. Gerrodette. 2006. Predicting Cuvier's (Ziphius cavirostris) and Mesoplodon beaked whale population density from habitat characteristics in the Eastern Tropical Pacific Ocean. JCRM 7(3):287–299.

In addition, ONR and SERDP have funded the development and fieldwork for the sound-and-orientation recording tag (DTAG), which has been successfully attached with suction cups to beaked whales (Tyack *et al.*, 2006). These data are providing critically valuable information on the movement and diving behaviors of beaked whales, both of which are important to know in order to understand the acoustic exposure that the animals may receive.

As stated in the Final SEIS Subchapter 2.7, the NMFS initial LOA under Condition 7(d) required the Navy to conduct research in accordance with 50 CFR § 216.185(e). The SURTASS LFA sonar LTM Program has been budgeted by the Navy at a level of approximately $1M per year for five years, starting with the issuance of the first LOA. The status of this research was summarized in Table 2–5 of the Final SEIS. Finally, planning has commenced for a 2007–2008 deep-diving odontocetes behavioral response study (BRS) to determine the potential effects of LFA sonar, MFA, and seismic sources on beaked whales and other deep diving odontocetes at an estimated cost of $3M per year. The BRS study is discussed later in this document.

Regarding stock assessment data, the modeling analysis considers the total amount of risk for each marine mammal species by summing a particular species' risk estimate within that stock, across areas of operation for each mission. This methodology does not assume that populations are unstructured, but includes the best information available on the reproductive behavior of each species at each mission site in order to determine stock affiliation and the total risk to the sustainability of each stock. Stock assessment data within U.S. waters are required to be updated annually under the MMPA, with new stock assessments being published when new data are available. The best available data were used in all instances of the modeling analysis for determining stock abundance and distribution.

The Navy states that it performs regular reviews of the latest research, including updating stock and density data. The Navy's applications for SURTASS LFA sonar LOAs are submitted after conducting a thorough review of the latest data on the marine animals present in the potential operating areas.

The Final EIS states, ''The model runs are designed to portray high potential effects for each site. For example, seasons were selected based on the potential for maximum LF-sensitive animal abundance.'' (Please see FOEIS/EIS Subchapters 4.2.1 and 4.2.2.2, and RTCs 4–3.8, 4–3.9, and 4–3.11.)

Comment 41: The Navy incorrectly claims that significant impacts on stocks and populations, as modeled for its LOA applications, would necessarily occur at percentages lower than those assumed in the Navy's modeling of coastal area and NMFS Final Rule, even disregarding the underestimates of take resulting from the other errors described. The Navy's approach to modeling behavioral impacts from multiple exposures is not conservative.

Response: NMFS disagrees with the commenter's statement regarding the Navy's approach to modeling behavioral impacts from multiple exposures not being conservative. Subchapter 4.2.3.1 of the Final EIS provides details on how the Navy derived the $L + 5 \log_{10}(N)$ formula for a single ping equivalent (SPE). The SPE concept is related to widely accepted methods for comparing sounds of different durations. It is universally acknowledged that increased exposure duration increases the severity of potential impact. The SPE calculation is conservative in assuming that the increase in potential effects observed by extending the duration of a continuous sound stimulus applies to a sequence of SURTASS LFA sonar pings, even though the transmissions are separated by many minutes when the system is off. This applies to SURTASS LFA sonar-type signals, not continuous sound. In this process, an SPE received level is larger than the maximum RL of any single ping in sequence. Also, the SPE for a sequence consisting of a single loud ping and a long series of much softer pings is almost the same as the level of a single loud ping. A ping duration (length) of 60 seconds was assumed in the modeling and risk assessment calculations using SPE. The adoption of 60 seconds and 20 percent as the standard ping duration and duty cycle, respectively, for calculations in the Final EIS, provides a reasonable estimate of the potential for effects from real-world SURTASS LFA sonar operations without sacrificing the conservative nature of the analysis process.

Comment 42: There is an unknown history of exposure of animals in an area where active sonar is regularly used.

Response: The adequacy of scientific information on marine animals is discussed in Subchapter 1.4.2 of the Final EIS. It states that there is an urgent need for better methods for measuring and estimating potential risk. These data gaps have necessitated the use of various models and extrapolations in order to provide a rational basis for the assessment of potential risk from exposure to LF sounds. To address some of these gaps, the Navy performed underwater acoustic modeling and supported the LFS SRP to study the

potential effect of LF sound on free-ranging marine mammals. This research did not specifically address the issue of LF impact on marine mammal hearing; rather, it focused on the behavioral responses of baleen whales to controlled exposure from SURTASS LFA sonar-like signals. In general, understanding the mechanics of hearing and the biological functions of sounds for marine mammals has improved considerably over the past decade. Specific information on the effects of most types of human-made underwater noise on marine animals is incomplete, but has also increased in recent years. However, as the environmental evaluation of the SURTASS LFA sonar system progressed, the Navy recognized that additional research was required in several areas to address some basic gaps in scientific knowledge. This included development of a scientifically reasonable estimate of the underwater sound exposure levels that may cause injury to marine mammals, and research on the potential effects of LF sound on marine mammal behavior. While recognizing that not all of the questions on the potential for LF sound to affect marine life are answered, and may not be answered in the foreseeable future, NMFS believes the Navy has combined scientific methodology with a prudent approach throughout the Final EIS and SEIS to protect the marine environment. Although there are recognized areas of insufficient knowledge that must be accounted for when estimating the potential direct and indirect effects on marine life from SURTASS LFA sonar, the present level of understanding is adequate to place reasonable bounds on potential impacts. Therefore, though data on specific exposure of anthropogenic sounds, particularly sonar, on the marine environment is limited, the Navy and NMFS have taken this into account during their analyses. Moreover, we know much more about the impacts of different types of sonar in the marine environment today than we knew five years ago, when SURTASS LFA went through the environmental compliance process the first time, and the best scientific data that we have indicates that SURTASS LFA can be operated safely with the prescribed mitigation, in a manner that has no more than a negligible impact on marine mammal species and stocks.

Comment 43: There is a low level of accuracy with which the exposed individuals can be monitored in real time.

Response: Sound field limits are estimated using near-real-time environmental data and underwater acoustic performance models. These models are an integral part of the SURTASS LFA sonar processing system. The acoustic models help determine the sound field by predicting the SPLs, or RLs, at various distances from the SURTASS LFA sonar source location. Acoustic model updates are nominally made every 12 hours, or more frequently when meteorological or oceanographic conditions change. For further information, please see the Final SEIS, RTC 5.1.1. Though individuals cannot be effectively monitored beyond the reach of the HF/M3, the sound field is monitored in near-real-time.

Comment 44: The intense sound generated by military active sonar can induce a range of adverse effects in whales and other species, from significant behavioral changes to stranding and death. In a 2004 symposium at the International Whaling Commission (IWC), more than 100 whale biologists concluded that the association between sonar and beaked whale deaths is very convincing and appears overwhelming. Mass mortalities, though an obvious focus of much reporting and concern, are likely only the tip of the iceberg of sonar's harmful effects. Marine mammals are believed to depend on sound to navigate, find food, locate mates, avoid predators, and communicate with each other. Flooding their habitat with man-made, high-intensity noise interferes with these other functions.

In addition to strandings and non-auditory injuries, the harmful effects of high-intensity sonar include (1) temporary or permanent loss of hearing; (2) avoidance behavior; (3) disruption of biologically important behaviors such as mating, feeding, nursing, or migration, or loss of efficiency in conducting those behaviors; (4) aggressive (or agonistic) behavior; (5) masking of biologically meaningful sounds; (6) chronic stress; (7) habituation; and (8) declines in the availability and viability of prey species, such as fish and shrimp.

Response: The use of the term ''sonar'' does not reflect what Annex K of the IWC 2004 Scientific Committee Report actually stated. The Report does not implicate LFA sonar in the stranding of beaked whales. The full text of the quoted statement is: ''The weight of accumulated evidence now associates mid-frequency, military sonar with atypical beaked whale mass strandings. This evidence is very convincing and appears overwhelming.''

There are different types of anthropogenic sounds associated with possible impacts to and strandings of marine mammals. There are naval sonar and seismic airgun arrays, each with different characteristics and purposes. Many lump these types together. Accordingly, when there is a stranding that may be associated with the use of one type of sonar or sound source, all sources are implicated—a premise that does not stand up to scientific scrutiny in the marine bio-acoustics community. A wide range of naval sonars are used to detect, localize and classify underwater targets. For the purposes of the SURTASS LFA sonar Final SEIS, the MMPA application, and this Final Rule, these systems are categorized as LFA sonar (less than 1000 Hz) and MFA sonar (1 to 10 kHz). Table 1 in this document provides pertinent information on different types of LFA sonar and MFA sonar. General information is also provided on airgun arrays. (We also note that sonar signals are generally coherent while air guns are impulsive.)

TABLE 1.—COMPARISON OF UNDERWATER ACOUSTIC SOURCE PROPERTIES

Source type	SURTASS LFA sonar	AN/SQS 53C (MF)	AN/SQS 56 (MF)	Air gun array (LF)
Source Level	215 dB per element	235 dB	223 dB	260 dB.
Pulse Duration	Variable 6 to 100s. Never longer than 10s at single freq.	1–2 s	1–2 s	0.02 s.
Inter-pulse Time	6 to 15 min	24 s	24 s	9–14 s.
Center Frequency	100–500 Hz	2.6 & 3.3 kHz	6.8, 7.5, & 8.2 kHz	Broadband.
Bandwidth	30 Hz	100 Hz	100 Hz	Wideband.
Source Depth	Array 87 to 157 m. Center 122 m	8 m	6 m	6–10 m.
Beamwidth	Omni-directional in horizontal	40 degrees	30 degrees	Function of freq.

TABLE 1.—COMPARISON OF UNDERWATER ACOUSTIC SOURCE PROPERTIES—Continued

Source type	SURTASS LFA sonar	AN/SQS 53C (MF)	AN/SQS 56 (MF)	Air gun array (LF)
Beam Direction	Horizontal	3 degrees down from horizontal.	Horizontal	Vertical.

MF = mid frequency; LF = low frequency.
Source: D'Spain *et al.* (2006); DON (2001).

Cox *et al.* (2006) provides a summary of common features shared by the strandings events in Greece (1996), Bahamas (2000), and Canary Islands (2002). In addition to use of MF sonar, these included deep water close to land (such as offshore canyons), presence of an acoustic waveguide (surface duct conditions), and periodic sequences of transient pulses (i.e., rapid onset and decay times) generated at depths less than 10 m (32.8 ft) by sound sources moving at speeds of 2.6 m/s (5.1 knots) or more during sonar operations (D'Spain *et al.*, 2006). A number of these features do not relate to LFA sonar operations. First, the SURTASS LFA sonar vessel operates with a horizontal line array (SURTASS: a passive listening system) of 1,500 m (4,921 ft) length at depths below 150 m (492 ft) and a vertical line array (LFA sonar source) at depths greater than 100 m. Second, operations are limited by mitigation protocols to at least 22 km (12 nm) offshore. Therefore, for these reasons SURTASS LFA sonar cannot be operated in deep water that is close to land. Finally, the LFA sonar signal is transmitted at depths well below 10 m (32.8 ft), and the vessel has a slow speed of advance of 1.5 m/s (3 knots).

While there was a LF component to the sonar potentially related to the Greek stranding in 1996, only mid-frequency components were present in the strandings in the Bahamas in 2000, Madeira in 2002, and Canaries in 2002. This supports the logical conclusion that the LF component in the Greek stranding was not causative (ICES, 2005; Cox *et al.*, 2006). In its discussion of the Bahamas stranding, Cox *et al.* (2006) stated, ''The event raised the question of whether the mid-frequency component of the sonar in Greece in 1996 was implicated in the stranding, rather than the low-frequency component proposed by Frantzis (1998).'' The ICES in its ''Report of the Ad-Hoc Group on the Impacts of Sonar on Cetaceans and Fish'' raised the same issue as Cox *et al.*, stating that the consistent association of MF sonar in the Bahamas, Madeira, and Canary Islands strandings suggest that it was the MF component, not the LF component, in the NATO sonar that triggered the Greek stranding of 1996 (ICES, 2005).

Most odontocetes, such as beaked whales, have relatively sharply decreasing hearing sensitivity below 2 kHz. If a cetacean cannot hear a sound of a particular frequency or hears it poorly, then it is unlikely to have a significant behavioral impact (Ketten, 2001). Therefore, it is unlikely that LF transmissions from LFA sonar would induce behavioral reactions from animals that have poor LF hearing, e.g. beaked whales, bottlenose dolphins, striped dolphins, harbor porpoise, belugas, and orcas (summarized in: Nedwell *et al.*, 2004).

New data describing potential mechanisms of harm to marine mammals from sonar are concerned with acoustically mediated bubble growth and resonance. Cox *et al.* (2006) stated that it is premature to judge acoustically mediated bubble growth as a potential mechanism and recommended further studies to investigate the possibility. The analysis by the Navy (Cudahy and Ellison, 2002) and reports from two workshops on acoustic impacts (DOC, 2002; Cox *et al.*, 2006) support the conclusion that resonance from LFA sonar operations is not a ''reasonably foreseeable'' impact. The ICES (2005) report concluded that no strandings, injury, or major behavioral change has yet to be associated with the exclusive use of LF sonar. Please see Final SEIS RTCs 2.5.2 and 4.0.3 for additional discussions.

Therefore, the numerous scientists, who participated in the 2004 Workshop convened by the U.S. Marine Mammal Commission (Cox *et al.*, 2006), and the ICES AGISC (2005), support the logical conclusion that LFA sonar is not related to marine mammal strandings.

The masking effect of the SURTASS–LFA sonar signal will be limited for a number of reasons. First, the bandwidth of the system is limited (30 Hz), and the instantaneous bandwidth at any given time of the signal is small, on the order of 10 Hz. Therefore, within the frequency range in which masking is possible, the effect will be limited because animals that use this frequency range typically use signals with greater bandwidth. Thus, only a portion of the animal's signal would be masked by LFA sonar. Furthermore, the average duty cycle when LFA sonar is in operation, is always less than 20 percent, and based on past LFA sonar operational parameters (2003 to 2007) is nominally 7.5 to 10 percent (as stated in Chapter 2 of the Final SEIS) which means that for 80–92.5 percent of the time there is no risk of animal signals being masked by the LFA sonar signal when LFA sonar is operating. Therefore, within the area in which masking is possible, the effect will be limited because animals that use this frequency region typically use broader bandwidth signals. As a result, the chances of an LFA sonar sound actually overlapping whale calls at levels that would interfere with their detection and recognition would be extremely low. The potential effects of masking are discussed in the Final SEIS RTCs 4.3.1 and 4.3.23.

In regards to biologically significant behaviors, the risk continuum explicitly represents the potential for significant change in a biologically important behavior within the 119 to 180 dB RL range. For additional information, please see the previous discussion on this issue and also the Final EIS (RTCs 4–5.2, 4–5.6, 4–5.12, 4–5.22, 4–6.2, 4–6.3), and Appendix D. The conclusion that the potential effects on the stocks of marine mammals from behavioral changes would be minimal is discussed in the Final SEIS (RTC 4.3.29). It is reiterated that during Phase I of the LFS SRP research, there were times when the test source level was at the higher, operational level. During such test periods received levels at the subject animals were within the range as specified in the research permit and responses were no different than those observed when using lower source levels.

The Miller *et al.* (2000) article ''Whale songs lengthen in response to sonar'' concerning observations of male humpback whales during Phase III of the LFS SRP was addressed in the Final OEIS/EIS RTC 4–5.19 and in NMFS Final Rule RTC SIC16 and SIC17. Fristrup *et al.* (2003) used a larger data set from Phase III to describe song length variability and to explain song length variation in relation to LF broadcasts. In spite of methodological and sample size differences, the results of the two analyses were generally in agreement, and both studies indicated

that humpback whales tend to lengthen their songs in response to LF broadcasts.

The Fristrup *et al.* (2003) results provide a detailed picture of short-term response as compared to behavioral variation observed in the absence of the stimuli. These responses were relatively brief in duration, with all observed effects occurring within 2 hours of the last LFA sonar source transmission. It should be noted that these effects were not salient to the acoustic observers on the scene, but were revealed by careful statistical analyses (Fristrup *et al.*, 2003). Aside from the delayed responses, other measures failed to indicate cumulative effects from LF broadcasts, with song-length response being dependent solely on the most recent LF transmission, and not the immediate transmission history. The modeled seasonal factors (changes in density of whales sighted near shore) and diurnal factors (changes in surface social activities) did not show trends that could be plausibly explained by cumulative exposure. Increases in song length from early morning to afternoon were the same on days with and without LF transmissions, and the fraction of variation in song length that could be attributed to LF broadcast was low. Fristrup *et al.* (2003) found high levels of natural variability in humpback song length and interpreted the whales' responses to LF broadcasts to indicate that exposure to LFA sonar would not impose a risk of dramatic changes in humpback whale singing behavior that would have demographic consequences.

The effects of SURTASS LFA sonar on fish are discussed elsewhere in this document. Based on the analysis in the Final SEIS, Chapter 4.1, it is not believed that marine mammal prey species will be affected by SURTASS LFA sonar.

Comment 45: The proposed rule-making cites the ICES report on sonar (which was written partly by non-independent scientists receiving funding from U.S. or Royal Navy, or working for the U.S. government), but does not cite the conclusions or reports from the IWC Scientific Committee (SC) (which consists of several hundred international, independent scientists), whose concerns include lack of monitoring and inappropriateness of current mitigation measures.

Response: The SEIS cited the ICES report, which was written by experts in the marine field. The SEIS also cited the Journal of Cetacean Resources Management, which is published by the IWC. Since no citation was provided by the commenter, it is unclear which IWC publication the comment refers to. The SEIS cited Cox *et al.* (2006), which was published in the Journal of Cetacean Resources Management. This article discusses monitoring and mitigation, focusing on beaked whales, but the monitoring and mitigation discussion was not specifically discussed in the Final SEIS. The conclusions on monitoring and mitigation state ''Current visual survey efforts to detect beaked whales in areas of acoustic activity are probably ineffective as a mitigation aid. Key limiting factors include sea state, amount of daylight, experience of observers and the diving and surfacing behavior of beaked whales, which makes them either difficult to see or unavailable for visual observation at the surface for long periods of time. For the same reasons, surveys to determine distribution and abundance are also difficult and limited in their reliability. However, additional sensing technologies, such as passive acoustics, active sonar and radar, are currently in development that may increase scientists' abilities to detect beaked whales.'' As discussed in the Final SEIS, the Final Comprehensive Report and NMFS' Proposed Rule, the agencies recognize that visual monitoring is limited, particularly due to the factors such as sea state and daylight, as discussed in Cox *et al.* (2006). The final rule also requires passive acoustics, estimated to be 32 percent effective with visual monitoring and active acoustics, the HF/M3, which has a calculated effectiveness of 95 percent. The use of this tri-partite monitoring raises overall mitigation effectiveness to 98 percent. Therefore, the Navy will conduct the monitoring and mitigation measures recommended in Cox *et al.* (2006).

Comment 46: The Navy's assessment of the risk of marine mammal injury and mortality from LFA sonar use is deficient. The problems with the Navy's calculation of thresholds for injury and behavioral disturbance, (mentioned previously in their October, 2006 letter) carry through to its analysis of the risk of injury.

Response: NMFS does not agree. The Navy believes that the unusual or innovative nature of LFA sonar is what sets it apart from other anthropogenic sources, especially tactical, mid-frequency sonar and makes it much less likely to cause strandings of those marine mammals most associated with anthropogenic sound-related strandings (i.e., odontocetes, especially beaked whales). First, odontocetes generally have poor LF hearing. Second, the LFA sonar transmit array depth is well below 10 m (33 ft) and thus not likely to be entrained in a surface duct. Third, the 6 to 15 minute off-time in between 60-second transmissions and narrow bandwidth (30 Hz) generally preclude masking.

SURTASS LFA sonar has been operating since 2003 in a restricted area in the western Pacific Ocean, with approximately 470 hours of transmit time under the first four years of the LOAs. These extensive operations, with mitigation, have produced no known Level A takes on marine mammals. As noted before, LFA sonar is not the same as MFA (please see the Comment 44 in this document and the Final SEIS RTC 4.0.3 and 4.3.7). There is no evidence that SURTASS LFA sonar has caused injuries below or within the 180-dB mitigation zone as verified by mitigation monitoring requirements of the LFA sonar safety zone. Therefore, the 180-dB injury threshold remains valid, as does the effectiveness of the mitigation measures within the 180-dB potential injury zone.

The potential for SURTASS LFA sonar to cause harm to marine mammals and the validity of the 180-dB injury threshold for SURTASS LFA sonar are discussed in the Final SEIS RTCs 4.0.1, 4.0.2, 4.0.3, 4.3.1, 4.3.2, 4.3.7, 4.3.8, 4.3.9, 4.3.10, and 4.3.12. LFA sonar will not cause physical harm to marine mammals below 180 dB RL. Moreover, mitigation within the 180-dB mitigation zone is effective (See the Final EIS Subchapter 2.3.2.2).

Comment 47: The Navy wrongly dismisses mechanisms of sonar injury to marine mammals that would cause harm independent of stranding events. The Navy portrays a leading theory that whales suffer from bubble growth in organs that is similar to decompression sickness, or ''the bends'' in human divers as a controversial hypothesis. The Navy and NMFS cannot omit the numerous published, peer-reviewed papers that support this theory, or disregard the recognition bubble growth has received from expert panels, such as the one convened in 2004 by the Marine Mammal Commission to review sonar-related strandings. The Navy's analysis of injuries to whales leaves out a possibility that has been widely noted in literature, that some of the observed injuries are a result of behavioral changes, such as rapid surfacing or premature diving, that sonar could induce. In describing the 2000 Bahamas stranding event, the Navy places undue reliance on a list of ''contributory factors'' that it feels make a similar event unlikely to reoccur. We do not doubt that certain factors, such as the use of sonar in channels, can increase the risk of harm; but it is abundantly evident from the literature that has emerged since the government's

Bahamas report appeared in 2001 that strandings may well occur in their absence.

Response: NMFS has not dismissed any of the mechanisms of sonar injury to marine mammals that would cause harm independent of stranding events. One form of injury theorized to be caused by marine mammal reactions to sonar is gas-bubble disease. Cox *et al.* (2006) (which is the only reference cited by the commenter on this issue) stated that gas-bubble disease, induced in supersaturated tissues by a behavioral response to acoustic exposure, is a plausible pathologic mechanism for the morbidity and mortality seen in cetaceans associated with mid-frequency sonar exposure. They also state that it is premature to judge acoustically mediated bubble growth as a potential mechanism and recommended further studies to investigate the possibility. Since the Draft SEIS was published, there has been additional information available on this theory. If acoustically mediated bubble growth does prove to be the mechanism leading to mortality and/or strandings of beaked whales, then the fact that LFA sonar has not been associated with any of these strandings would indicate that it would be less likely to cause this effect.

Comment 48: In addition, the Navy has failed to consider most of the mass beaked whale strandings that have been identified for their association, or possible association, with sonar and the fact that some marine mammal species are especially vulnerable to acoustical injuries. The Navy overestimates the importance of the fact that the long history of strandings associated with military sonar has usually implicated mid-frequency sonar. Many in the scientific community, including NMFS biologists, have expressed concern, based on the best available evidence, that low frequency sound could potentially induce similar effects. The NRDC believes that the Navy places far too much confidence in its assertion that its use of SURTASS LFA sonar in the last few years has not resulted in marine mammal strandings.

Response: While NMFS shares this concern, to date, SURTASS LFA sonar has not been linked with any stranding events, other than by name association with MF sonar. This was discussed previously in this document. As related to LFA sonar, the Navy performed extensive research to determine the potential for LF transmissions to cause significant behavioral effects in whales (the LFS SRP).

Given that the LFA sonar sound source can be detected at moderate to low levels over large areas of the ocean, there was concern at the initiation of the Navy's NEPA process in 1996 that there was the potential for large percentages of species stocks to be exposed to moderate-to-low received levels. If animals are disturbed at these moderate-to-low exposure levels such that they experience a significant change in a biologically important behavior, then such exposures could potentially have an impact on rates of reproduction or survival. Knowing that cetacean responses to LF sound signals needed to be better defined using controlled experiments, the Navy helped develop and supported the three-year LFS SRP beginning in 1997. This study focused on baleen whales because, as low frequency hearing specialists they are believed to be the most sensitive to LFA sound and thus most likely to have an adverse behavioral reaction. This field research program was designed to address three important behavioral contexts for baleen whales: (1) Blue and fin whales feeding in the southern California Bight; (2) gray whales migrating past the central California coast; and (3) humpback whales breeding off Hawaii. Taken together, the results from the three phases of the LFS SRP do not support the hypothesis that most baleen whales, who are expected to be most sensitive to LF sounds, exposed to RLs near 140 dB would exhibit disturbance behavior and avoid the area. These experiments, which exposed baleen whales to RLs ranging from 120 to about 155 dB, detected only minor, short-term behavioral responses. Short-term behavioral responses do not necessarily constitute significant changes in biologically important behaviors.

Although the LFS SRP did not involve beaked whales, there was no indication during these tests that whales surfaced rapidly or dove prematurely in response to LFA sonar source transmissions. NMFS believes therefore, it is unlikely that, at least for fin, gray and humpback whales exposed to low levels of LFA sonar sounds will not result in the behavioral reactions theorized for beaked whales exposed to MF sonar signals. However, while this does that mean that LF sonar will not cause similar, but presently unknown, reactions in beaked whales, NMFS believes, that based on the best information available, such information does not currently exist. Therefore, NMFS believes, based on our current state of knowledge, it is unlikely that marine mammals would be severely injured by LFA sonar at great distances from the source.

Comment 49: The Navy attempts to discount the well-established link between sonar use and marine mammal injuries and mortalities by suggesting (based on data compiled when acoustic impacts were not generally considered as a potential cause of strandings) that a majority of marine mammals strandings are related to natural causes. Finally, the Navy states, incorrectly, that ''there are no new data that contradict any of the assumptions or conclusions in the Final EIS.'' New data exists linking whale strandings to naval sonar; linking non-stranding injuries in marine mammals to naval sonar; describing mechanisms of harm to marine mammals from sonar; showing unexpectedly high propagation of noise in shallow waters; finding that intense noise sources can mask whale calls over great distances; and revealing the difficulties for noise impacts.

Response: As indicated elsewhere in this response, most marine mammal strandings are unrelated to the use of sonar. While the recognition that there was a link between tactical sonars and beaked whale strandings was slow to develop, that in no way should be interpreted to mean that strandings involving sonar are either common or long-occurring.

NMFS believes the issue for this rulemaking is not whether sonar causes mass strandings of beaked whales, but whether SURTASS LFA sonar has the potential to cause marine mammal strandings. The evidence to date, supported by scientific reports, such as ICES (2005), Cox *et al.* (2006), and D'Spain *et al.* (2006), is that SURTASS LFA sonar has not caused any strandings. In reference to the contributory factors for strandings, the Bahamas 2000 stranding event did not involve LFA sonar. The list of ''contributing factors'' is generally supported by the workshop on understanding the impacts of anthropogenic sound on beaked whales convened by the U.S. Marine Mammal Commission in 2004 (Cox *et al.*, 2006) and the analysis by D'Spain *et al.* (2006). Whether or not surface ducts occurred during other reported strandings is not relevant to LFA sonar operations. First, NMFS believes LFA sonar operations will not cause physical injury to marine mammals at received levels below 180 dB. Second, LFA sonar signals are initially transmitted substantially below 10 m (32.8 ft) depth and are not likely to have signal strength above 180 dB in the surface duct. Surface ducting conditions were analyzed in the Final EIS at a number of the 31 model sites. Therefore, with LFA sonar mitigation, no marine

mammals, either with or without a surface duct, are expected to be exposed to injurious levels of LFA sonar signals.

The evidence to date, supported by scientific reports, such as ICES (2005), Cox *et al.* (2006), and D'Spain *et al.* (2006), is that SURTASS LFA sonar has not caused any strandings. Beaked whales, which hear best in the mid-frequency range appear to be most vulnerable to acoustic-induced stranding. These animals hear poorly in the low frequency range. The LFS SRP specifically studied the behavioral reactions of baleen whales, which hear best in the low frequency range, and thus were concluded to be most at risk (potentially) from the operation of LFA sonar. The three-phase LFS SRP involved more than 20 scientists from 6 universities and independent research groups. The results of the LFS SRP demonstrated that behavioral responses predictably occurred at received levels around 140 dB, not at the lower decibel levels that had been previously predicted. Moreover, the results showed that behavioral responses lasted for only a matter of tens of minutes and involved only modest changes in behavior. These results plus a five-year history of safely operating SURTASS LFA sonar without evidence of strandings or injury supports NMFS conclusion that the system can be operated, with appropriate mitigation measures, in manner that has no more than a negligible impact on marine mammal species and stocks.

In the Final SEIS Subchapter 4.4.3, the Navy discusses both anthropogenic and natural causes of marine mammal strandings. In the conclusion in Subchapter 4.4.3.4, it is stated that military sonar is not the principal cause of marine mammal strandings. There was no conclusion that the majority of marine mammal strandings were related to only natural causes. The Navy did not intend to give the impression that it discounts any scientifically-supported links between anthropogenic sources and marine mammal strandings. However, it will point out that there is no known connection between marine mammal strandings and LFA sonar, which is supported by scientific workshops, reports, and published papers (ICES, 2005; Cox *et al.*, 2006; D'Spain *et al.*, 2006).

Finally, to address the comment that there is no new data to contradict any of the assumptions or conclusions in the Final EIS, in order to address the comment, it must be pointed out once again that there are different types of anthropogenic sounds potentially associated with possible impacts to and strandings of marine mammals. These are naval sonar and seismic airgun arrays, each with different characteristics and purposes. Many comments lump these types under one heading, loud naval sonars or military sonars; or loud anthropogenic noise sources including sonars and seismic survey airguns. Thus, when there is a stranding that may be associated with the use of one type of sonar or sound source, it gets blamed on sonar as a whole-a premise that is not true and one that does not stand up to scientific scrutiny from the marine bio-acoustics community. A wide range of naval sonars are used to detect, localize and classify underwater targets. For the purposes of the SURTASS LFA sonar Final SEIS analysis, these systems are categorized as LFA sonar (less than 1000 Hz) and MFA sonar (1 to 10 kHz). Table 1 provides pertinent information on different types of LFA sonar and MFA sonar. General information is also provided on airgun arrays. Sonar signals are generally coherent while air guns are impulsive.

Cox *et al.* (2006) provided a summary of common features shared by the strandings events in Greece (1996), Bahamas (2000), and Canary Islands (2002). These included deep water close to land (such as offshore canyons), presence of an acoustic waveguide (surface duct conditions), and periodic sequences of transient pulses (i.e., rapid onset and decay times) generated at depths less than 10 m (32.8 ft) by sound sources moving at speeds of 2.6 m/s (5.1 knots) or more during sonar operations (D'Spain *et al.*, 2006). A number of these features do not relate to LFA sonar operations. First, the SURTASS LFA sonar vessel operates with a horizontal line array (SURTASS: a passive listening system) of 1,500 m (4,921 ft) length at depths below 150 m (492 ft) and a vertical line array (LFA sonar source) at depths greater than 100 m. Second, operations are limited by mitigation protocols to at least 22 km (12 nm) offshore. Therefore, for these reasons SURTASS LFA sonar cannot be operated in deep water that is close to land. Finally, the LFA sonar signal is transmitted at depths well below 10 m (32.8 ft), and the vessel has a slow speed of advance of 1.5 m/s (3 knots).

While it is true that there was a LF component of the sonar potentially related to the Greek stranding in 1996, only mid-frequency components were present in the strandings in the Bahamas in 2000, Madeira 2002, and Canaries in 2002. This supports the logical conclusion that the LF component in the Greek stranding was not causative (ICES, 2005; Cox *et al.*, 2006). In its discussion of the Bahamas stranding, Cox *et al.* (2006) stated, ''The event raised the question of whether the mid-frequency component of the sonar in Greece in 1996 was implicated in the stranding, rather than the low-frequency component proposed by Frantzis (1998).'' The ICES in its ''Report of the Ad-Hoc Group on the Impacts of Sonar on Cetaceans and Fish'' raised the same issue as Cox *et al.*, stating that the consistent association of MF sonar in the Bahamas, Madeira, and Canary Islands strandings suggest that it was the MF component, not the LF component, in the NATO sonar that triggered the Greek stranding of 1996 (ICES, 2005).

Most odontocetes, such as beaked whales, have relatively sharply decreasing hearing sensitivity below 2 kHz. If a cetacean cannot hear a sound of a particular frequency or hears it poorly, then it is unlikely to have a significant behavioral impact (Ketten, 2001). Therefore, it is unlikely that LF transmissions from LFA sonar would induce behavioral reactions from animals that have poor LF hearing, e.g. beaked whales, bottlenose dolphins, striped dolphins, harbor porpoise, belugas, and orcas (summarized in: Nedwell *et al.*, 2004).

New data describing potential mechanisms of harm to marine mammals from sonar are concerned with acoustically mediated bubble growth and resonance. Cox *et al.* (2006) stated that it is premature to judge acoustically mediated bubble growth as a potential mechanism and recommended further studies to investigate the possibility. The analysis by the Navy (Cudahy and Ellison, 2002) and reports from two workshops on acoustic impacts (DOC, 2002; Cox *et al.*, 2006) support the conclusion that resonance from LFA sonar operations is not a ''reasonably foreseeable'' impact.

The ICES (2005) report concluded that no strandings, injury, or major behavioral change has yet to be associated with the exclusive use of LF sonar.

Based on the above discussions, there are no ''new'' data: (1) Linking LFA sonar to whale strandings, (2) linking LFA sonar to non-stranding related injuries, or (3) describing mechanisms of harm to marine mammals from LFA sonar.

Regarding unexpectedly high propagation of noise in shallow water, this concerns the measurement of propagation of broadband noise from air gun arrays in both deep and shallow water (Tolstoy *et al.*, 2004). As noted in Table 1, there are substantial differences between the impulsive sounds of air guns and the coherent signals from LFA

sonar, so that one must be careful in how they are compared. First, while Tolstoy *et al.* (2004) found that when their calibrations were conducted in deep water (at 3200 m (10,500 ft)) and slope waters (at 500 m (1641 ft)), the predicted and measured distances to the received level of 160 dB from the air gun arrays indicated that the predicted radii tended to overestimate actual 160 dB RL ranges. (This implied that the 180-dB radii for all arrays should be less than the predicted 1 km (0.54 nm), likely significantly less.) Second, they found that their actual measurements for shallow water (30 m (98 ft)) had been underestimated when compared to the same predicted values used for the deep water comparison. This was due to the model not taking into account interaction with the ocean bottom. In deep, homogenous water, sound initially spreads spherically (spherical spreading) and its intensity decreases in proportion to the square of the range. Once sound has propagated to a distance approximately equal to the water depth, it is physically constrained and propagates cylindrically (cylindrical spreading). When this occurs, its intensity decreases in direct proportion to the range (please see Final EIS, Appendix B). Most importantly, however, SURTASS LFA sonar will not operate in water less than 200 m (656.2 ft), most likely always operating in deep and slope waters. Sound propagation from deep offshore waters onto shallower shelf waters will almost always decrease quickly due to bottom and surface interaction with the sound. This means that LFA sonar sounds will more quickly decrease in intensity in shallow water than in other waters. Lastly, the Tolstoy *et al.*(2004) findings are not applicable to the SURTASS LFA sonar analysis because the propagation models utilized for LFA sonar are empirically validated and correctly account for critical variables, such as water depth (Final EIS Subchapters 4.2, 4.2.1 and 4.2.2; and Technical Report #2).

The masking effect of the SURTASS-LFA sonar signal will be limited for a number of reasons. First, the bandwidth of the system is limited (30 Hz), and the instantaneous bandwidth at any given time of the signal is small, on the order of 10 Hz. Therefore, within the frequency range in which masking is possible, the effect will be limited because animals that use this frequency range typically use signals with greater bandwidth. Thus, only a portion of the animal's signal would be masked by the LFA sonar. Furthermore, when LFA sonar is in operation, the LFA sonar source is active only 7.5 percent of the time (based on historical LFA sonar operational parameters) and no more than 20 percent, which means that for 80–92.5 percent of the time there is no risk of animal signals being masked by the LFA sonar signal when LFA sonar is operating. Therefore, within the area in which masking is possible, the effect will be limited in duration and because animals that use this frequency region typically use broader bandwidth signals that allow them to communicate even when SURTASS LFA sonar is transmitting.

Finally, NMFS does not believe that the Navy has experienced difficulties in executing the mitigation procedures required by NMFS for LFA sonar, which are based on protecting marine animals from injury. Because it is impractical and infeasible for mitigation to cover vast oceanic areas, where the received levels do not cause physical injury to marine mammals or jeopardize threatened or endangered species, the laws provide methods for authorizations for limited non-injurious impacts to marine mammals and listed species. NMFS believes that SURTASS LFA sonar has met all of these requirements and has been operating since 2003-without any known physical injuries to marine animals. Potential non-injurious impacts are estimated based on location and times of operations and best available abundance and density data for the areas and seasons of the operations. These are reported to NMFS both quarterly and annually as required by regulation (50 CFR § 216 Subpart Q).

Comment 50: We don't know the impact of SURTASS LFA sonar on species, stocks, and ecological processes over time. Therefore, NMFS can't say stock-level effects are ''not reasonably likely'' to occur.

Response: When compared to other naturally occurring and anthropogenic sources of noise in the ocean, LFA sonar, barely contributes a measurable portion of acoustic energy in the oceans. Other sources of marine anthropogenic sound that add appreciably to the oceanic ambient noise level are commercial shipping, offshore oil and gas exploration, and other uses of naval sonars (ICES, 2005). Also, the low duty cycle (7.5 to 20 percent) of LFA sonar, the lack of known strandings where LFA sonar has operated, and the results of the LFS SRP support NMFS'' conclusion that SURTASS LFA sonar is neither expected to significantly add to oceanic ambient noise, nor result in significant behavioral responses in marine mamals in waters distant from the LFA sonar vessels, and therefore not likely to have population level impacts. Based on extensive evaluation in the Final EIS and the Final SEIS, the operation of SURTASS LFA sonar, with monitoring and mitigation is not expected to result in lethal takes or serious injury. In addition, no lethal takes are being authorized by NMFS either under this rule or the LOAs issued under the rule. This finding is also supported by the fact that SURTASS LFA sonar has been operating since 2003 in the northwestern Pacific Ocean with no reported Level A (injury) harassment takes or strandings associated with its operations (DON, 2007a). Moreover, there has been no new information or data that contradict NMFS'' finding that the potential impacts from SURTASS LFA sonar operation on any stock of marine mammal will be negligible.

Comment 51: The proposed rule implies that there have been only three sonar-related stranding incidents, when it is known that there have been multiple incidents off the Canary Islands, several likely incidents in the Mediterranean, unusually high rates of strandings adjacent to naval bases in Japan, and published data (in a peer-reviewed journal) of high stranding rates and animals showing signs of acoustic trauma of cetaceans in Taiwan, occurring coincident with U.S. military and Chinese submarine-utilizing exercises, amongst other things.

Response: The Navy's intention in the Draft SEIS was to examine three of the more studied stranding events in which naval sonars were implicated as a potential cause, not to indicate that there have been only three stranding events. The subchapter was expanded in the Final SEIS (Subchapter 4.4.3). However, NMFS believes that the issue is whether SURTASS LFA sonar has caused strandings or could cause strandings in the future. The evidence to date, supported by recent scientific reports, supports the conclusion that the U.S. Navy's LFA sonar is not likely to cause marine mammal strandings. The information supporting this conclusion has been provided in Comment 44 and 47 in this document.

No citation was given with this comment but NMFS assumes that the reference to a recent paper on strandings in Japan refers to the examination by Brownell *et al.* (2004) which evaluated Cuvier's beaked whale strandings from local records between 1950 and 2004 in the waters of Japan. Two facts were presented in this paper: (1) Cuvier's beaked whales stranded in Sagami and Suruga Bays between 1960 and 1990; and (2) U.S. Naval vessels are stationed in Yokosuka, Japan. From these two facts, the authors infer, without any evident support, that the second caused

the first. Based on our review of the paper, we conclude that the authors' assumption is not supported by the available evidence. First, the authors' primary source (Ishikawa, 1994) is not readily available to review because it is in Japanese and no translation was provided except for Table 1 in their report. There are inconsistencies in Brownell *et al.*'s presentation of the data and results, which could not be compared to the cited sources of the data. Table 1 is titled ''Mass strandings of Cuvier's beaked whales Ziphius cavirostris, on the central Pacific coast of Honshu'' and states that the data are from Ishikawa (1994). The number of stranded animals listed from 1960 to 1990 in the table is 47. The first page of their report states ''Ishikawa (1994) reported 68 Cuvier's beaked whales that stranded on the coast of Japan between 1960 and 1993.'' This begs two questions: (1) Where did the remaining 21 beaked whales strand; and (2) why were they not listed? In their results, Brownell *et al.* (2004) state that Ishikawa (1994) records include eight cases of mass strandings (correct, based on Table 1) with a total of 43 individuals (incorrect, based on Table 1, the number should be 35). Finally, general data from the National Science Museum, Tokyo, is provided without citation. Given that the data from Ishikawa (1994) is presented in an inconsistent manner, the museum data is vital for any effective analysis of the Brownell *et al.* (2004) report.

It is inaccurate to state, as the Brownell *et al.* (2004) paper does, that Cuvier's beaked whales are stranding due solely to naval sonar operations. The authors infer several times in the paper that ''naval operations with acoustic components'' or ''the Navy may have tested MFA'' has no foundation and is pure speculation. The ports of Tokyo, Chiba, Kawakai, Yokohama, and Yokosuka are all located on Tokyo Bay, which opens to Sagami Bay. Suruga Bay is separated from Sagami Bay by a large peninsula. Based on the locations, it is most likely that other natural and anthropogenic factors contributed to at least some of the reported strandings. These include dense shipping traffic/shipping-related noise, construction-related noise, dredging, scientific research using active sources, pollution, fisheries interactions, earthquakes, pollution from increased human population, etc.

Therefore, because of the irreconcilable inconsistencies, Brownell *et al.* (2004) do not provide any reliable and supportable linkage between Cuvier's beaked whale stranding events and naval activities in Japanese waters near Yokosuka. The only data that the Navy could confirm were that there is a major U.S. naval base there and that the area is also home to five major Japanese seaports, including Tokyo, one of the world's busiest seaports, with an average of 33,000 vessels arriving annually.

At the time the Final SEIS was published, a non-citable paper describing stranding events in Taiwan was being circulated. Even though the Navy requested but was not given permission by the authors to cite the paper, the strandings are reported to have occurred in the winter of 2004 and were part of the SEIS stranding assessment. These strandings were reported in the Cetacean Stranding Database (*http://www.legaard.org/strandings/index.html*), which was utilized as part of the overall marine mammal stranding evaluations in both the Final SEIS and the Final Comprehensive Report (DON, 2007a, 2007b). The review of recent stranding data from the National Science Museum of Tokyo, Japan; the Cetacean Stranding Database; other Internet sources; and international reports, did not indicate any stranding events associated with the times and locations of LFA sonar operations in the northwestern Pacific Ocean.

The authors of the initial report on the 2004 Taiwan strandings have now published their findings in the Journal of Cetacean Research and Management (Wang and Yang, 2006). This paper also includes additional Taiwanese stranding events in the winter and summer of 2005. A review of these additionally reported strandings events did not indicate any association with the times and locations of SURTASS LFA sonar operations.

The commenter also states that the paper provides data of unusually high rate of strandings in Taiwan and cetaceans showing signs of acoustic trauma, occurring coincident with U.S. military and Chinese submarine-utilizing exercises, amongst other things. NMFS does not agree and believes that the commenter misstates the conclusions drawn in the Wang and Yang (2006) paper. While the information in the paper on the examination of the stranded animals is presented in a clear manner, the authors state that it was impossible to determine the reason for the stranding events. Although the authors opined that the injuries noted in at least one stranding (beaked whale) was from acoustic trauma, the evidence presented does not necessarily support this as the only possible conclusion. But in any event, SURTASS LFA sonar was not implicated in any of these events, as there was no spacial or temporal coincidence between the strandings and the operation of the SURTASS LFA sonar system. The relationship of at least one of the Taiwanese stranding events to naval maneuvers is based on conjecture, not facts.

Comment 52: It is disingenuous to state that at-sea use of LFA sonar since the 1980s has had no impacts. The U.S. Navy has deployed the system but instigated no program to monitor its impacts while being used at sea. Stocks of cetaceans in areas where the system has now been used have not had before- or after-use assessments. For all we know, the system could have had severe impacts, but without a robust research program it is impossible to say.

Response: NMFS does not believe that is a correct assessment. First, NMFS recognizes that an ocean basin effects study would be difficult to undertake, take years to carry out, and would need to ensure that marine mammals were not being affected by other factors, such as shifting food sources due to oceanographic parameter shifts, natural population fluctuations, coastal whaling, incidental take in commercial fishing operations etc. in order to be successful. Although the Navy has not conducted real-time at sea distance sampling for potential impacts, NMFS does not have reason to believe that LFA sonar is having impacts sufficient to have population level effects occur. The potential for impacts on affected marine mammal species was partially addressed by the LFS SRP as discussed previously in Comment 47 and elsewhere in this document. Also, NMFS believes the results from the BRS study (discussed elsewhere in this document) will provide additional information on whether impacts on this potentially sensitive species to anthropogenic sounds is likely.

For additional information on potential impacts on sonar sounds on marine mammals, the Navy's ONR sponsors significant research to study the potential effects of naval activities on marine mammals. In 2004 and 2005, Navy funded research produced approximately 65 peer-reviewed articles in professional journals. Publication in open professional literature through peer review is a benchmark for the quality of the research. This ongoing marine mammal research includes hearing and hearing sensitivity, auditory effects, dive and behavioral response models, noise impacts, beaked whale global distribution, modeling of beaked whale hearing and response, tagging of free ranging marine animals at-sea, and radar-based detection of marine

mammals from ships. Under NMFS 2002 Final Rule, the Navy was required to conduct research. The Navy developed and has been conducting a Long Term Monitoring Program (LTM) Program. The program is designed to: (1) Provide a summary of the unclassified SURTASS LFA sonar operations each year; (2) Provide a summary of unclassified plans for the following year; (3) Assess the efficacy of mitigation measures used during the past year, as well as the value-added from the various LTM elements with recommendations for improvements; (4) Provide a synopsis of LOA reports to NMFS on estimates of percentages of marine mammal stocks affected by SURTASS LFA sonar operations to help confirm the validity of the impact analyses, particularly pertaining to the adequacy of scientific information; and (5) Assess any long-term ecological processes that may be exhibiting effects from SURTASS LFA sonar operations, and reports or scientific papers on discernible or estimated cumulative impacts from such operations.

Since commencing operations in 2003, the *R/V Cory Chouest* and the USNS IMPECCABLE completed 40 missions from January 2003 through August 2006 under the first four LOAs. The general areas are known to the public because they are based on the Court Injunction, published in the Final SEIS and incorporated into the NMFS LOAs. The locations and times of LFA sonar active operations are reported to NMFS quarterly (classified report) as required in the first Final Rule and annual LOAs (50 CFR § 216.186). These operations, with mitigation, have produced no known Level A takes on marine mammals as reported in the Annual Reports (DON, 2003a; 2004a; 2005a; 2006a) and the Final Comprehensive Report (DON, 2007a) to NMFS under 50 CFR § 216.186. To date, there have been no reported Level A harassment (injury) takes from LFA sonar transmissions. Level B harassment is calculated based on the times and locations of LFA sonar operations. Both are submitted to NMFS in quarterly reports, including dates/times and locations of the active LFA sonar missions.

Finally, even the single stranding event where LF sonar was operating, the 1996 Greece stranding, has been addressed. According to Cox *et al.* (2006) and ICES (2005), since a MF component was also used in the Greece stranding, and MF sonar components were implicated in the Bahamas (2000), Madeira (2002), and Canaries (2002) strandings, the LF component in the Greece stranding was not causative.

Comment 53: The active component of the SURTASS LFA sonar operations should not take place off the Atlantic Coast of the United States due to impacts on the North Atlantic right whale.

Response: NMFS disagrees. The area from the coastline to the 200 m (656-ft) isobath of the North American East Coast is protected as an OBIA year-round which protects the North Atlantic right whale migration route and its critical habitat from SPLs greater than 180 dB. As right whales predominantly inhabit coastal waters, and as this OBIA extends the 12-nm (22-km) coastal standoff to 40 nm (74 km) off Drum Inlet, NC and 80 nm (148 km) off Long Island, NY, effects on North Atlantic right whales are expected to be limited to, at most, some Level B (behavioral) harassment and have a negligible impact on the species.

Marine Mammal Cumulative Impact Concerns

Comment 54: How can NMFS ignore the trend that the evidence substantiating a wide range of anthropogenic acoustical impacts is increasing, and also ignore that the Navy's assertions regarding the LFA sonar's safety of operation continue to be unsubstantiated? The trends are clear to any reasonable observer, but by ignoring contrary evidence NMFS give the appearance of arbitrary compliance with the Navy's assertions.

Response: While NMFS agrees that anthropogenic sources of underwater sound in the ocean is increasing (as addressed elsewhere in this document) with a likely increasing impact on marine mammals, NMFS does not agree that we are ignoring contrary evidence on the impacts of LFA sonar on marine mammals. All information to date implicates MF sonar, not LF sonar. NMFS notes that the Navy has conducted an investigation of stranding records and this investigation has not indicated a relationship between LFA sonar operations and marine mammal strandings, as addressed in more detail elsewhere in this document (see, for example Comments 18, 31, 33, 45, 48, and 52). Therefore, if LFA sonar is having an unknown, but serious impact on marine mammals, that impact has not manifested itself through strandings, observable surface behavioral patterns, or deceased marine mammals within an operation area.

Comment 55: In its discussion of acoustic impacts, the Draft SEIS is flawed because it dismisses cumulative and synergistic effects by minimizing the magnitude of the potential impacts and explaining away the unavoidable impacts with promises of ineffectual mitigation measures.

Response: Cumulative and synergistic effects by SURTASS LFA sonar operations are discussed in the Final SEIS (see also RTCs 4.1.9, 4.3.23, 4.3.30, 4.4.27, 4.6.2, 4.6.6, 4.6.16, 4.6.25, 4.6.27, and 4.6.29). In order to effectively evaluate potential cumulative effects of SURTASS LFA sonar, it is necessary to draw comparisons between LFA sonar and other sources of anthropogenic effects. As such, SURTASS LFA sonar was compared to anthropogenic noise levels and injury/lethal takes from other anthropogenic causes.

As discussed previously, Dr. John Hildebrand provided a comparison of anthropogenic underwater sound sources by their annual energy output (Hildebrand, 2005). This analysis included SURTASS LFA sonar, in which he estimated that on an annual basis four SURTASS LFA sonar systems would have a total energy output two orders of magnitude less than seismic air gun arrays and one order of magnitude less than MF sonar and super tankers. This is discussed also in more detail in the Final SEIS (RTC 4.6.19). this information. Therefore, given that all sonars (MF and LF included) account for only 10 percent of the marine anthropogenic noise budget, and SURTASS LFA sonar's energy output using 4 systems is estimated at an order of magnitude less than MF sonar, the contribution of LFA sonar to the total noise budget is trivial, and the potential for adverse cumulative or synergistic effects as a result of LFA sonar use are unlikely.

As stated in the Final SEIS (Subchapter 4.6.3), SURTASS LFA sonar is not likely to cause lethal takes of marine mammals. This is supported by the ICES (2005) report that stated, ''No strandings, injury, or major behavioural change has yet been associated with the exclusive use of low frequency sonar.''

Comment 56: How many vessels is the Navy planning for, and what will be the worldwide cumulative impact of all LFA sonar operations?

Response: The Navy analyzed potential impact of deploying up to four vessels in the Final EIS and the Final SEIS. This final rule does not authorize more than four vessels for SURTASS LFA sonar operations. Therefore, the number of systems has not increased over the number initially proposed in the Final EIS and impacts to marine mammals remain capped by the requirements that the activity have a negligible impact over the 5-year period that the regulations are in effect.

The Final SEIS (Subchapter 4.6) discussed cumulative impacts, including other military sonars, whaling, by-catch and entanglement, ship strikes, oil and gas exploration, geophysical research, and shipping in terms of noise. It states that, even if considered in combination with other underwater sounds (from the aforementioned activities), the SURTASS LFA sonar systems do not add appreciably to the underwater sounds to which fish, sea turtles, and marine mammals stocks are exposed. See also the Final SEIS RTCs 4.6.5, 4.6.6, 4.6.7, 4.6.8, 4.6.13, 4.6.14, 4.6.19, 4.6.20, 4.6.21, 4.6.22, and 4.6.23 for additional information on cumulative impacts.

Comment 57: It is necessary to consider the impacts of the Navy's training with LFA sonar alongside those of existing naval activities as well as those of industrial and commercial activities such as fishing, shipping, and geophysical research. The Navy seems to believe that it can satisfy the requirement to assess cumulative impacts by cataloguing the ways in which impacts from LFA sonar are small compared with the totality of threats faced by marine mammals.

Response: Cumulative impacts are addressed under NEPA, not section 101(a)(5)(A) of the MMPA. Cumulative impacts on marine mammals from activities other than SURTASS LFA sonar have been addressed in the Navy's Final EIS and Final SEIS. The requirement under the MMPA is for NMFS to determine (among other things) that the total taking by the activity (not by the activity and all other activities) is having a negligible impact on affected species and stocks of marine mammals. This has been done in this rulemaking document. In that regard, the Navy's LFS SRP concluded that behavioral impacts to marine mammals at greatest risk are likely to be relatively minor, and thus are unlikely, even in the presence of other stressors taken cumulatively, to alter the health of the species.

In regards to stating that the impacts of LFA sonar are small compared to other activities, as indicated by the LFS SRP, NMFS believes that while significant changes in biologically important behavior can occur to marine animals at significant distances from the LFA sonar source, these impacts will affect relatively few mammals at these distances. The Navy has assessed this potential impact by employing the risk continuum approach as discussed in the Final EIS. For those areas which are outside of the area covered by the risk continuum, the received LFA sonar signal is approximately that of the ambient environment. Thus, the signals do not add appreciably to the ambient noise levels, and therefore do not accumulate, or collect, to greater effects. The conclusion reached in the Final EIS (Subchapter 4.4.4) that even when considered in combination with other underwater sounds, SURTASS LFA sonar does not add appreciably to the underwater sounds that fish, sea turtle and marine mammals are exposed to, remains valid.

Comment 58: Marine mammals may surface too rapidly to escape the sounds and suffer from the bends.

Response: Tissue damage and acoustically mediated bubble growth were examined in the Final SEIS, Subchapter 4.3.1 and RTCs 4.0.3, 4.3.12, 4.3.33, 4.3.4, 4.3.42, 4.3.43, 4.3.44, 4.3.45, 4.3.46, 4.3.47, 4.3.48, 4.3.49, 4.3.50, 4.3.51, 4.3.52, and 4.3.53.

Comment 59: What about animals that die but never surface?

Response: NMFS and the Navy recognize that absence of evidence is not the same as no effect or impact (Final EIS, Comment 4–5.11). However, based on the extensive analyses of the Final EIS and Final SEIS, including the results of the LFS SRP, the results of five years of operations and with monitoring and mitigation measures, SURTASS LFA sonar operations have not been known and are not expected to cause any Level A harassment (injury) or death.

Effects on Other Marine Species

Comment 60: SEAFLOW states that we have no idea what the consequences of SURTASS LFA sonar operations will be to the many other animals in the ocean that make up the marine habitat, but are not identified in the MMPA, ESA, and NEPA.

Response: Under NEPA, analyses must be conducted that include the entire marine environment that has the potential to be affected, not just marine mammals and listed species. Please see Chapters 3 and 4 of Final EIS and Final SEIS for a full discussion and analysis of these potential impacts of SURTASS LFA sonar on the marine environment.

Comment 61: 90 percent of the ocean pelagic predators have been depleted (Myers and Worm, 2003).

Response: Myers and Worm (2003) discuss the decline in large predatory fish biomass. However, the decline is due to industrialized fisheries, not due to SURTASS LFA sonar. Recent studies have shown that SURTASS LFA sonar will likely have a negligible effect on fish, as stated in Subchapter 4.1 of the Final SEIS.

Comment 62: In addition to the target species, a wide variety of marine species can be found within the exposure area, including other marine mammals, sea turtles, invertebrates, teleost and elasmobranch fish, and sea birds. The proposed activity is not designed to expose just one target species. WSPA notes that the sounds to be administered will have unknown (and unmonitored) effects on other animals (e.g., prey species) that may occur in the exposure area thereby subjecting the identified ''affected species'' to additional indirect effects.

Response: When using SURTASS LFA sonar, the Navy's target is to identify potentially hostile submarines, it does not ''target species'' during its operations. The Navy applied for an authorization for the incidental taking of those marine mammal species specified in the application and analyzed impacts to all potentially affected species (including marine mammals, sea turtles, invertebrates, fish, sharks, and sea birds) in Chapters 3 and 4 of the Final EIS and SEIS.

Comment 63: WSPA is concerned that the impacts of the proposed activities could have a more damaging effect on younger animals in the exposed groups.

Response: See the Navy's response in the Final EIS, Comment 4–4.2.4. It states the primary factors increasing risk to a marine species would be a more pelagic and deeper distribution of animals in the water column. No clear examples were identified during the analyses in which juveniles rather than adults met these criteria. For marine mammals, this analysis is further supported by the LFS SRP. Further, coastal marine mammal species would likely receive lower SPLs thereby further protecting calves and juveniles from offshore LFA sonar operations (but not from other coastal anthropogenic sounds).

Impacts on Marine Mammal Habitat

Comment 64: The U.S. Navy has not provided any evidence that the SURTASS LFA sonar system is harmless to the marine environment. The Draft SEIS offers no new information to suggest that SURTASS LFA sonar will not harm marine life.

Response: NMFS believes that the Final SEIS and the Final EIS contains a full analysis of SURTASS LFA sonar and the effects on the marine environment. The potential for SURTASS LFA sonar operations to cause harm to marine invertebrates is discussed also in SEIS RTC 3.2.5 while impacts to marine fish are discussed in SEIS RTC 4.1.4, and impacts to marine mammals are provided in RTCs referenced in SEIS RTC 4.3.6.

Since the Final EIS was published in early 2001, there has been additional research published in a peer reviewed journal that supports the 180-dB criterion for injury as being a conservative level for assessing potential injury to marine mammals. Laurer *et al.* (2002) exposed rats to 5 minutes of continuous high intensity, low frequency (underwater) sound (HI LFS) either at 180 dB SPL re 1 microPa at 150 Hz or 194 dB SPL re 1 microPa at 250 Hz, and found no overt histological damage in brains of any group. Also, blood gases, heart rate, and main arterial blood pressure were not significantly influenced by HI LFS suggesting that there was no pulmonary dysfunction due to exposure. This published paper was based on work performed in support of Technical Report #3 of the SURTASS LFA sonar Final EIS.

From 2003 to 2006, the University of Maryland conducted a series of studies to test the effects of high intensity LFA sonar on fishes. These studies, which tested the effects of an actual LFA sonar transducer, examined the changes in hearing capabilities, changes in the mechanical structures of the ear, and the effects on other organ systems, including the swim bladder and brain. Detailed information on the experiment is provided in the Draft SEIS (pp. 4 10 to 4 22). Popper *et al.* (2007) shows that there is no permanent hearing loss in either species studied (the rainbow trout (*Onchorynchus mykiss*), a close relative of endangered and listed salmonid species, and the channel catfish (*Ictalurus punctatus*), an example of a hearing specialist). Both species showed some temporary hearing loss. This was not of great magnitude, and hearing returned to normal within a day or so after exposure. Results suggest no effect on other organ systems; for example, the swim bladder in fish exposed to the LF sonar signal was completely intact. Moreover, all animals survived the experiments and none died, even several days after exposure. The sound levels (up to 193 dB rms re: 1 microPascal2 at 196 Hz RL) used in these experiments approached those that fish would encounter very close to an active LFA sonar source array (within 200 m (656 ft)). However, the exposure during experiments was very likely more substantial (e.g., experimental exposure to either 324 or 628 seconds) than any a fish would encounter in that the fish were exposed to multiple replicates of very intense sounds, whereas any fishes in the wild would encounter sounds from a moving source, and the successive emissions from the source would decrease in intensity as the ship moved away from exposed fish.

To date, no evidence has been provided that supports the hypothesis that ''SURTASS LFA sonar can do great harm to fish stocks.'' The SEIS discussed several studies which examined fish catch rates before and after presentations of sounds from seismic air guns (SEIS Subchapter 4.1.1.4). These studies noted a temporary decline in catch rate for trawls and longlines. The Navy points out that the exposure to seismic air guns was over a much longer time frame than those projected for LFA sonar. Moreover, there are significant acoustic differences between the impulsive sounds of air guns and the coherent sounds of LFA sonar. Thus, at this time it is scientifically premature to extrapolate from these studies to LFA sonar. Since exposure times to LFA sonar is significantly shorter than to seismic air guns, it is reasonable to suggest that any behavioral effects from LFA sonar signals will be minor and transitory.

Other Marine Life Concerns

Comment 65: The commenter is concerned with the effects of sound energy on marine life. They request we promulgate restrictions which will protect marine mammals from hazards. These restrictions need only be ones of common sense, such as: (1) Avoiding known sensitive feeding, breeding or rearing grounds and migration routes within federally designated critical habitat areas when conducting naval exercises; (2) Using passive technology to determine the presence of marine mammals and avoid using active sonar while in their presence, as defined by the distance necessary to avoid harm; (3) Cease active sonar operations if marine mammals are observed, particularly if observations are compatible with fear, stress displays, or abandonment of young; (4) Not using active sonar in confined, shallow, coastal waters where marine mammals are likely to congregate; and (5) Not exceeding the level sonar energy which has been scientifically documented to be below the threshold of injury to the exquisitely sensitive organs of hearing.

Response: NMFS (and the Navy) agree with these mitigation measures, which are all already in place. Please see Monitoring and Mitigation sections in this rule for details.

Mitigation Concerns

Comment 66: The Navy promises only to turn off LFA sonar if they spot or detect whales in a very small area around the ships. Since the impacts of underwater sound, both to do physical harm to whales and also to disrupt and harass whales' and dolphins' own communication, feeding, and orientation, cover enormous distances, these mitigation measures are too paltry to protect the health of whales and dolphins.

Response: Implementing a shutdown zone of approximately 2 km (1.1 nm) around the LFA sonar unit will ensure that no marine mammals are exposed to an SPL greater than about 174 dB. This is significantly lower than the 180-dB used for other acoustic projects for protecting marine mammals from injury. As shown in this document and elsewhere, SURTASS LFA sonar is not expected to cause physical injury to marine mammals below 180 dB RL. The 180 dB injury criterion is based on scientific documents and research, which are provided in the Final EIS (Subchapter 1.4.2.1, and Chapter 10 and RTCs 4 4.9, 4 5.1, 4 6.1, 4 6.13, and 5 2.1). In NMFS' 2002 Final Rule for the operation of SURTASS LFA sonar (67 FR 46721 89), we discussed the 180-dB criterion (see RTC SIC44 through SIC49).

Since the Final EIS was published in early 2001, there has been additional research published in a peer reviewed journal further supports the 180-dB criterion for injury as being a conservative level for assessing potential injury to marine mammals. As described elsewhere in this document, Laurer *et al.* (2002) research supported the findings in Technical Report #3 of the SURTASS LFA sonar Final EIS. Also, the potential for SURTASS LFA sonar to cause harm to marine mammals and the validity of the 180 dB injury threshold for SURTASS LFA sonar are discussed in the Final SEIS (RTCs 4.0.1, 4.0.2, 4.0.3, 4.3.1, 4.3.2, 4.3.7, 4.3.8, 4.3.9, 4.3.10, and 4.3.12).

Regarding strandings, the best available scientific evidence supports a conclusion that beaked whales are the primary species of concern, and that mid-frequency active sonar, not LFA sonar, when combined with other factors, is the sonar most likely implicated. Also, most odontocetes have relatively sharply decreasing hearing sensitivity below 2 kHz. If a cetacean cannot hear a sound or hears it poorly, it is unlikely to have a significant behavioral impact (Ketten, 2001). Therefore, it is unlikely that LF transmissions from LFA sonar would induce behavioral reactions from animals that have poor LF hearing, such as beaked whales. While it is highly unlikely, the sounds could damage tissues even if the animal does not hear

the sound, but this would have to be occur within the 180 dB sound field (within 1,000 m (3,280 ft)) of the transmit array. The likelihood of a marine mammal entering the 180 dB sound field is considered highly unlikely due to the detection effectiveness of the Navy's HF/M3 sonar. Therefore, NMFS believes that the tripartite monitoring program has a high probability of detecting the presence of marine mammals prior to potential injury. This will be discussed later in this document. Finally, NMFS discusses the potential for masking marine mammal communications and hearing elsewhere in this document.

Comment 67: The Federal Court that struck down the Navy's earlier EIS wrote: '' endangered species, including whales, listed salmon and sea turtles, will be in LFA sonar's path. There is little margin for error without threatening their survival.'' The court therefore urged the Navy to consider protective measures such as wide coastal exclusion zones, more effective surveys for whales before sonar exercises, shut down procedures for fish, and the use of training areas that present less risk to marine life. The Navy's proposed authorization rejects each of these ideas.

Response to the first point: The choice of 46 km (25 nm) was selected because it was just over twice the current coastal exclusion restriction, and seaward of the hypothetical shelf break for all three shelf cases examined in its analysis. The Philippine Sea dual criteria alternative referred to by the commenter (111 km (60 nm) from the coast or 56 km (30 nm) seaward of the 200 m (656 ft) isobath, whichever is greater) was negotiated in a mediated settlement. The Final EIS analysis was based on a coastal geographic restriction of 22 km (12 nm); whereupon it was incorporated into the Navy's ROD, NMFS's 2002 Final Rule and subsequent LOAs. In the Navy's good faith attempt to respond to a Court identified deficiency relating to the number of alternatives considered, additional alternatives were analyzed in the Draft SEIS, including more than doubling the coastal standoff range. The results, which are too complex to discuss in detail here, are summarized in Final SEIS Subchapter 4.7.6. This analysis indicates that increasing the coastal standoff range decreases exposure to higher RLs for the concentrations of marine mammals closest to the shore (shelf species) but does so at the expense of increasing exposure levels for shelf break species and pelagic marine mammal species. Increasing the range to 56 km (30 nm) or even 111 km (60 nm) (criteria from the Permanent Injunction) would not make a significant difference in the outcome. However, coastal shelf areas, in many cases, are already excluded. The Final SEIS Table 2–4 delineates OBIAs that are also a coastal shelf exclusion zones. For example, the North American east coast exclusion zone includes all shelf waters landward of the 200-m (656-ft) isobath between 28 deg N to 50 deg N latitude, west of 40 deg W longitude. This is a year-round restriction and encompasses the Northern Right Whale Critical Habitat, the Stellwagen Bank National Marine Sanctuary (NMS), the Monitor NMS, and the Gray's Reef NMS.

Response to the 2nd Point. The Stipulation Regarding Permanent Injunction issued on October 14, 2003, by the U.S. District Court for the Northern District of California, as agreed to by the parties stated the Navy was not required to conduct ''pre operation surveys'' as described in the Court's Opinion and Order. In response to the Opinion and Order, the Navy provided an evaluation of the use of small boats and aircraft for pre operational surveys in the Draft SEIS Subchapter 5.4. That evaluation demonstrated that small boat and pre operational aerial surveys for SURTASS LFA sonar operations are not practicable, not effective, may increase the harassment of marine mammals, and are not safe for the observers. In addition to small boats, small aircraft surveys were also suggested. This issue was addressed in SEIS Subchapter 5.4 which provided a detailed discussion of why aerial and small craft surveys were not considered a viable mitigation option. The possible harassment of marine mammals from these surveys was only one factor in this consideration. Please see SEIS RTCs 5.4.1, 5.4.2, and 5.4.3 for additional information.

Comment 68: The Navy proposes to retreat from the mitigation measures it currently uses to protect marine life in its operation of LFA sonar today, including wide exclusion zones of 30 to 60 nm (55.6–111 km), 1-km (0.43-nm) buffer zone, 330 Hz limit on frequency. It shrinks the safety zone around transmitting ships, removing three quarters of the buffer currently required by NMFS. It eliminates the restrictions imposed by NMFS to operate the system only at frequencies below 330 Hz. The MMPA's mitigation standard has not been met, nor has the agency prescribed mitigation sufficient to make an affirmative finding of negligible impact [and] the Navy's new permit application * * * fails to adopt or severely shortchange each of these mitigation measures.

Response: Wider exclusion zones are discussed in Comment 67. The one-km (0.54 nm) buffer zone was an interim operational restriction added by NMFS in the 2002 Final Rule. An analysis by the Navy demonstrated that the removal of this restriction will not appreciably change the percentage of animals potentially affected. However, NMFS has again included the one-km (0.54 nm) buffer zone in its rule for SURTASS LFA sonar to further protect against marine mammals entering the 180 dB isopleth.

The 330-Hz frequency restriction was an interim operational restriction added by NMFS in the 2002 Final Rule to preclude the potential for injury to marine mammals by resonance effects. That restriction was based on a statement made by Dr. Darlene Ketten, an expert on the functional morphology of marine mammal hearing, in her testimony before the Subcommittee on Fisheries Conservation, Wildlife and Oceans of the House Committee on Resources on October 11, 2001 (Ketten, 2001). The Navy's Final SEIS states that the NMFS acoustic resonance workshop ruled out resonance, but stated that the report provided part of the evidence required by NMFS that resonance and/or tissue damage from LFA sonar transmissions were unlikely to occur in marine mammals at levels below 190 dB (Final SEIS Subchapter 2.5.1). DOC (2002) states that it seemed unlikely that acoustic resonance in air spaces played a primary role in tissue trauma in the Bahamas and other events. Nevertheless, they suggested continued research. While the Marine Mammal Commission workshop did not discuss in detail the results of the NMFS acoustic resonance workshop, it endorsed three recommended areas of study: (1) Beaked whale lung resonance throughout the dive profile; (2) potential for other organs and structures to be affected by resonance; and (3) possibility that animals experience tissue shear (Cox *et al.*, 2006). At this time, there is no information available that supports an increase in the probability of LFA sonar to cause injury to marine mammals through resonance in the frequency range of 330 to 500 Hz. The frequency requirements for the CLFA sonar to be installed onboard the VICTORIOUS Class vessels are above 330 Hz, but still within the 100 to 500 Hz range as stated in both the Final EIS and Final SEIS. After conducting a full review of resonance in its Final SEIS, the Navy concluded, and NMFS agrees, that effects from resonance are unlikely and that there is no need to retain the 330-Hz restriction.

A full analysis of the mitigation measures was conducted in the Final SEIS, Chapter 5. Further, mitigation measures have been discussed in this document. NMFS believes that use of SURTASS LFA sonar consistent with these regulations meets the MMPA mandate that takings be reduced to the lowest level practicable.

Comment 69: The Navy's take application proposes to abandon or severely curtail existing protections. Every one of its alternatives would allow the Navy to train with LFA sonar throughout 75 percent of the world oceans. It withdraws from a court-ordered extended coastal exclusion zone, reverting to the originally proposed (and rejected) zone of 12 nm (22 km).

Response: Please see previous responses on the comment regarding LFA sonar operation in 75 percent of the world's oceans. As for the coastal exclusion zone, in the Navy's good faith attempt to respond to a court-identified deficiency, additional alternatives were analyzed in the Draft SEIS, including more than doubling the coastal standoff range. The results summarized in Final SEIS Table 4.7.7 indicate that increasing the coastal standoff range does decrease exposure to higher RLs for the concentrations of marine animals closest to the shore (shelf species) but does so at the expense of increasing exposure levels for shelf break species and pelagic species. Increasing the range to 56 km (30 nm) or even 111 km (60 nm) would not make a significant difference in the outcome.

In addition, if the Navy does operate at 12 nm from the coast, there are potential benefits over operating farther from shore. Analysis of the geometry, bathymetry, sound propagation, and animal densities in a variety of sample areas revealed that the overall risk to marine mammals is lower when SURTASS LFA sonar is operated at 12 nm from shore than when it is operated at 25 nm. First, a smaller volume of ocean is ensonified. For example, the estimated volume exposed to a received level of 155 dB decreases by 21%. This is due, in part, to shallower water depths closer to shore. In addition, in the majority of scenarios studied, when all biological factors were taken into account, including marine mammal densities, the risk incurred by moving closer to shore decreased or remained the same. Given the Navy's stated need to have the flexibility to use the system closer to shore if training, testing, or military operational demands required it, and in light of evidence demonstrating that operation at 12 nm from shore created less impact on marine mammals than a larger coastal exclusion zone, NMFS determined that a smaller coastal exclusion zone was warranted and consistent with its obligation under the MMPA to prescribe ''other means of effecting the least practicable adverse impact,'' while taking into account ''personnel safety, practicality of implementation, and impact on the effectiveness of the military readiness activity.'' Naturally, if the Navy's operational needs did not require it to take advantage of the additional flexibility offered by the narrower coastal exclusion zone, then the potential benefits would not be realized, and the impacts would remain the same as before under the broader coastal exclusion zone.

Comment 70: The Draft SEIS does not state at what distance from the source the 180 dB RL isopleths will occur, but in the mitigation section repeatedly refers to the ''mitigation zone.'' Clarification of the distance from the source at which a RL of the 180 dB is expected should be included.

Response: The distance to the 180-dB isopleth is given in the Final EIS on pages 2–14, 2–18, and 5–1, which were incorporated by reference into the Final SEIS. Under normal operating conditions, this zone will vary from 0.75 to 1.00 km (0.4 to 0.54 nm) from the source array, ranging over a depth of approximately 87 to 157 m (285 to 515 ft). This information was added to the appropriate section in Final SEIS Chapter 2. In addition, NMFS has continued the requirement for the Navy to establish a ''buffer'' zone extending an additional 1 km (0.54 nm) beyond the 180-dB isopleth. Any marine mammals detected within the 180-dB zone or the 1-km (0.54-nm) buffer zone will result in a shut-down of the SURTASS LFA sonar array and a power-down of the HF/M3 sonar so that the marine mammal(s) detected are not subject to LFA sonar sounds in excess of 180 dB.

Comment 71: In regards to monitoring, the Draft SEIS does not state how much training these personnel will receive, how their level of expertise will be measured, the amount of refresher training that will be done, or if these ship personnel will have to perform other duties when they are conducting observations. The Draft SEIS also does not state how many trained marine mammal observers will be used at any one time or where they will be positioned on the ship, except at the topside. SURTASS LFA sonar should cease during hours of darkness when the chances of spotting a marine mammal or turtle approximate zero.

Response: As stated in NMFS' 2002 Final Rule (RTC MOC 8), personnel trained in detecting and identifying marine animals will make observations from the SURTASS LFA sonar vessel. At least one observer, qualified by NMFS, has trained, tested and evaluated other visual observers. Visual observation effectiveness estimates will be provided to NMFS in accordance with LOA reporting requirements.

Because of the limitations of both passive acoustic and visual monitoring, the Navy developed the HF/M3 sonar to provide effective 24-hour, all-weather active acoustic monitoring of an area of approximately 2-km (1.1 nm) radius from the array. The HF/M3's detection effectiveness is calculated at 95 percent standing alone and is not dependent on the time of day. For further information see sections on mitigation and monitoring in this rule and the Final SEIS, Chapter 5, and the Navy's Final Comprehensive Report, Chapter 2.

Comment 72: The use of passive acoustic monitoring to listen for vocalizing marine mammals as a complementary detection method to visual observation is a good idea. However, to use the SURTASS array for this purpose would limit detections to those animals vocalizing within the bandwidth of the system. Most marine mammals would therefore not be detected.

Response: This topic was addressed in Final EIS, Subchapter 4.2.7.1. In calculating the effectiveness for the various monitoring systems for purposes of the Final EIS analyses, the passive monitoring component of the three-part monitoring system was estimated at 0.25, or 25 percent. Because of the limitations of both passive acoustic and visual monitoring, the Navy developed the HF/M3 sonar to provide 24-hour, all weather active acoustic monitoring.

Comment 73: The protocol described in the Draft SEIS for reacting to a detected animal is based on a subjective and mission-impacting judgment call by the array technician who has to decide if the detected animal might be impacted by the SURTASS LFA sonar. In all likelihood, such decisions are unlikely to be made in favor of the animal when the consequence is the shut down of operations and chance of incurring the disfavor of peers and superiors.

Response: NMFS has no reason to question that the Navy would not fully comply with the mitigation and monitoring requirements for the SURTASS LFA sonar operations operations which mandate non-operation or shutdown of the sonar source if a marine mammal is detected

within 2 km of the source. For further information on mitigation and monitoring, please see the Final SEIS, Chapter 5, and the Final Comprehensive Report, Chapter 2.

Comment 74: The Draft SEIS does not state what the full power levels of the HF/M3 will be but merely states that RLs will not exceed 180 dB and does not give distances from the HF/M3 source. A mitigation measure that adds more noise to the environment is illogical.

Response: The general operating characteristics of the HF/M3 sonar have been provided in the Final EIS (p. 2–17). The source level is 220 dB re 1 microPascal at 1 m. HF/M3 sonar testing and effectiveness are discussed in the Final EIS (pp. 2–19 through 2–22) and the Final SEIS RTC 5.2.20. As a mitigation measure, the HF/M3 sonar is ramped up from 180 dB SL to full power over 5 minutes in 10 dB increments (Final SEIS, Subchapter 5.2.3).

There is recent scientific evidence that sonars, similar to the HF/M3, which are in common use in the fishing and maritime industries, do not harm marine life. In a recently published paper, Benoit-Bird *et al.* (2006) examined the hypothesis that marine mammals acoustically stun their prey by exposing three species of fish commonly preyed upon by odontocetes to pulsed signals at 18 kHz, 55 kHz, and 120 kHz with exposure levels from 193 dB (peak-to-peak), 208 dB (peak-to-peak), and 213 dB (peak-to-peak), respectively. They observed: (1) No measurable changes in the behavior for any of the species during the exposures; (2) no noticeable change in swimming activity; (3) no apparent loss of buoyancy; (4) no movement away from the transducer; and 95) no mortality. Despite the use of signals at the maximum source levels recorded for odontocetes clicks, the researchers could not induce stunning or even disorientation in the fish tested.

In addition, a requirement to ramp-up the HF/M3 ensures that marine mammals are detected by the HF/M3 sonar at the lowest sound level possible. If a marine mammal is detected during ramp-up within the 180-dB sound field or 1-km (0.54-nm) buffer zone, further increases in power are not initiated until the animal is no longer detected. At that time, ramp-up would continue unless that animal, or another, was detected. The HF/M3 sonar effectiveness has been discussed in a report by Ellison and Stein (2001), which is available to the public on the SURTASS LFA sonar Web site at *http://www.surtass-LFA sonar-eis.com/Download/index.htm*. In addition, a paper on this subject was presented at the 2001 Acoustical Society of America meeting (Stein *et al.*, 2001).

For additional information please see Final EIS Subchapter 4.2.7.3 and RTCs 5–2.4, 5–2.11, 5–2.12, 5–2.13, 5–2.19, 5–2.21, and 5–2.22; and NMFS 2002 Final Rule RTCs MOC10, MOC12, MOC14, and MOC17.

Comment 75: The commenter is concerned by the mention of the use of a high frequency sonar system to detect whales. Has this undergone an appropriate environmental assessment? Has a take authorization been issued for animals that this might impact? Have the cumulative impacts of low and high frequency systems being used in conjunction been considered?

Response: As stated in the SURTASS LFA sonar Final EIS (RTC 5–2.21), the HF/M3 sonar is basically a fish-finder type sonar with similar frequency ranges and power output as many commercial fish finder sonars. These sonar types are commercially available and used worldwide, and are unregulated. The potential impacts of the HF/M3 sonar are discussed in Subchapter 4.2.7.3 in the Final EIS. If a marine mammal is detected during ramp-up within the 180-dB sound field or the 1-km (0.54-nm) buffer zone, further increases in power are not initiated until the animal is no longer detected. At that time, ramp-up would continue unless that animal, or another, was detected. It was concluded that the impacts of the HF/M3 sonar when utilized using the above supplemental safety measures would have negligible impacts. Therefore, the environmental documentation requirements for the HF/M3 sonar have been met by the Final EIS. This analysis from the Final EIS remains valid. Additionally, as required by the first Final Rule, the HF/M3 has undergone further analyses of effectiveness in the Navy's Final Comprehensive Report (2007a) and, to remain in compliance with this Final Rule, the Navy is required to analyze the HF/M3 over the next five years.

The cumulative impacts of LFA sonar and other military and commercial sonars used in conjunction have been addressed in the SEIS Subchapter 4.7.1. Because of the differences in the signal characteristics between LFA sonar and the HF/M3 sonar, synergistic effects are unlikely to occur. The HF/M3 is discussed further in Comment 74.

Comment 76: NMFS must establish that LFA sonar operational mitigations are adequate prior to granting this Authorization. No one has proven that the LFA sonar visual and acoustic detection mitigations actually work under realistic scenarios. There has been enough time to produce something of value; why has NMFS not required the Navy to validate detection mitigations, and instead accepted assertions and models? There have been no directed scientific research efforts to validate that the LFA sonar mitigations reliably detect marine mammals and turtles within the buffer zone under realistic scenarios and conditions, and no research to confirm that the LFA sonar operations are modified by delays or shutdowns whenever individuals of species of concern are actually within or about the enter the zone? The Commission expressed similar concerns in its July 24, 2007 letter. This lack of proof renders baseless the Navy's assertions of adequate shutdowns during yearly operations, because no one knows how many cetaceans and turtles were actually inside the buffer zone during previous LFA sonar operations, no one studied what happened over a reasonable time to those that were within a kilometer, and no one studied actual behavioral impacts over wider ranges and times.

Response: NMFS and the Navy have stated the limitations of the visual and passive acoustic detection systems previously. However, as stated in Subchapter 2.3.2.2 of the Final EIS, the HF/M3 sonar has undergone both qualitative and quantitative assessments of the system's ability to detect marine animals of various sizes and was verified in seven sea trials between 1998 and 2000. In addition, LFA sonar has been operating since 2003 in a restricted area in the northwestern Pacific Ocean with a total of 470 hours of transmit time under the first four LOAs (DON, 2007). These operations, with mitigation, have produced no known Level A takes on marine mammals. NMFS regulations require the Navy to delay or suspend operation of SURTASS LFA sonar whenever a marine mammal is detected within 2 km (1.1 nm) of the sonar source by any means. NMFS has no reason to believe that the Navy has not complied with these requirements and, in fact, the Navy's reports indicate that use of the sonar has been delayed or suspended on many occasions in compliance with the regulations. Further information on mitigation effectiveness is provided in the Annual Reports required under the LOAs (DON 2003, 2004, 2005, 2006, and 2007). Additional analyses have been provided in the Navy's Final Comprehensive Report (DON, 2007). Finally, NMFS is unaware of a practical way to validate the number of animals underwater and outside the LFA sonar mitigation (shutdown) zone to verify the number of Level B takes by harassment. We are

also unsure whether the commenter is recommending research on the number of Level A (injury) harassment takes which (unless surrogate species are used) have the potential to result in injury to marine mammals during the course of research on the effectiveness of the tri-partite mitigation monitoring program. This ethical concern is a reason why the LFS SRP was limited to SPLs below 160 dB.

An evaluation of the effectiveness of the monitoring and mitigation measures has been provided to NMFS in the Final Comprehensive Report (DON, 2007) submitted under 50 CFR 216.186(c). This report is available to the public (see **ADDRESSES**). Estimated marine mammal densities are determined for each potential LFA sonar operations area proposed in the annual requests for LOAs under the current regulations. The 180-dB safety and 1-km (0.54-nm) buffer zones were monitored at all times during LFA sonar active transmissions as required by NMFS 2002 Final Rule (50 CFR 216.185 and 50 CFR 216.186) and the conditions of the LOAs as issued. In addition, available stranding data from the operating areas are continuously reviewed, and no strandings have coincided spatially or temporally with LFA sonar operations.

Comment 77: Why doesn't NMFS challenge detection methods as being compromised during a significant portion of the LFA sonar's operating envelope? Visual detections of marine turtles near one kilometer are unlikely during flat calm conditions, experts testify that only a very small percentage of nearby beaked whales will ever be seen and all visual detections become moot with medium sea states, night, and some weather operations.

Response: NMFS and the Navy agree that visual monitoring has a low detection probability. The Navy stated in several documents, including its Final Comprehensive Report (Navy, 2007) that the detection probability from visual monitoring is approximately 9 percent. For this reason, the Navy uses an active acoustic monitoring system, the HF/M3.

The HF/M3 sonar was specifically developed to improve detection of marine mammals and potentially sea turtles, through active acoustic detection, ensuring that they are not within the LFA sonar mitigation zone during SURTASS LFA sonar transmissions. It provides 24-hour detection for marine animals, even during poor visibility conditions. Analysis and testing of the HF/M3 sonar operating capabilities indicates that this system substantially increases the chances of detecting marine mammals (and possibly sea turtles) within the LFA sonar mitigation zone (i.e., inside the 180-dB safety and 1-km buffer zone sound fields). The probability of detection of various marine mammals is presented in the Final EIS, Figure 2–5. The potential for SURTASS LFA sonar to cause harm to marine mammals and the validity of the 180-dB injury threshold for SURTASS LFA sonar are discussed in Final SEIS (RTCs 4.0.1, 4.0.2, 4.0.3, 4.3.1, 4.3.2, 4.3.7, 4.3.8, 4.3.9, 4.3.10, and 4.3.12).

Comment 78: Acoustic detection requires that the marine animals in the path of the buffer zone make sounds, but current research does not validate that they do so sufficiently for anyone to expect to detect even a small percentage of animals included in, or in the path of the buffer zone. Can NMFS deny that the total acoustical output from the LFA sonar vessel and associated vessels may cause acoustically active animals to be more silent, rendering the acoustic monitoring moot?

Response: In calculating the effectiveness for the various monitoring systems for purposes of the Final EIS analyses, the passive monitoring component of the tri-partite monitoring system was estimated at 0.25, or 25 percent. Because of the limitations of both passive acoustic and visual monitoring, the Navy developed the HF/M3 sonar to provide 24-hour, all weather active acoustic monitoring. The HF/M3 was tested and the results were discussed and analyzed in the Final EIS and in Technical Report 3 (Ellison and Stein, 2001). This topic is also addressed in Final EIS Subchapter 4.2.7.1.

In regards to animals changing their vocal behavior, the following response is a summary of the information provided in the Final EIS.

Given that the LFA sonar sound source can be detected at moderate to low levels over large areas of the ocean, there was concern at the initiation of the NEPA process in 1996 that there was the potential for large percentages of species stocks to be exposed to moderate-to-low received levels. If animals are disturbed at these moderate-to-low exposure levels such that they experience a significant change in a biologically important behavior, then such exposures could potentially have an impact on rates of reproduction or survival. Knowing that cetacean responses to LF sound signals needed to be better defined using controlled experiments, the Navy helped develop and supported the three-year LFS SRP beginning in 1997. This field research program was designed to address three important behavioral contexts for baleen whales: (1) blue and fin whales feeding in the southern California Bight, (2) gray whales migrating past the central California coast, and (3) humpback whales breeding off Hawaii. Taken together, the results from the three phases of the LFS SRP do not support the hypothesis that most baleen whales exposed to RLs near 140 dB would exhibit disturbance behavior and avoid the area. These experiments, which exposed baleen whales to RLs ranging from 120 to about 155 dB, detected only minor, short-term behavioral responses. Short-term behavioral responses do not necessarily constitute significant changes in biologically important behaviors.

These results have been supported by recent, peer reviewed papers. Croll *et al.* (2001a) studied the effects of anthropogenic LF noise (SURTASS LFA sonar) on the foraging ecology of blue and fin whales off San Nicolas Island, California. Overall, the whale encounter rates and diving behavior appeared to be more strongly linked to changes in prey abundance associated with ocean parameters than to LFA sonar transmissions. In some cases, whale vocal behavior was significantly different between experimental and non-experimental periods. However, these differences were not consistent and did not appear to be related to LF sound transmissions. At the spatial and temporal scales examined, Croll *et al.* (2001) stated that they found no obvious responses of whales to a loud, anthropogenic, LF sound.

Both Miller *et al.* (2000) and Fristrup *et al.* (2003) published on the results of tests conducted with male humpback singers off Hawaii in which they evaluated variation in song length as a function of exposure to LF sounds. In spite of methodological differences, the results of both studies indicated that humpback whales slightly increased their songs in response to LF broadcasts. Fristrup *et al.* (2003) found that the fraction of variation in song length that could be attributed to LF broadcast was low and concluded that the effects of LF broadcast did not impose a risk of dramatic changes in humpback whale singing behavior that would have demographic consequences. Therefore, it is not believed that the use of active acoustics will dramatically change the vocalizations of acoustically active animals.

Comment 79: Does NMFS believe that the geographical mitigations are the only areas the LFA sonar may cause significant effects? If previous LFA sonar operations actually were conducted in areas with near-zero marine animals of concern, future operations certainly will be in the areas with significant populations. Again, without adequate detection, how can NMFS know that takes will not be excessive?

Response: As noted in the Final SEIS (Subchapter 2.5.2.1), for the purposes of obtaining an LOA, SURTASS LFA sonar operations are planned in advance for areas with reduced risk by avoiding areas of high marine life concentrations to the greatest extent feasible considering national security tasking. This process is detailed in the Final SEIS (Subchapter 4.4). Also, please see RTCs CSI–1, 2, 3, and 4 in this document. However, it is erroneous to say that the area in which SURTASS LFA has been operated for the last five years had ''near-zero'' marine animals. There are virtually no parts of the ocean that can be accurately described as ''oceanic deserts'' devoid of marine life. While some areas are better studied than others, it would be a mistake to assume that simply because data is lacking on marine mammal abundance the area is devoid of marine mammals. Thus, in selecting areas where the Navy will and will not operate LFA sonar, we must rely on what is known about marine mammal concentrations and attempt to avoid them, continue to fill knowledge gaps through additional research, and recognize that, by necessity, we are regulating in a dynamic area of science.

Comment 80: Without adequate detection, how can NMFS know that takes will not be excessive?

Response: As discussed previously in this document, NMFS believes that the tri-partite mitigation measures, particularly the HF/M3 sonar will be capable of detecting over 95 percent of all marine mammals within the 180 dB range. In addition, since detection is excellent out to the edge of the buffer zone, marine mammal detection will be more than adequate and will prevent Level A injury and mortality. Also please see the Navy's Final Comprehensive Report (DON, 2007).

Comment 81: Because there has been no participation by scientific experts on any LFA sonar mission cruises over several years there is no reliable documentation of observed and probably numbers of cetaceans and turtles that may have been within the LFA sonar's buffer zone, general surrounding area, or track line.

Response: According to the Navy, utilization of third-party marine biological visual observers is not feasible. First, there is no available berthing for additional personnel on the LFA sonar vessels. To accommodate visual observers(s), it would require the reduction of the number of operational personnel on the vessel, which would reduce mission effectiveness. Moreover, because of the nature of the missions, third-party observers would require security clearances. Although it is possible for these personnel to obtain the proper security clearances, the time and cost of applying for security clearances for these individuals is high. Please see NMFS' 2002 Final Rule (RTC MOC32) for further discussion.

However, while third-party observers during military operations are not practicable, NMFS has recommended certain research projects be undertaken by the Navy, during which non-Navy scientists would be participants.

Comment 82: The Navy fails to consider additional mitigation measures that would mitigate LFA sonar's impact on marine species, including, the Navy's failure to extend the coastal zone and instead disputes that greater exclusion zones would be beneficial to marine species. The Navy has failed to present sufficient modeling and analysis.

Response: In order to answer the question of whether a standoff range farther from the coast would, in fact, generate fewer marine mammal takes, a generic analysis was performed (Final SEIS Subchapter 4.7.6). This analysis was not portrayed in the Final SEIS as a modeling effort, but as a ''generic analytical methodology for coastal standoff range comparison'' as clearly stated in the Final SEIS. As further stated, ''The methodology used to assess the change in potential impacts to marine animals was designed to utilize several sets of simplified assumptions in order to determine a relative trend in these potential impacts for a variety of oceanic and biological conditions. This approach allows one to assess the trends without the extensive process of modeling all the conditions that exist.'' This was a method of relative analysis of 3 shelf cases vs. 3 biology types (yielding 9 different combinations of the factors) for each of two potential coastal standoff cases to estimate relative impacts.

Comment 83: The Navy fails to consider all reasonable alternatives for expanding its coastal exclusion zones.

Response: See Comment 67 and the Final SEIS (Subchapter 4.7.6 and RTCs 4.7.12, 4.7.13, 4.7.14, nd 4.7.15.) for response.

Comment 84: The Navy has done very little to respond to the Court's holding with respect to additional offshore exclusion areas. Five of the seven OBIAs in the Navy's preferred alternative were already included in the 2002 Final Rule, among those places where received levels were capped at 180 dB, and thus are not additional mitigations at all.

Response: NMFS has continued in these regulations a means to propose OBIAs, from any source, including the public. NMFS will accept petitions for OBIAs in accordance with 50 CFR 216.191. Additionally, based on the conclusions of the Final SEIS and previous NMFS Biological Opinions on LFA sonar (2002–2006), SURTASS LFA sonar is not likely to affect fish or sea turtles. The analyses in the Final EIS and Final SEIS support the conclusion that LFA sonar operations are not likely to cause injury to marine mammals, and minimal potential to cause significant changes in biologically important behaviors.

Under NMFS' first five year rule (50 CFR 216.191) concerning the designation of additional OBIAs, no nominations have been received.

Comment 85: One of the central flaws of the 2001 Final EIS was its failure to consider concentrating training with LFA sonar into specific, low impact areas, rather than spreading it around the globe.

Response: See Comment 67.

Comment 86: The Navy rejects NMFS' 360-degree, one km buffer zone extending out from the 180 dB isopleths.

Response: See Comment 68.

Comment 87: The Navy rejects the 330 Hz restriction imposed by NMFS.

Response: See Comment 68.

Comment 88: The Navy fails to implement the following mitigation measures: LFA sonar ramp-up, third-party marine biological visual observers, acoustic monitoring using existing acoustic nodes and other external platforms, a modification of sonar signal characteristics, avoidance of enclosed areas and coastal areas with complex, steep sea bed topography, lower power levels, wider safety zones, operational procedures in coastal zones that allow escape routes, and meaningful geographic restriction, avoidance of hot-spots.

Response: Ramp-up of the LFA sonar source is not required because the HF/M3 sonar will be ''ramped-up'' prior to LF transmissions to verify that the LFA sonar mitigation zone is clear of marine animals prior to turning on the LFA sonar. Please see Final EIS RTCs 5–2.26 and 5–2.27 and NMFS 2002 Final Rule RTCs MOC19, MOC20, and MOC21 for additional information.

As mentioned previously, utilization of third-party marine biological visual observers is also not feasible due to berthing concerns and security clearances. Please see Comment 81 in this document and the NMFS 2002 Final Rule (RTC MOC32) for further discussion. The Final EIS (Subchapter 5.2.1) states that visual monitoring is required during daylight hours. The effectiveness of visual monitoring declines during high sea states and periods of reduced visibility. Because of

the limitations of both passive acoustic and visual monitoring, the Navy developed the HF/M3 sonar to provide 24-hour, all-weather active acoustic monitoring of an area of approximately 2-km (1.1-nm) radius from the array. Moreover, to the extent that the comment is suggesting this, NMFS has no reason to believe that the Navy is not complying with its obligations under the regulations, and thus there is no need for observers to confirm compliance. The reporting requirement is designed to enable NMFS to verify that its regulations are being followed and to assist NMFS in improving its mitigation requirements.

Monitoring mitigation is designed to preclude marine mammals from being within the 180-dB mitigation zone of the LFA sonar array to protect them from potential injury. This zone is approximately 1-km (0.54 nm) in radius, thus making the use of other existing acoustic nodes (assuming the commenter is referring to fixed arrays such as SOSUS) and other external platforms not only impractical, but virtually impossible. The SOSUS arrays are no longer manned nor maintained, so their operations are degraded and not real-time. Other external platforms would only be vessels of opportunity. Because the SURTASS LFA sonar vessel would have limited or no communications with these vessels and the time delay in relaying information, the use of these platforms is impractical.

NMFS and the Navy do not consider modification of sonar signal characteristics (including reduction in source level) to be a practical mitigation option. First, the analyses and actual operations have demonstrated that the present mitigation methods are effective. The LFS SRP utilized the actual LFA sonar signal, sometimes at full power, with only minor behavioral effects. The Fish Controlled Exposure Experiment also utilized actual LFA sonar signals and source levels with no injury and minimal behavioral responses at received levels up to 193 dB. During the first four LOAs, the LFA sonar vessels completed 40 missions with over 470 hours of actual transmission (sound-in-the-water) with no known Level A harassment takes and Level B harassment takes estimated well within the requirement of the LOAs. Second, wavetrain characteristics and array source levels are optimally designed to detect threat submarines at long distances. Return signals are below ambient levels and any changes would potentially cause degradation in detection effectiveness. Therefore, there is no need for the Navy to consider modification of LFA sonar's signal characteristics, and NMFS is satisfied that doing so would not be practicable and would result in an ''impact on the effectiveness of the military readiness activity.''

NMFS and the Navy concur that LFA sonar operations should avoid enclosed areas and coastal areas with complex, steep seabed topography. First, because of the lengths of both the passive (SURTASS) and active (LFA sonar) line arrays, enclosed areas are avoided. Second, during the annual LOA application process (Final SEIS Subchapter 4.4 and Figure 4.4–1), marine mammal habitats, seasonal activities, and behavioral activities are considered in the process of determining potential mission areas. Thus these areas will be analyzed as part of the annual LOA application process. Therefore, NMFS believes that the Navy avoids planning and conducting LFA sonar operations in areas of known high marine animal densities or ''hot spots.''

As noted in the Final SEIS Subchapter 2.5.2.1, SURTASS LFA sonar operations are planned for areas with reduced risk by avoiding areas of high marine life concentrations. This process is detailed in SEIS Subchapter 4.4. Additionally, nominations for inclusion as OBIA can be made under 50 CFR 216.191, thus providing protection for specific geographic ''hot spots.''

Because SURTASS LFA sonar will have a coastal standoff distance (at least 12 nm (22 km)), any LFA sonar signal heard by marine animals in the coastal zone will come from the same general direction, thus allowing an animal to move laterally away from the signal's source. Also, NMFS has addressed the wider coastal exclusion zone in Comment 67.

Comment 89: The Navy refuses to adopt small-craft pre-operational surveys for marine mammals in missions close to shore. The Court held that such surveys are necessary to protect marine life. The Navy does not consider: The option of using boats launched from shore; the fact that any minor disturbance to marine mammals from small planes and small boats would be far outstripped by the risk of serious injury and death that might result if marine mammals remain undetected in the zone of highest impact; using more than a single small boat if a single small boat is insufficient to task; the fact that the effectiveness of any visual monitoring program, including the one used by the Navy, is diminished by high sea states, low visibility and diving habits of whales, making additional mitigation more important; and the comparative cost of operating LFA sonar in a manner that exposes coastal marine mammals to a higher risk of stranding and other injuries.

Response: As previously mentioned, the Stipulation Regarding the Permanent Injunction issued on 14 October 2003 by the U.S. District Court, Northern District of California, as amended by Order dated July 7, 2005, and as agreed to by the parties, stated that the Navy is not required to conduct ''pre-operation surveys'' as described in the Opinion and Order. In response to the Opinion and Order, the Navy provided an evaluation of the use of small boats and aircraft for pre-operational surveys in the DSEIS Subchapter 5.4. That evaluation demonstrated that small boat and pre-operational aerial surveys for SURTASS LFA sonar operations are not feasible because they are not practicable, not effective, may increase the harassment of marine mammals, and are not safe to the observers. As a result, under this directive and in compliance with the amendments to the MMPA as made by the NDAA FY04, pre-operational surveys are not considered as a viable mitigation measure.

Vessels launched from land were addressed in the Final SEIS. They would have to sail from ports within reasonable distance from the operations site. Because of the classified nature of LFA sonar operations, National Security considerations would preclude the ability to arrange these vessels in advance. However, the primary concern with the utilization of small boats is not their effectiveness, but their unsafe nature and the impracticality of their operations from the LFA sonar vessels. Therefore, if the use of a single survey boat is considered impractical and unsafe, then this would concomitantly apply to the utilization of additional boats.

The Final SEIS did not state that the visual observers onboard the LFA sonar vessels would be able to see marine mammals better than visual observers during aerial surveys, nor were helicopters mentioned. Subchapter 4.2.7.1 of the Final EIS states that visual monitoring is limited to daylight hours and its effectiveness declines during high sea states. Because of the limitations of both passive acoustic and visual monitoring, the Navy developed the HF/M3 sonar to provide 24-hour, all-weather active acoustic monitoring of an area of approximately 2-km (1.1 nm) radius from the array. In calculating the effectiveness for the various monitoring systems for purposes of the Final EIS, the visual monitoring component of the three-part monitoring

system was estimated at 0.09, or 9 percent and the passive monitoring component was 0.25 or 25 percent effective. Utilization of the HF/M3 sonar with an effectiveness value of 0.95 or 95 percent raises the overall mitigation effectiveness to 0.98 or 98 percent (DON, 2007)

When operated under the mitigation protocols required under this rulemaking, NMFS believes that marine mammals will not be exposed to LFA sonar sound levels that will cause injuries or strandings regardless of whether they are in coastal or open ocean waters. As mentioned previously, LFA sonar has never caused, nor is expected to cause, marine mammal strandings.

Comment 90: The AEI suggests a lower allowable threshold for received levels at 22 km from shore, to protect these biologically important areas for received levels at 22 km in response to moderate noise levels. Given the relatively long duration of SURTASS LFA sonar ''pings,'' masking may be more of an issue that it is with impulsive noise sources.

Response: The subject of masking has been addressed in response to several comments in this rule. The Final SEIS states that mitigation measures for SURTASS LFA sonar operations would be conducted such that the sound field is below 180 dB received level (RL) within 12 nm (22 km) of any coastline, including islands. RLs below 180 dB for LFA sonar will not result in serious injury or death. The Final EIS provided detailed analyses of the potential effects of exposure to LFA sonar received levels less than 180 dB for 31 separate sites. These included numerous sites that were at the closest proximity to land based on SURTASS LFA sonar operational limits where biological densities were high. These analyses determined that potential effects from exposures to LFA sonar RLs greater than or equal to 180 dB were negligible and less than 180 dB were minimal. However, during the annual LOA application process for operations close to coastal areas (and OBIAs), the potential for marine mammal stocks to be affected at RLs less than 180 dB are determined, as outlined in the risk assessment approach described in the Final SEIS Subchapter 4.4. As shown in Tables 4.4–2 to 4.4–10 in the Final SEIS, minimal percentages of marine mammal stocks will be affected, which includes the potential to disturb a marine mammal by causing disruption of natural behavioral patterns to a point where the patterns are abandoned or significantly altered.

Comment 91: Why is the continental shelf off the east coast of North America the only shelf area given a broad exclusion? If there are biologically important reasons to keep the SURTASS LFA sonar signal out of this area, then it follows that other parts of the world's coastal margins at depths of less than 200 m (656 ft) should also be protected.

Response: The intention of the 12 nm (22 km) coastal restriction is to provide protection to areas of greater concentrations of marine mammals and their migration routes. The 12 nm (22-km) exclusion zone is not tied to the width of the continental shelf because of the large variability of the shelf's distance from coastlines around the world. For example, on the U.S. eastern seaboard this distance is 60 to 70 nm (111 to 130 km) from the coast while in Hawaii it can be 5 nm (9.3 km) or less. In order to provide protection to biologically important areas outside of 12 nm, several OBIAs have been designated, including one new one with this Final Rule. Because of animal concentrations and migration routes on the eastern seaboard over the continental shelf, this area has been designated as an OBIA in the Final Rule with limits extending to the 200 m (660 ft) isobath for the East Coast of the United States (from 28 N to 50 N west of 40 W) to protect more species. The 12-nm (22-km) restriction includes almost all marine related critical habitats and NMSs. However, some parts of NMSs, that are recognized to be important for marine mammals, are outside 12 nm (22 km). As a result, NMSs have been designated as OBIAs as shown in SEIS Table 2 3 and this Final Rule, and the 12-nm coastal exclusion zone has been increased to include the LFA sonar ''buffer zone'' of 1 km (0.54 nm). This additional mitigation ensures that LFA sonar SPLs are below 174 dB within OBIAs.

Comment 92: With the lone exception of The Gully, no new OBIA outside U.S. waters is even considered by NMFS. For example, the Navy's analysis does not consider any of the areas specifically mentioned in the Court's Opinion as potential OBIAs, such as the southern end of the Oyashio/Kuroshio region off Kamchatka and the area where the Emperor Seamount Chain intersects the Aleutian Rise.

Response: Areas mentioned by the Court's Opinion and Order of August 26, 2003, are Oyashio/Kuroshio area off Kamchatka, and the Emperor Seamount Chain (45 to 55 deg N latitude and 170 to 160 deg W longitude (the Court's Opinion erroneously listed this longitude as 60 degrees. The northern part of the Oyashio/Kuroshio area off Kamchatka is within the Bering Sea, which is a non-operational area as presented in the Final EIS, Figure 1–1. The southern portion of this area and the Emperor Seamount Chain are large ocean expanses. As stated in NMFS' 2002 Final Rule (RTC MIC11), marine mammals in unspecified migration corridors and open ocean concentrations should be adequately protected by the tripartite monitoring and mitigation protocols. Please see comment 93 for further information on OBIAs.

Comment 93: The commenter states that he has worked on Marine Protected Areas (MPAs) worldwide, focusing on marine mammals, and his book ''Marine Protected Areas for Whales, Dolphins & Porpoises'' (2005) details more than 350 existing MPAs for cetaceans and a further 175 areas proposed for protection. There are also 20 countries and territories that have declared their 200 nm EEZs as marine mammal protection zones. If 70 percent of the world ocean is now to be opened to LF sonar ensonification, it is possible that marine mammals in this proposed and existing MPAs will be impacted.

Response: First, NMFS notes that while 70–75 percent of the world ocean will be open to LF sonar operations, that does not equate to LFA sonar operations affecting even close to 70–75 percent of the world's ocean area at any given time. In addition, because most MPAs are mostly located in coastal waters, where LFA sonar will not operate, MPAs are unlikely to receive high SPLs from SURTASS LFA sonar.

NMFS and the Navy did consider adopting MPAs as OBIAs, as shown in the Final SEIS. MPAs are discussed under E.O. 13158 in Chapter 6 and are further discussed in Comment 4.7.19 in Chapter 10. The commenter's book, Hoyt (2005), was also cited in the Final SEIS. Hoyt (2005) states that most MPAs fall within the nation's EEZ limits and most of them are coastal and would therefore fall within the SURTASS LFA sonar coastal exclusion zone. OBIAs are not designated based on speculation on the location and density of animals. As with the first Final Rule, NMFS has in place a process for the public to propose OBIAs. An area must be of particular importance for marine mammals as an area for primary feeding, breeding, or migration, and not simply an area occupied by marine mammals. The proposed area should also not be within a previously designated OBIA or other 180-dB exclusion area. Further information on proposing OBIAs can be found in the Designation of Biologically Important Marine Mammal Areas section of this Final Rule.

Comment 94: NMFS does not consider any MPAs established by countries other than the U.S., such as any of Canada's 9 existing MPAs with cetaceans (with the exception of The Gully), Australia's 38 existing MPAs with cetaceans, or Brazil's 16 existing MPAs with cetaceans—or any of the non-U.S. protected areas discussed in the recent, relevant assessment (i.e., Hoyt, 2005).

Response: We have reviewed previously the areas cited by the commenter and note that they are within the coastal exclusion zone of these nations, as mentioned by Hoyt (2005). NMFS believes that the level of information about marine mammal abundance is lacking for many parts of the world. However, based on its review of the available science, NMFS believes that it has designated all OBIAs that are currently appropriate for designation.

Comment 95: The Navy does not consider any of the biologically significant, globally representative areas compiled in the 1990s by the World Conservation Union (IUCN), in conjunction with the World Bank and the Great Barrier Reef Marine Park Authority: A recent published assessment of beaked whale hotspots, which identifies more than 20 areas of significant global concern based on currently available evidence.

Response: NMFS does not believe that areas that are vaguely described as areas of marine mammal habitation, such as beaked whale ''hotspots,'' meet the requirement for designation as OBIAs. Also, NMFS does not currently have sufficient information on these areas to know if they meet the criteria for an OBIA. In order for NMFS to make a preliminary determination that an area is biologically important for marine mammals, it needs detailed information on the biology of marine mammals within the area, including estimated population size, distribution, density, status, and the principal biological activity during the proposed period of designation sufficient for; and detailed information on the area with regard to its importance for feeding, breeding, or migration for those species of marine mammals that have the potential to be affected by low frequency sounds. Areas within 12 nm (22 km) of any coastline, including offshore islands (which includes most MPAs), or within non-operating areas for SURTASS LFA sonar (Arctic Ocean) are not eligible for consideration. In its comment, the commenter lists other literary sources that give information for designation as OBIAs. However, these, documents do not provide information sufficient for NMFS to begin the designation process outlined in the regulations.

Comment 96: U.S. MPAs are noted in this proposed rulemaking, but MPAs in other countries are not. For example, what about the important marine mammal sanctuary in waters of the Dominican Republic? Or the international Indian Ocean whale sanctuary designated by the IWC? What about MPAs in the south China sea, on the Russian coast, or in the Philippine Sea, some of which are specifically for threatened cetaceans?

Response: NMFS does not consider it necessary to expand the list of OBIAs prior to its making the required determinations under section 101(a)(5)(A) of the MMPA. NMFS established a process for nominating new OBIAs in its 2002 rulemaking. During the past 5 years, NMFS has not received any nominations from the public for new OBIAs. It should be recognized that while NMFS may nominate areas as OBIAs, it does not believe that it should be the sole proponent for nominating areas and that was the reason for allowing it to be a public process following standard rulemaking practice. NMFS recommends however, that areas already subject to significant anthropogenic noise such as seismic and shipping areas within 12 nm (22 km) of any coastline, or otherwise already excluded (Arctic, Antarctic oceans), areas that cannot be geographically described, and areas designated for non-biological reasons (e.g., the IWC's Indian Ocean Sanctuary) not be nominated. Areas being nominated must include sufficient information to indicate why that area warrants more protection than would be provided through the Navy's visual, passive acoustic and HF/M3 monitoring program and 180-dB shut-down procedures.

Comment 97: NMFS has not considered establishing larger buffer zones around even the few exclusion zones it has identified, allowing ensonification in these areas up to 180 dB even though significant impacts on marine mammal behavior are expected well below this level and would rise, according to the Navy's risk function, as pressure levels increase. Allowing the Navy to place the LFA sonar system directly outside the Monterey Bay National Marine Sanctuary (for example) does not, by any argument, reduce impacts to marine mammals in the Sanctuary to the maximum extent practicable.

Response: As a result of the comment, NMFS has reviewed the information it currently has and has determined that by requiring the Navy to maintain approximately 2-km (1.1-nm) stand-off distance from the outer boundary of any OBIA, SPLs within the NMS will be reduced to approximately 174 dB. This means that the LFA sonar vessel must observe both the measured 180-dB zone and the additional 1-km (0.54 nm) buffer zone from the outer edge of all OBIAs. This measure is both practicable for the Navy to implement, will not cause significant impact to the Navy for conducting LFA sonar operations and results in reducing sounds within NMSs to the lowest level practicable.

Comment 98: The Navy will operate LFA sonar without any limitations or mitigation during periods of ''armed conflict or direct combat support operations, (or) during periods of heightened threat conditions.''

Response: Depending upon the situation, the Navy may decide to implement mitigation measures to protect marine mammals. However, that issue is beyond the current rulemaking action. Depending upon the area and duration of activity, NMFS may determine appropriate review necessary prior to issuing new LOAs after cessation of the armed combat situation.

Comment 99: NMFS has reviewed the Annual Reports without requiring any more mitigation measures.

Response: Based on its review of the Annual Reports, NMFS did not believe that additional mitigation was either practicable or warranted. However, as part of its review of the Navy's SURTASS LFA sonar application, and the comments submitted by the public as part of its rulemaking process, NMFS has added The Gully as an OBIA and has added a new mitigation measure to limit sounds entering offshore OBIAs. An analysis of mitigation and monitoring measures has been provided previously in this document.

Monitoring Concerns

Comment 100: The Navy's monitoring over the past five years has been inadequate to gauge the impact the system is having on marine mammals and other species in the western Pacific.

Response: The 180-dB and 1-km mitigation zone was monitored at all times during LFA sonar active transmissions, as required by NMFS 2002 Final Rule (50 CFR 216.185 and 50 CFR 216.186) and LOAs. In addition, as mentioned previously in this document, available stranding data from the operating areas are continuously reviewed, and no strandings are known to have coincided spatially or temporally with LFA sonar operations. Further, an evaluation of the effectiveness of the monitoring and

mitigation measures has been provided to NMFS in the final Comprehensive Report (DON, 2007a) submitted under 50 CFR 216.186(c). Monitoring areas beyond the buffer zone are not practical from the LFA sonar vessel. As a result, NMFS has required the Navy to conduct research in order to monitor potential impacts at some distance from the vessel. For more information on research, please see the Research section of this document.

Comment 101: NMFS should consider prescribing the following monitoring methods: suspension of acoustic exercises outside daylight hours and during periods of low visibility; aerial surveillance for marine mammals; passive acoustic monitoring using the Navy's existing acoustic nodes in certain ranges and operating areas and various other external platforms, and third-party monitoring by marine biologists.

Response: Operations do not need to be suspended during times of reduced visibility, including darkness, because the Navy's HF/M3 sonar is equally effective during these periods at detecting any marine mammals within the area where injury may occur.

Aerial surveillance has been discussed previously in this document (see Final SEIS RTCs EIIs-4, 10, 11). Pre-operational aerial surveys are not practicable mitigation.

Passive monitoring and second vessel monitoring has been addressed in comment 88 and elsewhere. Because the nodes are inoperable and the SURTASS LFA sonar vessel would have limited or no communications with these vessels and the time delay in relaying information, the use of these measures are considered impracticable.

As mentioned previously, utilization of third-party marine biological visual observers is not necessary because visual monitoring is not the primary means of detecting marine mammals and NMFS has no reason to believe that the Navy is not complying with the regulatory requirements, and it is not feasible due to berthing concerns and security clearances. Please see Comments 81 and 88 in this document and the NMFS 2002 Final Rule (RTC MOC32) for further discussion.

Comment 102: NMFS must question why no verification results are available. Why has there been no embedded but independent research concurrent with those Pacific LFA sonar operations?

Response: The SURTASS LFA sonar vessels are military vessels conducting training exercises; they are not research vessels capable of carrying independent research scientists. Also, because these are military vessels, researchers would be required to have a security clearance prior to conducting any research onboard them. As a result, NMFS and the Navy determined that an LTM program provided the best opportunity to verify (or refute) the current findings that impacts will be negligible. The LTM discussion in the Final EIS (and incorporated by reference in the Final SEIS) has been continued under the new regulations. Under NMFS regulations, the Navy is required to conduct an LTM (as discussed in detail elsewhere (see Research Concerns)) . The status of this research was summarized in Table 2–5 of the Draft and Final SEIS. Planning has commenced for a 2007–2008 deep-diving odontocetes BRS to determine the potential effects of LFA sonar, MFA, and seismic sources on beaked whales and other deep diving odontocetes. Further LTM research will bedetermined by the decision-maker in the Navy's ROD and in consultation with NMFS.

Reporting Concerns

Comment 103: Acoustical detections from the continuously operating HF/M3 sonar systems only logged 16 ''events'' in 10 of 16 missions. Visual monitoring logged cetaceans within the buffer zone only on three occasions during all LFA sonar operations. No marine turtles were ever seen. LFA sonar transmissions were delayed or suspended on 33 occasions, many because of system failures or unverified detections, and only one resulted from a sighting of dolphins. Does NMFS accept that the very few sightings in the Annual Reports mean that very few animals were actually present?

Response: The Navy's Final Comprehensive Report indicates that, under the first four LOAs totaling 40 missions, there were 3 visual sightings of marine mammals, no passive acoustic detections, and 71 active acoustic detections. Based on the quarterly, annual, and Final Comprehensive reports, and based on the fact that the Navy avoids areas of high marine life concentrations, NMFS believes the Navy's reports that there have been few marine mammal sightings as an indicator that either few marine mammals are present (low density) or marine mammals are avoiding the immediate area of LFA sonar operations prior to commencing LFA sonar operations.

Research Concerns

Comment 104: In 2003, the Navy was provided a limited area within which to deploy SURTASS LFA sonar. While it has been required to report on mitigation measures taken to prevent or minimize marine mammal takes in the immediate operating area, it has not been required to perform systematic population studies on marine mammals or examinations of stranding incidents and health trends in operating range. Given both the extent of the current range, as well as the far reach of the SURTASS LFA sonar signals, the health of animals ''taken'' in this area alone would be difficult to assess. Given the short period that the U.S. Navy has been operating in a limited deployment area it is difficult to determine any trends in the natural history, biology and behavior of marine mammals subjected to the SURTASS LFA sonar noise.

Response: NMFS' LOAs under Condition 7(d) require the Navy to conduct research in accordance with 50 CFR 216.185(e). The Navy's completed and ongoing research is detailed in the Final Comprehensive Report (DON, 2007a) and in the Final SEIS Subchapter 2.7. See the Final SEIS RTC 5.3.2 for additional information. Baseline data on the distribution and behavior of marine animals are discussed in the Final SEIS RTCs 1.4.1 and 2.7.2. Prioritization of the available research monies by the Navy does not at this time allow for the systematic population studies on marine mammals. Based on recommendations from the scientific community, planning is underway for a 2007–2008 deep-diving odontocetes BRS to determine the potential effects of LFA sonar, MFA, and seismic sources on beaked whales and other deep diving odontocetes.

Reviews of stranding reports in the area showed that there were a total of 19 strandings reported in Asia (four in Taiwan, nine throughout the Philippines, two in Thailand, two in Indonesia, and two in China) (The Cetacean Stranding Database, accessed: 11/28/2006). None of these strandings were coincident either temporally or spatially with LFA sonar operations. See the Final SEIS (RTC 4.4.12) for additional information of strandings.

Comment 105: What has resulted from research projects related to LFA sonar?

Response: Under the NMFS 2002 and 2007 rulemaking and related LOAs for LFA sonar, the Navy is required to conduct research. These topics and their status are provided in the Final Comprehensive Report (DON, 2007). The Navy is working to meet these research requirements. The SURTASS LFA sonar LTM Program has been budgeted by the Navy at a level of approximately $1M per year for five years, starting with the issuance of the first LOA in 2002. Planningis underway for a 2007–2008 deep-diving odontocetes BRS to determine the potential effects of LFA sonar, MFA,

and seismic sources on beaked whales and other deep diving odontocetes at an estimated cost of $3M per year.

Although not directly related to the LFA sonar MMPA regulatory process, the Navy funded independent research to determine the potential for SURTASS LFA sonar signals to affect fish. Popper *et al.* (2007) investigated the effects of exposure to LFA sonar on rainbow trout (a hearing generalist related to several endangered salmonids) and channel catfish (a hearing specialist) using an element of the standard SURTASS LFA sonar source array (Popper *et al.*, 2005; Halvorsen *et al.*, 2006; Popper *et al.*, 2007).

Comment 106: Why is no current effort to quantify and monitor long-term, cumulative, stock-level impacts from LFA sonar mentioned in the LFA sonar 2005 Annual Report?

Response: NMFS recommended this as a research topic. However, detecting and scientifically validating a change in a marine mammal population (e.g., trend, demographics) is extremely difficult. It is also unrealistic to expect a single factor to explain population changes. For LFA sonar, research results indicate that some whales will respond to LFA sonar over relatively short temporal periods and over small spatial areas, though this research was only capable of testing for responses over short time periods and spatial scales. To date, there is no evidence that LFA sonar will have an effect on individual survival or reproductive success, or population trends or demographics. However, because research on the appropriate temporal and spatial scales has not been conducted, questions concerning the level of impact at such scales remain.

Comment 107: A prioritized study of beaked whale habitats is only at the draft planning stage, although considerable work has been done previously to identify likely habitats in certain regions such as the Mediterranean. While this work also may help to identify the critical link between sonars and beaked whale deaths, the primary goal may simply be to identify areas where naval sonars should not operate for test and training.

Response: Research on beaked whales is underway. A list of recently published papers that was the result of funding by ONR and SERDP was provided in Comment 39. Again, it is worth noting that beaked whales appear to be a species sensitive, under certain conditions, to MF sonar, not LFA sonar.

Comment 108: Behavioral reactions of whales to sound levels above 155 dB have not been tested, in part because the Navy has assumed the required authorization would be extremely hard to get, but primarily because expert researchers have been concerned that such received sound levels might have harmed the research subjects. NMFS should review the size of the potential LFA sonar impact zone based upon the 155 dB isopleth.

Response: Estimates of Level B harassment take are calculated using the risk continum from 120 dB to 179 dB, and NMFS considers all marine mammals to be injured at an SPL of 180 dB or greater, considers, even though at 180 dB, marine mammals are unlikely to even incur TTS (Level B harassment). Therefore, NMFS believes reviewing the size of the LFA sonar impact zone based upon the 155 dB isopleth is unnecessary. Originally, there was concern that if marine mammals experience a significant change in a biologically important behavior at moderate-to-low sound exposure levels, then such exposures could potentially have an impact on rates of reproduction or survival. Knowing that cetacean responses to LF sound signals needed to be better defined using controlled experiments, the Navy helped develop and supported the three-year LFS SRP beginning in 1997. This study was designed to assess the potential impacts of SURTASS LFA sonar on the behavior of low-frequency hearing specialists, those species believed to be at (potentially) greatest risk. This field research program was designed to address three important behavioral contexts for baleen whales: (1) Blue and fin whales feeding in the southern California Bight, (2) gray whales migrating past the central California coast, and (3) humpback whales breeding off Hawaii. Taken together, the results from the three phases of the LFS SRP do not support the hypothesis that most baleen whales exposed to RLs near 140 dB would exhibit disturbance behavior and avoid the area. These experiments, which exposed baleen whales to RLs ranging from 120 to about 155 dB, detected only minor, short-term behavioral responses. Short-term behavioral responses do not necessarily constitute significant changes in biologically important behaviors.

These results have been supported by recent, peer reviewed papers. Croll *et al.* (2001a), Miller *et al.* (2000) and Fristrup *et al.* (2003) that were discussed previously in this document.

Comment 109: There has been classified research to determine if large whales are silenced by anthropogenic noise, presumably sonars, but it has occurred in the Atlantic and its applicability to LFA sonar operations is unknown to the public. Has NMFS reviewed this data?

Response: As reported in the Final Comprehensive Report, passive acoustic monitoring for the possible silencing of calls of large whales using bottom-mounted hydrophones is ongoing. Four research efforts in the North Atlantic (NORLANT, 2004, 2005, 2006–01, 2006–02) have addressed this topic. The research reports for these tasks are classified; unclassified summary reports have been produced. Navy funding has supported and continues to support these research efforts. NMFS has not reviewed any data from this classified research.

Comment 110: CSI recommends research with an immediate focus on cetacean fear, aversion, or avoidance responses to sonars.

Response: Under the application for the BRS for Deep Diving Odontocetes, the Navy (and its partners) proposes to examine behavioral responses to anthropogenic sounds. The proposed BRS study has not yet received a scientific research permit (SRP) under section 104 of the MMPA. If an SRP is issued under section 104 of the MMPA, the proposed BRS would first investigate the acoustic exposures of MF sonar, not LF sonar, and natural sounds. If the BRS is successful and if NMFS is able to issue a second SRP, the BRS proposes to then determine the acoustic exposures of LF sonar. The rationale for this is that beaked whales are not known to have good hearing in the LF range, and as such LFA sonar has not been implicated in any stranding events. Additional information on this study can be found at 72 FR 19181 (April 17, 2007).

Comment 111: The Navy's BRS research (72 FR 19181, April 17, 2007) should be completed before the U.S. Navy is given a 5-year permit to operate the LFA sonar system. Given the controversy on the potential impacts of the low frequency transmissions in sound ducts on marine mammals beyond the buffer zone, it seems inconsistent with the precautionary approach to give the Navy a permit until this research has been completed. This research should be completed by an independent third party and not by the Navy/NMFS.

Response: NMFS believes that it has sufficient scientific information to make the determinations required by section 101(a)(5)(A) of the MMPA. In addition, the Navy has advised that a gap in SURTASS LFA sonar operations would be detrimental to national security and reduce protection of U.S. and Allied naval forces from submarine threats. Uninterrupted operational deployment

of SURTASS LFA sonar is the Pacific Fleet Commander's top antisubmarine warfare priority. As NMFS believes the Navy has adopted a precautionary approach using conservative assumptions for identifying and analyzing potential impacts to the environment, including marine mammals, it has determined that it is not necessary to withhold the MMPA authorization to the Navy. Lastly, the Navy and NMFS are working with many independent researchers (third party scientists) to complete the BRS. Therefore, the Final Rule does not need to be delayed for the completion of the proposed BRS.

NEPA Concerns

Comment 112: With the Supplemental EIS, the Navy hopes not only to correct the deficiencies identified by the Court in the 2001 Final EIS, but also to fulfill its NEPA requirement for an analysis of the environmental impacts of its second five years of LFA sonar operation from 2007 through 2012. The Navy's application for a new incidental take authorization, however, is a separate final agency action from its original application, and, absent the sort of tiering that has not been conducted here, requires its own EIS.

Response: The Navy prepared an original Final EIS for SURTASS LFA sonar in January, 2001. In accordance with CEQ regulations (40 CFR 1502.9), agencies are required to prepare a Supplemental EIS (SEIS) when the agency makes substantial changes to the proposed action that are relevant to environmental concerns, there are significant new circumstances or information relevant to environmental concerns and bearing on the proposed action and its impacts, or if the agency determines that the purposes of the act will be furthered. The Navy prepared this SEIS to both address the District Court findings and to review new information relevant to impacts on the marine environment from SURTASS LFA sonar operations. As NMFS is a cooperating agency, as defined under NEPA regulations, in the preparation of the Draft SEIS and the Final SEIS, the issuance of this rulemaking, based upon an application for an incidental take authorization under the MMPA is not considered an action separate from the SURTASS LFA sonar operation.

In accordance with 40 CFR 1506.3(a), NOAA has adopted the Navy's Final SEIS as its own NEPA statement on the issuance of regulations and LOAs for the taking of marine mammals incidental to SURTASS LFA sonar operations.

Comment 113: What rationale does the Navy now assert for failing to prepare an EIS for use of SURTASS LFA sonar during threat and warfare conditions?

Response: As stated in NMFS' 2002 final rule **Federal Register** notice, (RTC AC2), war, combat, and heightened threat conditions are determined by the Congress or the National Command Authorities (NCA), not the U.S. Navy. Chapter 1 (Purpose and Need) and RTC 1–1.7 of the Final EIS identify the NCA as the President and the Secretary of Defense (or their duly designated alternates or successors), as assisted by the Chairman of the Joint Chiefs of Staff. Since these determinations are not made by the Navy, both the application and the Navy's Draft and Final EISs and SEISs are specifically limited to employment of the SURTASS LFA sonar during training, testing, and routine military operations and will not cover use of the SURTASS LFA sonar system in self-defense, in times of war, combat, or heightened threat conditions.

Affected Marine Mammal Species

In its Final SEIS and Final EIS and application, the Navy excluded from incidental take consideration marine mammal species that do not inhabit the areas in which SURTASS LFA sonar would operate. Where data were not available or were insufficient for one species, comparable data for a related species were used. Because all species of baleen whales produce LF sounds, and anatomical evidence strongly suggests their inner ears are well adapted for LF hearing, all balaenopterid species are considered sensitive to LF sound and, therefore, at risk of harassment or injury from exposure to LF sounds. The twelve species of baleen whales that may be affected by SURTASS LFA sonar are blue, fin, minke, Bryde's, sei, humpback, North Atlantic right, North Pacific right, southern right, pygmy right, bowhead, and gray whales.

The odontocetes (toothed whales) that may be affected because they inhabit the deeper, offshore waters where SURTASS LFA sonar might operate include both the pelagic (oceanic) whales and dolphins and those coastal species that also occur in deep water including harbor porpoise, spectacled porpoise, beluga, *Stenella* spp., Risso's dolphin, rough-toothed dolphin, Fraser's dolphin, northern right-whale dolphin, southern right-whale dolphin, short-beaked common dolphin, long-beaked common dolphin, very long-beaked common dolphin, *Lagenorhynchus* spp., *Cephalorhynchus* spp., bottlenose dolphin, Dall's porpoise, melon-headed whale, beaked whales (*Berardius* spp., *Hyperoodon* spp., *Mesoplodon* spp., Cuvier's beaked whale, Shepard's beaked whale, Longman's beaked whale), killer whale, false killer whale, pygmy killer whale, sperm whale, dwarf and pygmy sperm whales, and short-finned and long-finned pilot whales.

Potentially affected pinnipeds include hooded seal, harbor seal, spotted seal, ribbon seal, gray seal, elephant seal, Hawaiian monk seal, Mediterranean monk seal, northern fur seal, southern fur seal (*Arctocephalus* spp.), harp seal, Galapagos sea lion, Japanese sea lion, Steller sea lion, California sea lion, Australian sea lion, New Zealand sea lion, and South American sea lion.

A description of affected marine mammal species, their biology, and the criteria used to determine those species that have the potential for being taken by incidental harassment are provided and explained in detail in the Navy application and Final SEIS and, although not repeated here, are considered part of the NMFS' administrative record for this action. Additional information is available at the following URL: *http://www.nmfs.noaa.gov/pr/sars/*. Please refer to these documents for specific information on marine mammal species.

Effects on Marine Mammals

To understand the effects of LF noise on marine mammals, one must understand the fundamentals of underwater sound and how the SURTASS LFA sonar operates in the marine environment. This description was provided earlier in this document and also by the Navy in Appendix B to the Final EIS.

The effects of underwater noise on marine mammals are highly variable, and have been categorized by Richardson *et al.* (1995) as follows: (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 behavioral reactions of variable conspicuousness and variable relevance to the well-being of the animal; these can range from subtle effects on respiration or other behaviors (detectable only by statistical analysis) to active avoidance reactions; (4) upon repeated exposure, animals may exhibit diminishing responsiveness (called habituation), or disturbance effects may persist (most likely with sounds that are highly variable in characteristics, unpredictable in occurrence, and associated with situations that the

animal perceives as a threat); (5) any human-made noise that is strong enough to be heard has the potential to reduce (mask) the ability of marine mammals to hear natural sounds at similar frequencies, including calls from conspecifics, echolocation sounds of odontocetes, and environmental sounds such as surf noise; and (6) very strong sounds have the potential to cause temporary or permanent reduction in hearing sensitivity, also known as threshold shift. 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. As described later in this document, received sound levels must be even higher for there to be risk of permanent hearing impairment, or permanent threshold shift (PTS). Finally, intense acoustic or explosive events (not relevant for this activity) 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. Severe hemorrhage could lead to death.

The original analysis of potential impacts on marine mammals from SURTASS LFA sonar was developed by the Navy based on the results of a literature review; the Navy's Low Frequency Sound Scientific Research Program (LFS SRP) (described later in this document); and a complex, comprehensive program of underwater acoustical modeling.

To assess the potential impacts on marine mammals by the SURTASS LFA sonar source operating at a given site, it was necessary for the Navy to predict the sound field that a given marine mammal species could be exposed to over time. This is a multi-part process involving (1) the ability to measure or estimate an animal's location in space and time, (2) the ability to measure or estimate the three-dimensional sound field at these times and locations, (3) the integration of these two data sets into the Acoustic Integration Model (AIM) to estimate the total acoustic exposure for each animal in the modeled population, (4) beginning the post-AIM analysis, converting the resultant cumulative exposures for a modeled population into an estimate of the risk from a significant disturbance of a biologically important behavior, and (5) using a risk continuum to convert these estimates of behavioral risk into an assessment of risk in terms of the level of potential biological removal.

In the post-AIM analysis, as mentioned in numbers (4) and (5) above, a relationship was developed for converting the resultant cumulative exposures for a modeled population into an estimate of the risk to the entire population of a significant disruption of a biologically important behavior and of injury. This process assessed risk in relation to received level (RL) and repeated exposure. The resultant risk continuum is based on the assumption that the threshold of risk is variable and occurs over a range of conditions rather than at a single threshold. Taken together, the LFS SRP results, the acoustic propagation modeling, and the risk assessment provide an estimate of potential environmental impacts to marine mammals. The results of 4 years of monitoring (2002–2006) onboard the two SURTASS LFA sonar vessels support the use of this methodology.

The acoustic propagation modeling was accomplished using the Navy's standard acoustical performance prediction transmission loss model-Parabolic Equation (PE) version 3.4. The results of this model are the primary input to the AIM. AIM was used to estimate marine mammal sound exposures. It integrates simulated movements (including dive patterns) of marine mammals, a schedule of SURTASS LFA sonar transmissions, and the predicted sound field for each transmission to estimate acoustic exposure during a hypothetical SURTASS LFA sonar operation. Description of the PE and AIM models, including AIM input parameters for animal movement, diving behavior, and marine mammal distribution, abundance, and density, are described in detail in the original Navy application and the Final EIS (see box, page 4.2–11) and are not discussed further in this document.

The same analytical methodology utilized in the application for the first 5-year rule and LOAs was utilized to provide reasonable and realistic estimates of the potential effects to marine mammals specific to the potential mission areas as presented in the application. Information on how the density and stock/abundance estimates are derived for the selected mission sites is in the Navy's application. These data are derived from current, published source documentation, and provide general area information for each mission area with species-specific information on the animals that could occur in that area, including estimates for their stock abundance and density.

Although this rule uses the same analysis that was used for the 2002–2007 rule, the AIM analysis is continuously updated with new marine mammal biological data (behavior, distribution, abundance and density) whenever new information becomes available. It was recently independently reviewed by a panel of experts in mathematics, modeling, acoustics, and marine mammalogy convened by NMFS' Center for Independent Experts (CIE). The task of the Panel was to evaluate whether AIM correctly implements the models and data on which it is based; whether animal movements are correctly implemented; and whether AIM meets the Council for Regulatory Environmental Monitoring (CREM) guidelines. As stated in their Report on AIM, the CIE Panel agreed that: (1) AIM appears to be correctly implemented; (2) the animal movement appears to be appropriately modeled; and (3) the principles of credible science had been addressed during the development of AIM and that AIM is a useful and credible tool for developing application models. A copy of the CIE report is available (see **ADDRESSES**).

During the analytical process in the Final EIS, the Navy developed 31 acoustic modeling scenarios for the major ocean regions. Locations were selected by the Navy to represent the greatest potential effects for each of the three major ocean acoustic regimes where SURTASS LFA sonar could potentially be used. These acoustic regimes were: (1) Deep-water convergence zone propagation, (2) near surface duct propagation, and (3) shallow water bottom interaction propagation. These sites were selected to model the greatest potential for effects from the use of SURTASS LFA sonar incorporating the following factors: (1) Closest plausible proximity to land (from SURTASS LFA sonar operations standpoint), and/or offshore biologically important areas (OBIAs) where biological densities are higher, particularly for animals most likely to be affected; (2) acoustic propagation conditions that allow minimum propagation loss, or transmission loss (TL) (*i.e.*, longest acoustic transmission ranges); and (3) time of year selected for maximum animal abundance. These sites represent the upper bound of impacts (both in terms of possible acoustic propagation conditions, and in terms of marine mammal population and density) that can be expected from operation of the SURTASS LFA sonar system. Thus, if SURTASS LFA sonar operations are conducted in an area that was not acoustically modeled in the Final EIS, the potential effects would most likely be less than those analyzed for the most similar site in the analyses.

The assumptions of the Final EIS are still valid and there are no new data to contradict the conclusions made in the Potential Impacts on Marine Mammals (Chapter 4) in the Final EIS. The chapter on impacts to marine mammals was incorporated by reference into the Navy's Final SEIS.

LFS SRP

The goal of the 1997–1998 LFS SRP was to demonstrate the avoidance reaction of sensitive marine mammal species during critical biologically important behavior to the low frequency underwater sound produced by the LFA sonar system. Testing was conducted in three phases as summarized here from Clark *et al.* (1999).

Phase I was conducted in September through October 1997. The objective of Phase I was to determine whether exposure to low frequency sounds elicited disturbance reactions from feeding blue and fin whales. The goal was to characterize how whale reactions to the sounds vary, depending on: (1) The received level of the sound; (2) changes in the received level; and (3) whether the system was operating at a relatively constant distance or approaching the whale. Full and reduced LFA sonar source power transmissions were used. The highest received levels at the animals were estimated to be 148 to 155 dB. In 19 focal animal observations (4 blue and 15 fin whales), no overt behavioral responses were observed. No changes in whale distribution could be related to LFA sonar operations, and whale the distributions correlated with the distribution of food.

Phase II was conducted in January 1998. The objectives were to quantify responses of migrating gray whales to low frequency sound signals, compare whale responses to different RLs, determine whether whales respond more strongly to RL, sound gradient, or distance from the source, and to compare whale avoidance responses to an LF source in the center of the migration corridor versus in the offshore portion of the migration corridor. A single source was used to broadcast LFA sonar sounds up to 200 dB. Whales showed some avoidance responses when the source was moored 1 mi (1.8 km) offshore, in the migration path, but returned to their migration path when they were a few kilometers from the source. When the source was moored 2 mi (3.7 km) offshore, responses were much less, even when the source level was increased to 200 dB, to achieve the same RL for most whales in the middle of the migration corridor. Also, offshore whales did not seem to avoid the louder offshore source.

Phase III was conducted from February to March 1998. The objectives were to assess the potential effects of LFA sonar signals on behavior, vocalization and movement of humpback whales off the Kona coast in Hawaii. The maximum exposure levels in this phase were as high as 152 dB. Approximately half of the whales observed visually ceased their song during the transmissions, but many of them did so while joining a group of whales, which is the time that singing whales usually stop their songs naturally. All singers who interrupted their songs were observed to resume singing within tens of minutes. The analysis of one data set showed that whales increased their song lengths during LFA sonar transmissions, but a second analysis indicated that song length changes were more complicated and depended on the portion of the song that was overlapped by LFA sonar transmissions. Overall patterns of singer and cow-calf abundance were the same throughout the experiments as they had been during several years of prior study.

Risk Analysis

To determine the potential impacts that exposure to LF sound from SURTASS LFA sonar operations could have on marine mammals, biological risk standards were defined by the Navy with associated measurement parameters. Based on the MMPA, the potential for biological risk was defined as the probability for injury (Level A) or behavioral (Level B) harassment of marine mammals. In this analysis, behavioral (Level B) harassment is defined as a significant disturbance in a biologically important behavior (also referred to as a biologically significant response). NMFS believes that this is equivalent to the MMPA definition of Level B harassment for military readiness activities. The potential for biological risk is a function of an animal's exposure to a sound that would potentially cause hearing, behavioral, psychological or physiological effects. The measurement parameters for determining exposure were RLs in dB, the pulse repetition interval (time between pings), and the number of pings received.

Before the biological risk standards could be applied to realistic SURTASS LFA sonar operational scenarios, two factors had to be considered by the Navy: (1) How does risk vary with repeated sound exposure? and (2) how does risk vary with RL? The Navy addressed these questions by developing a function that translates the history of repeated exposures (as calculated in the AIM) into an equivalent RL for a single exposure with a comparable risk. This dual-question method is similar to those adopted by previous studies of risk to human hearing (Richardson *et al.*, 1995; Crocker, 1997).

It is intuitive to assume that effects on marine mammals would be greater with repeated exposures than for a single ping. However, no published data on repeated exposures of LF sound on marine mammals exist. Based on discussions in Richardson *et al.* (1995) and consistent with Crocker (1997), the Navy determined that the best scientific information available is based on the potential for effects of repeated exposure on human models.

The formula L + 5 log10(N) (where L = ping level in dB and N is the number of pings) defines the single ping equivalent (SPE). This formula is considered appropriate for assessing the risk to a marine mammal of a significant disturbance of a biologically important behavior from LF sound like SURTASS LFA sonar transmissions.

Behavioral Harassment

For reasons explained in detail in the Final EIS (Section 4.2.5), the Navy interpreted the results of the LFS SRP to support use of unlimited exposure to 119 dB during an LFA sonar mission as the lowest value for risk. Below this level, the risk of a biologically significant behavioral response from marine mammals approaches zero. It is important to note that risk varies with both received level and number of exposures.

Because the LFS SRP did not document a biologically significant response at maximum RLs up to 150 dB, the Navy determined there was a 2.5-percent risk of an animal incurring a disruption of biologically important behavior at an SPL of 150 dB, a 50-percent risk at 165 dB, and a 95-percent risk at 180 dB. For more detailed information, see Chapter 4.2.5 of the Final EIS and Navy's Technical Report #1 (Navy, 2001). The Navy used this risk continuum analysis as an alternative to an all-or-nothing use of standard thresholds for the onset of behavioral change or injury. NMFS has reviewed and agrees with this approach. The subsequent discussion of risk function emphasizes the advantages of using a smoothly varying model of biological risk in relation to sound exposure. These results are analogous to dose-response curves that are accepted as the best practice in disciplines such as epidemiology, toxicology, and pharmacology.

Changes in Hearing Sensitivity

In NMFS's 2002 rule, NMFS and the Navy based their estimate of take by injury or the significant potential for such take (Level A harassment) on the criterion of 180 dB. NMFS continues to believe this is a scientifically supportable value for preventing auditory injury or the significant potential for such injury (Level A harassment), as it represents a value less than where the potential onset of a minor TTS in hearing might occur based on Schlundt *et al.* (2000) research (see Navy Final Comprehensive Report Tables 5 through 8). Also, an SPL of 180 dB is considered a scientifically supportable level for preventing auditory injury because there is general scientific agreement with NMFS's position that TTS is not an injury (i.e., does not result in tissue damage), but rather a temporary impairment to hearing (i.e., results in an increased elevation or decreased sensitivity in hearing) that may last for a few minutes to a few days, depending upon the level and duration of exposure. In addition, there is no evidence that TTS would occur in marine mammals at an SPL of 180 dB. In fact, Schlundt *et al.* (2000) indicates that onset TTS for at least some species occurs at significantly higher SPLs.

Schlundt *et al.*'s (2000) measurement with bottlenose dolphins and belugas at 1-second signal duration implies that the TTS threshold for a 100-second signal would be approximately 184 dB (Table 1–4, Final EIS). For the 400-Hz signal, Schlundt *et al.* found no TTS at 193 dB, the highest level of exposure. Therefore, NMFS believes that establishing onset TTS as the upper bound of Level B harassment, but using 180 dB as the beginning of the zone for establishing mitigation measures to prevent auditory injury, is warranted by the science.

With three levels of mitigation monitoring for detecting marine mammals (described later in this document), NMFS and the Navy believe it is unlikely that any marine mammal would be exposed to received levels of 180 dB before being detected and the SURTASS LFA sonar shut down. However, because the probability is not zero, the Navy has included Level A harassment in its authorization request.

Unlike with behavioral responses, an ''injury continuum'' is not necessary because of the very low numbers of individual marine mammals that could potentially experience high received sound levels, and the high level of effectiveness of the monitoring and shutdown protocols. For this action, all marine mammals exposed to an SPL of 180 dB or above are considered to be injured even though the best scientific data available indicate a marine mammal would need to receive an SPL significantly higher than 180 dB to be injured.

When SURTASS LFA sonar transmits, there is a boundary that encloses a volume of water where received levels equal or exceed 180 dB, and a volume of water outside this boundary where received levels are below 180 dB. In this analysis, the 180-dB SPL boundary is emphasized because it represents a single-ping RL that is a scientifically supportable estimate for the potential onset of injury. Therefore, the level of risk for marine mammals depends on their location in relation to SURTASS LFA sonar. Under this rule, a marine mammal would have to receive one ping greater than or equal to 180 dB to be considered to have been injured or have the potential to incur an injury.

Although TTS is not considered Level A harassment, PTS is considered Level A harassment. The onset of PTS for marine mammals may be 15–20 dB above TTS levels. However, mitigation measures, such as mitigation zones and shutdown protocols, are required where there is the potential for a marine mammal to incur TTS so as to prevent an animal from incurring a PTS.

Potential for Non-Auditory Injury

Since the release of the Final EIS, an investigation by Cudahy and Ellison (2002) hypothesized that the threshold for in vivo tissue damage (including lung damage and hemorrhaging) from LF sound can be on the order of 180 to 190 dB. Balance and equilibrium could be affected, but may not result in injury. These effects are based on studies of humans. Vestibular (balance and equilibrium) function was investigated by the Navy during its Diver's Study and the results reported in LFS SRP Technical Report 3. Measurable performance decrements in vestibular function were observed for guinea pigs using 160 dB SPL signals at lung resonance and 190 dB SPL signals at 500 Hz. Because guinea pigs are not aquatic species, like humans, they are not as robust to pressure changes as marine mammals and, therefore, are likely more susceptible to injury at lower SPLs than marine mammals.

Presently, there is controversy among researchers over whether marine mammals can suffer from decompression sickness. It is theorized that this may be caused by diving and then surfacing too quickly, forcing nitrogen bubbles to form in the bloodstream and tissues. Cox *et al.* (2006) stated that gas-bubble disease, induced in supersaturated tissues by a behavioral response to acoustic exposure, is a plausible pathologic mechanism for the morbidity and mortality seen in cetaceans associated with sonar exposure. The authors also stated that it is premature to judge acoustically mediated bubble growth as a potential mechanism and recommended further studies to investigate the possibility.

As stated in Crum and Mao (1996) and as discussed in the Final EIS (pages 10–137) and the Final SEIS (pages 4–31), researchers hypothesized that RLs would have to exceed 190 dB for there to be the possibility of non-auditory trauma due to supersaturation of gases in the blood. Such non-auditory traumas are not expected to occur from sound exposure below SPLs of 180 dB.

In light of the high detection rate of the high-frequency marine mammal monitoring (HF/M3) sonar, ensuring required SURTASS LFA sonar shutdown when any marine mammal approaches or enters the 180-dB isopleth from LFA sonar, the risks of these traumas to a marine mammal approach zero.

Additional research published in the peer-reviewed journal Ultrasound in Medicine and Biology supports the 180-dB criterion for injury as being a scientifically supportable level for assessing potential non-auditory injury to marine mammals (Laurer *et al.*, 2002). Laurer *et al.* (2002) exposed rats to 5 minutes of continuous high-intensity, low-frequency (underwater) sound (HI-LFS) either at 180 dB SPL re 1 µPa at 150 Hz or 194 dB SPL re 1 µPa at 250 Hz, and found no overt histological damage in brains of any group. Also, blood gases, heart rate, and main arterial blood pressure were not significantly influenced by HI-LFS, suggesting that there was no pulmonary dysfunction due to exposure. This published paper was based on work performed in support of Technical Report #3 of the SURTASS LFA sonar Final EIS.

Strandings

Marine mammal strandings are not a rare occurrence in nature. The Cetacean Stranding Database (*http://www.legaard.org/strandings/index.html* formerly *http://www.strandings.net*) registered over one hundred strandings worldwide in 2004. However, mass strandings, particularly multi-species mass strandings, are relatively rare. Acoustic systems are becoming increasingly implicated in marine mammal strandings. In particular, a number of mass strandings have been linked to mid-frequency sonars (see, e.g.

Joint Interim Report on the Bahamas Marine Mammal Stranding Event of 15–16 March 2000, DOC and DON, 2001). Many theories exist as to why noise may be a factor in marine mammal strandings. It is theorized that marine mammals become disoriented, or that the sound forces them to surface too quickly, which may cause symptoms similar to decompression sickness, or that they are physically injured by the sound pressure. The biological mechanisms for effects that lead to strandings must be determined through scientific research.

There is no record of SURTASS LFA sonar ever being implicated in any stranding event since LFA sonar prototype systems were first operated in the late 1980s. Moreover, the system acoustic characteristics differ between LF and mid-frequency (MF) sonars: LFA sonars use frequencies generally below 1,000 Hz, with relatively long signals (pulses) on the order of 60 sec; while MF sonars use frequencies greater than 1,000 Hz, with relatively short signals on the order of 1 sec. Cox *et al.* (2006) provided a summary of common features shared by the strandings events in Greece (1996), Bahamas (2000), and Canary Islands (2002). These included operation of MF sonar, deep water close to land (such as offshore canyons), presence of an acoustic waveguide (surface duct conditions), and periodic sequences of transient pulses (i.e., rapid onset and decay times) generated at depths less than 10 m (32.8 ft) by sound sources moving at speeds of 2.6 m/s (5.1 knots) or more during sonar operations (D'Spain *et al.*, 2006). These features do not relate to LFA sonar operations. First, no MF-sonar component will be in operation. Second, the SURTASS LFA sonar vessel operates with a horizontal line array of 1,500 m (4,921 ft) length at depths below 150 m (492 ft) and a vertical line array (LFA sonar source) at depths greater than 100 m (328 ft). Third, operations are limited by mitigation protocols to at least 22 km (12 nm) offshore. For these reasons, SURTASS LFA sonar cannot be operated in deep water that is close to land. Also, the LFA sonar signal is transmitted at depths well below 10 m (32.8 ft), and the vessel has a slow speed of advance of 1.5 m/s (3 knots).

While there was an LF component in the Greek stranding in 1996, only mid-frequency components were present in the strandings in the Bahamas in 2000, Madeira 2000, and Canaries in 2002. This supports the conclusion that the LF component in the Greek stranding was not causative (ICES, 2005; Cox *et al.*, 2006). In its discussion of the Bahamas stranding, Cox *et al.* (2006) stated: ''The event raised the question of whether the mid-frequency component of the sonar in Greece in 1996 was implicated in the stranding, rather than the low-frequency component proposed by Frantzis (1998).'' The ICES in its ''Report of the Ad-Hoc Group on the Impacts of Sonar on Cetaceans and Fish'' raised the same issues as Cox *et al.*, stating that the consistent association of MF sonar in the Bahamas, Madeira, and Canary Islands strandings suggests that it was the MF component, not the LF component, in the NATO sonar that triggered the Greek stranding of 1996 (ICES, 2005). The ICES (2005) report concluded that no strandings, injury, or major behavioral changes have been associated with the exclusive use of LF sonar.

Beaked whales have been the subject of particular concern in connection with strandings. Like most odontocetes, they have relatively sharply decreasing hearing sensitivity below 2 kHz (Cook *et al.* (2006), Richardson *et al.* (1995) and Finneran *et al.* (2002)). The SURTASS LFA sonar source frequency is below 500 Hz. If a cetacean cannot hear a sound or hears it poorly, the sound is unlikely to have a significant behavioral impact (Ketten, 2001). Therefore, it is unlikely that LF transmissions from LFA sonar would induce behavioral reactions from animals that have poor LF hearing. Though highly unlikely, the sounds could damage tissues even if the animal does not hear the sound, but this would have to be within 1,000 m (3,280 ft) of the array, where detection would be very likely, triggering shutdown.

Estimates of Potential Effects on Marine Mammals

The effects on marine mammals from operation of SURTASS LFA sonar will not be the lethal removal of animals. In addition, while possible, Level A harassment, if it occurs at all, is expected to be so minimal as to have no effect on rates of reproduction or survival of affected marine mammal species. Based on AIM modeling results, the primary effects would be the potential for Level B harassment. The Final SEIS Subchapter 4.4 provides the risk assessment methodology applied to SURTASS LFA sonar operations for the annual LOA applications for proposed operational areas.

Tables 4.4–2 through 4.4–10 in the Final SEIS provide, through a case study based on the results of the Navy's 2005–2006 LOA, estimates of the percentage of stocks potentially affected for SURTASS LFA sonar operations, which are based on reasonable and realistic estimates of the potential effects to marine mammal stocks specific to the potential mission areas. Also, Tables 5 through 8 in the Navy's Final Comprehensive Report for the 2002–2007 rule provide annual total estimates of percentages of marine mammal stocks potentially affected annually during the first four years of LFA sonar operations, based on actual operations during the period of the LOAs.

The scenarios chosen by the Navy are not the only possible combinations of areas where the SURTASS LFA sonar will operate. The potential effects from other scenarios can be estimated by making a best prediction of the areas in which the Navy would conduct SURTASS LFA sonar operations annually in each oceanic basin area, determining from Tables 4.4–2 through 4.4–10 in the Final SEIS the percentage of each stock that may potentially be affected, and adding those percentages together for each affected stock. Tables 5–8 in the Navy's Comprehensive Report indicate that annually Level B harassment may affect 0 to 6 percent for most marine mammal stocks, rising to just over 11 percent annually for other species (e.g., common dolphins (6.4 percent), Risso's dolphins (6–8 percent), short-finned pilot whales (6 to 9 percent), false killer whales (5 to 10 percent), Pacific white-sided dolphins (6 to 11 percent) and melon-headed whales (11.2 percent)).

Also, using updated modeling where appropriate, the Navy will rerun AIM when planning missions and, if necessary, modify annual LOA requests with an analysis of take estimates prior to any mission in a new/different area. For this rule, NMFS is adopting the Navy estimates shown in Final SEIS (Tables 4.4–2 through 4.4–10) as the best scientific information currently available.

As with the 2002 rule, Navy will limit operation of LFA sonar to ensure no stocks will be subject to more than 12 percent of takes (by Level B harassment) annually, although most stocks are estimated to incur a lower percentage of takes. This per-stock cap applies regardless of the number of ships operating with LFA sonar or the overall increased number of hours of LFA sonar operations. The Navy will use the 12 percent take cap to guide its mission planning and annual LOA applications.

Mitigation for Marine Mammals

NMFS is requiring the same visual, passive acoustic, and active acoustic monitoring of the area surrounding the SURTASS LFA sonar array, as required for the current 2002–2007 rule and LOAs, to prevent the incidental injury of marine mammals that might enter the 180-dB isopleth from the SURTASS

LFA sonar. These three monitoring systems are described in the next section of this document. NMFS has implemented the same protocols as in the 2002–2007 rule. Prior to each active sonar exercise, the distance from the SURTASS LFA sonar source to the 180-dB isopleth will be determined. If, through monitoring, a marine mammal is detected within the 180-dB isopleth, the Navy proposes to shut down or immediately suspend SURTASS LFA sonar transmissions. Transmissions may commence/resume 15 minutes after the marine mammal has left the area of the 180-dB isopleth or there is no further detection of the animal within the 180-dB isopleth. The protocol established by the Navy for implementing this temporary shut-down is described in the application. As an added safety measure, NMFS is again requiring a ''buffer zone'' extending an additional 1 km (0.54 nm) beyond the 180-dB isopleth. This 180-dB plus 1 km (0.54 nm) distance will be the established mitigation zone for that exercise. If a marine mammal is detected by the HF/M3 sonar, the SURTASS LFA sonar will be either turned off or not turned on. This is an effective mitigation measure since testing of the HF/M3 sonar indicates effective levels of detection up to 2 km (1.1 nm). At 2 km (1.1 nm), the SPL from the SURTASS LFA sonar will be approximately 174 dB, significantly below the 180 dB threshold for estimating onset of injury. SURTASS LFA sonar operators would be required to estimate SPLs before and during each operation to provide the information necessary to modify the operation, including delay or suspension of transmissions, so as not to exceed the mitigation sound field criteria.

In addition to establishing a mitigation zone at 180 dB plus 1 km (0.54 nm) to protect marine mammals, the Navy has established a mitigation zone for human divers at 145 dB re 1 microPa(rms) around all known human commercial and recreational diving sites. Although this geographic restriction is intended to protect human divers, it will also reduce the LF sound levels received by marine mammals located in the vicinity of known dive sites.

The Navy also recommended establishing OBIAs for marine mammal protection in its Final EIS and SEIS. The Navy evaluated nine sites in its Final EIS and SEIS where marine animals of concern (marine animals listed under the ESA and other marine mammals) congregate to carry out biologically important activities.

Based on the Navy's evaluation, NMFS has designated these nine sites as OBIAs for LFA sonar. The nine areas are: (1) The North American East Coast between 28° N. and 50° N. from west of 40° W. to the 200-m (656-ft) isobath year-round; (2) the Antarctic Convergence Zone, from 30° E. to 80° E. to 45° S., from 80° E. to 150° E. to 55° S., from 150° E. to 50° W. to 60° S., from 50° W to 30° E. to 55° S. from October through March; (3) the Costa Rica Dome, centered at 9° N. and 88° W., year-round; (4) Hawaiian Islands Humpback Whale National Marine Sanctuary-Penguin Bank, centered at 21° N. and 157° 30′ W. from November 1 through May 1; (5) Cordell Bank National Marine Sanctuary, boundaries in accordance 15 CFR 922.110 year-round; (6) Gulf of the Farallones National Marine Sanctuary, boundaries in accordance 15 CFR 922.80 year-round; (7) Monterey Bay National Marine Sanctuary, boundaries in accordance with 15 CFR 922.30 year-round; (8) Olympic Coast National Marine Sanctuary, boundaries within 23 nm of the coast from 47°07′ N. to 48°30′ N. latitude in December, January, March, and May; and (9) Flower Garden Banks National Marine Sanctuary, boundaries in accordance with 15 CFR 922.120 year-round.

NMFS has also designated an additional OBIA that was recommended by several commenters on the Draft SEIS: The Gully with boundaries at 44°13′ N., 59°06′ W. to 43°47′ N., 58°35′ W. to 43°35′ N., 58°35′ W. to 43°35′ N., 59°08′ W. to 44°06′ N., 59°20′ W., year round. NMFS believes this area is biologically important for marine mammals, based on its importance as habitat for several species of marine mammals, particularly the northern bottlenose whale.

NMFS'' proposed rule solicited public comments and information on marine mammal distribution, densities, and the specific biologically important activities that take place in the Northwestern Hawaiian Islands to determine whether certain areas should be designated as OBIAs. We did not receive public comment on this issue. Any additional OBIA designations would be made through a separate rulemaking process.

NMFS is continuing the system established in the 2002–2007 rule for expanding the number of OBIAs, as described later in this document. While retaining the requirement to provide notice and an opportunity to comment, this final rule eliminates the specific length of time for public comment on proposed OBIAs. OBIAs are not intended to apply to other Navy activities and sonar operations, but rather as a mitigation measure to reduce incidental takings by SURTASS LFA sonar.

These regulations require the Navy to refrain from operating the SURTASS LFA sonar within any OBIA and requires that the SURTASS LFA sonar vessel ensures that the 180 dB (re 1 microPa(rms)) isopleth remains at least 1 km (0.54 nm) seaward of the outer perimeter of the OBIA.

Marine Mammal Monitoring

In order to minimize risks to marine mammals that may be present in waters surrounding SURTASS LFA sonar, NMFS is again requiring the Navy to: (1) Conduct visual monitoring from the ship's bridge during daylight hours, (2) use passive SURTASS sonar to listen for vocalizing marine mammals; and (3) use high frequency active sonar (i.e., similar to a commercial fish finder) to monitor/locate/track marine mammals in relation to the SURTASS LFA sonar vessel and the sound field produced by the SURTASS LFA sonar source array.

Through observation, acoustic tracking and implementation of shut-down criteria, the Navy will ensure, to the greatest extent practicable, that no marine mammals approach the SURTASS LFA sonar source close enough to be subjected to potentially injurious sound levels (inside the 180-dB sound field; approximately 1 km (0.54 nm) from the source). In the Navy's Final EIS, as reanalyzed in the Final Comprehensive Report for SURTASS LFA sonar, the Navy assessed mitigation effectiveness. The overall effectiveness of detecting a marine mammal approaching the 180-dB sound field of the source array by at least one of these monitoring methods is above 95 percent. This value is supported by analyses of field data in a sampling of 6 missions between June 2004 and February 2006 (see the Navy's Final Comprehensive Report for LFA sonar).

The results of the visual, passive, and active monitoring for each LOA are discussed in the Annual Reports (most recently, Annual Report 5, 2007, Chapter 4). Mitigation effectiveness is described in Chapter 4 for the Final Comprehensive Report (2007) and in the Annual Reports.

Visual monitoring consists of daylight observations for marine mammals from the vessel. Daylight is defined as 30 minutes before sunrise until 30 minutes after sunset. Visual monitoring would begin 30 minutes before sunrise or 30 minutes before the SURTASS LFA sonar is deployed. Monitoring would continue until 30 minutes after sunset or until the SURTASS LFA sonar is recovered. Observations will be made by personnel trained in detecting and identifying marine mammals. Marine mammal biologists qualified in conducting at-sea

marine mammal visual monitoring from surface vessels train and qualify designated ship personnel to conduct at-sea visual monitoring. The objective of these observations is to maintain a track of marine mammals observed and to ensure that none approach the source close enough to enter the LFA sonar mitigation zone (including the buffer zone).

These personnel would maintain a topside watch and marine mammal observation log during operations that employ SURTASS LFA sonar in the active mode. The numbers and identification of marine mammals sighted, as well as any unusual behavior, will be entered into the log. A designated ship's officer will monitor the conduct of the visual watches and periodically review the log entries. There are two potential visual monitoring scenarios.

First, if a marine mammal is sighted outside of the LFA sonar mitigation zone, the observer will notify the Officer-in-Charge (OIC). The OIC then notifies the HF/M3 sonar operator to determine the range and projected track of the animal. If it is determined the animal will enter the LFA sonar mitigation zone, the OIC will order the delay or suspension of SURTASS LFA sonar transmissions when the animal enters the LFA sonar mitigation zone. Second, if the animal is visually observed within the mitigation zone, the OIC will order the immediate delay or suspension of SURTASS LFA sonar transmissions. The observer will continue visual monitoring/recording until the animal is no longer seen.

Passive acoustic monitoring is conducted when SURTASS is deployed, using the SURTASS towed horizontal line array to listen for vocalizing marine mammals as an indicator of their presence. If the sound is estimated to be from a marine mammal that may be in the SURTASS LFA sonar mitigation zone, the technician will notify the OIC who will alert the HF/M3 sonar operator and visual observers. If a marine mammal is detected within or approaching the mitigation zone prior to or during transmissions, the OIC will order the delay or suspension of SURTASS LFA sonar transmissions.

HF-active acoustic monitoring uses the HF/M3 sonar to detect, locate, and track marine mammals that could pass close enough to the SURTASS LFA sonar array to enter the LFA sonar mitigation zone. HF acoustic monitoring will begin 30 minutes before the first SURTASS LFA sonar transmission of a given mission is scheduled to commence and continue until transmissions are terminated. Prior to full-power operations, the HF/M3 sonar power level is ramped up over a period of 5 min from 180 dB SL in 10-dB increments until full power (if required) is attained to ensure that there are no inadvertent exposures of local animals to RLs greater than 180 dB from the HF/M3 sonar. There are two potential scenarios for mitigation via active acoustic monitoring.

First, if a ''contact'' is detected outside the LFA sonar mitigation zone, the HF/M3 sonar operator determines the range and projected track of the animal. If it is determined that the animal will enter the LFA sonar mitigation zone, the sonar operator notifies the OIC. The OIC then orders the delay or suspension of transmissions when the animal is predicted to enter the LFA sonar mitigation zone. If a contact is detected by the HF/M3 sonar within the LFA sonar mitigation zone, the observer notifies the OIC who promptly orders the immediate delay or suspension of transmissions.

All contacts will be recorded in the log and provided as part of the Long-Term Monitoring (LTM) Program to monitor for potential long-term environmental effects.

Research

The Navy spends approximately $10 to 14 million annually on marine mammal research programs. These research programs provide a means of learning about potential effects of anthropogenic underwater sound on marine mammals (including long-term) and ways to mitigate potential effects. During the first 4 years of LFA sonar operations, the Navy conducted research on several research areas. Table 9 in the Navy's Final Comprehensive Report for SURTASS LFA sonar provides the status of the research that is planned or underway.

NMFS is requiring the Navy to continue researching the impacts of LF sounds on marine mammals to supplement its monitoring and increase knowledge of the species, and coordinate with others on additional research opportunities and activities. This includes cumulative impact analyses of the annual takes of marine mammals over the next 5 years and the continuation of scientific data collection during SURTASS LFA sonar operations.

NMFS recommends that the Navy conduct, or continue to conduct, the following research regarding SURTASS LFA sonar over the second 5-year authorization period:

1. Systematically observe SURTASS LFA sonar training exercises for injured or disabled marine mammals.

2. Compare the effectiveness of the three forms of mitigation (visual, passive acoustic, HF/M3 sonar).

3. Conduct research on the responses of deep-diving odontocete whales to LF-sonar signals. These species are believed to be less sensitive to LF-sonar sounds than the species studied prior to the LFS SRP. However, enough questions exist that these species should be studied further. The Navy has applied for a Scientific Research Permit under section 104 of the MMPA to conduct a behavioral response study on deep-diving cetacean species exposed to natural and artificial underwater sounds and quantify exposure conditions associated with various effects (72 FR 19181, April 17, 2007).

4. Conduct research on the habitat preferences of beaked whales.

5. Conduct passive acoustic monitoring using bottom-mounted hydrophones before, during, and after LF sonar operations for the possible silencing of calls of large whales.

6. Continue to evaluate the HF/M3 mitigation sonar. This is the primary means of mitigation, and its efficacy must continue to be demonstrated.

7. Continue to evaluate improvements in passive sonar capabilities.

Reporting

During routine operations of SURTASS LFA sonar, technical and environmental data would be collected and recorded, which, along with research, are part of the Navy's LTM Program. These would include data from visual and acoustic monitoring, ocean environmental measurements, and technical operational inputs.

First, a mission report would be provided to NMFS on a quarterly basis, with the report including all active-mode missions completed 30 days or more prior to the date of the deadline for the report. Second, the Navy would submit an annual report no later than 45 days after expiration of an LOA. Third, the Navy would submit a Final Comprehensive Report at least 240 days prior to expiration of these regulations. These reports are summarized here.

Quarterly Report—On a quarterly basis, the Navy would provide NMFS with a classified report that includes all active-mode missions completed 30 days or more prior to the date of the deadline for the report. The Navy must submit its quarterly mission reports to NMFS, no later than 30 days after the end of each quarter beginning on the date of effectiveness of an LOA or as specified in the appropriate LOA. Specifically, these reports will include dates/times of exercises, location of vessel, LOA province (as set forth in

Longhurst (1998)), location of the mitigation zone in relation to the LFA sonar array, marine mammal observations, and records of any delays or suspensions of operations. Marine mammal observations would include animal type and/or species, number of animals sighted by species, date and time of observations, type of detection (visual, passive acoustic, HF/M3 sonar), the animal's bearing and range from vessel, behavior, and remarks/narrative (as necessary). The report would include the Navy's analysis of whether any Level A and/or Level B harassment taking occurred within the SURTASS LFA sonar 180-dB and 1 km (0.54 nm) mitigation zone and, if so, estimates of the percentage of marine mammal stocks affected (both for the quarter and cumulatively (to date) for the year covered by the LOA) by SURTASS LFA sonar operations. This analysis would include estimates of Level A and Level B harassment takes of marine mammals for within the mitigation zone, using predictive modeling based on operating locations, dates/times of operations, system characteristics, oceanographic environmental conditions, and animal demographics. In the event that no SURTASS LFA sonar missions are completed during a quarter, a report of negative activity would be provided.

Annual Report—The annual report would provide NMFS with an unclassified summary of the year's quarterly reports and will include the Navy's analysis of whether any Level A and/or Level B harassment takings of marine mammals occurred within the SURTASS LFA sonar's 180-dB and 1 km (0.54 nm) mitigation zones and, if so, estimates of the percentage of marine mammal stocks affected by SURTASS LFA sonar operations. This analysis would include estimates for both within and outside the 180-dB and 1 km (0.54 nm) mitigation zone, using predictive modeling based on operating locations, dates/times of operations, system characteristics, oceanographic environmental conditions, and animal demographics.

The annual report would also include: (1) Analysis of the effectiveness of the mitigation measures with recommendations for improvements where applicable; (2) assessment of any long-term effects from SURTASS LFA sonar operations; and (3) any discernible or estimated cumulative impacts from SURTASS LFA sonar operations.

Comprehensive Report—NMFS is requiring the Navy to provide NMFS and the public with a final comprehensive report analyzing the impacts of SURTASS LFA sonar on marine mammal species and stocks. This report, which is due at least 240 days prior to expiration of these regulations, would include an in-depth analysis of all monitoring and Navy-supported research pertinent to SURTASS LFA sonar conducted during the 5-year period of these regulations, a scientific assessment of cumulative impacts on marine mammal stocks, and an analysis on the advancement of alternative (passive) technologies as a replacement for LFA sonar. This report would be an important document for NMFS' review and assessment of impacts for any future rulemaking.

Annual reports and the Comprehensive Report will be posted on the NMFS homepage (see **ADDRESSES**).

Modification to Mitigation Measures

Any substantial modifications to NMFS' mitigation, monitoring, and reporting requirements will be proposed in the **Federal Register** with an opportunity for public comment prior to implementation (unless an emergency exists and modifications are necessary for the protection of marine mammals).

Designation of Offshore Biologically Important Areas for Marine Mammals

In addition to NMFS designating OBIAs independently, this rule describes a process for members of the public to petition NMFS to add an area to the list of OBIAs for marine mammals. To qualify for designation, an area must be of particular importance for marine mammals as an area for feeding, breeding, calving, or migration, and not simply an area occupied by marine mammals. The proposed area should not be within a previously designated OBIA or other 180-dB exclusion area. In order for NMFS to begin a rulemaking process for designating OBIAs, proponents must petition NMFS and submit the information described in 50 CFR 216.191(a). If NMFS makes a preliminary determination that the area is biologically important for marine mammals, NMFS will publish a **Federal Register** document proposing to add the area as an OBIA. After review of public comments and information, NMFS will make a final decision on whether to designate the area as an OBIA and publish a **Federal Register** document of its decision. Proposals for designation of areas will not affect the status of LOAs while the rulemaking is in process.

Waiver of Delay in Effectiveness Date

NMFS has determined good cause exists to waive the delay in effectiveness date for this final rule. Regulations governing the current MMPA authorization for Navy SURTASS LFA sonar operations expires on August 15, 2007. This final rule must therefore be effective by August 16, 2007 to avoid a gap in SURTASS LFA sonar operations. The Navy recently provided specific, credible, and verifiable information indicating that activities may occur on or after August 16, 2007 such that a gap in SURTASS LFA sonar operations would be detrimental to national security and reduce protection of U.S. and Allied naval forces from submarine threats. This rule, together with LOAs issued hereunder, will afford the Navy lawful incidental take coverage for marine mammals during SURTASS LFA sonar testing, training, and routine operations and avoid any gap in operations. The required mitigation and monitoring, which are designed to ensure the least practicable adverse impact on affected species or stocks will ensure that SURTASS LFA sonar will have a negligible impact on the affected species or stocks of marine mammals.

Changes From the Proposed Rule

NMFS has amended the proposed rule to add a 1-km (0.5-nm) buffer to the OBIA SPL restriction. Accordingly, the final rule requires the Navy to ensure SPLs do not exceed 180 dB (re 1 microPa(rms)) at a distance of 1km (0.5 nm) seaward of the outer perimeter of the OBIA. This measure will limit SPLs within OBIA to less than approximately 174 dB.

These regulations require the Navy to refrain from operating the SURTASS LFA sonar within any OBIA and further require the Navy to ensure SPLs do not exceed 180 dB (re 1 microPa(rms)) at a distance of 1km (0.5 nm) seaward of the outer perimeter of the OBIA.

Determinations

Based on the scientific analyses detailed in the Navy application and further supported by information and data contained in the Navy's Final SEIS and Final EIS for SURTASS LFA sonar operations and summarized in this rule, NMFS has determined that the incidental taking of marine mammals resulting from SURTASS LFA sonar operations would have a negligible impact on the affected marine mammal species or stocks over the 5-year period of LFA sonar operations covered by these regulations. That assessment is based on a number of factors: (1) The best information available indicates that effects from SPLs less than 180 dB will be limited to short-term Level B behavioral harassment averaging less than 12 percent annually for all affected marine mammal species; (2) the

mitigation and monitoring is highly effective in preventing exposures of 180 dB or greater; (3) the results of monitoring as described in the Navy's Comprehensive Report supports the conclusion that takings will be limited to Level B harassment and not have more than a negligible impact on affected species or stocks of marine mammals; (4) the small number of SURTASS LFA sonar systems (two systems in FY 2008 and FY 2009 (totaling 864 hours of operation annually), 3 in FY 2010 (totaling 1296 hours of operation annually), and 4 systems in FY 2011 and FY 20012 (totaling 1728 hours of operation annually)) that would be operating world-wide; (5) that the LFA sonar vessel must be underway while transmitting (in order to keep the receiver array deployed), limiting the duration of exposure for marine mammals to those few minutes when the SURTASS LFA sonar sound energy is moving through that part of the water column inhabited by marine mammals; (6) in the case of convergence zone (CZ) propagation, the characteristics of the acoustic sound path, which deflect the sound below the water depth inhabited by marine mammals for much of the sound propagation (see illustration 67 FR page 46715 (July 16, 2002); (7) the findings of the SRP on LF sounds on marine mammals indicated no significant change in biologically important behavior from exposure to sound levels up to 155 dB; and (8) during the 40 LFA sonar missions between 2002 and 2006, there were only three visual observations of marine mammals and only 71 detections by the HF/M3 sonar, which all resulted in mitigation protocol suspensions in operations. These measures all indicate that while marine mammals will potentially be affected by the SURTASS LFA sonar sounds, these impacts will be short-term behavioral effects and are not likely to adversely affect marine mammal species or stocks through effects on annual rates of reproduction or survival. In addition, mortality of marine mammals is not expected to occur as a result of LFA sonar operations and is not authorized in these regulations nor in any LOA issued under this rule.

Finally, because SURTASS LFA sonar operations will not take place in Arctic waters, it would not have an unmitigable adverse impact on the availability of marine mammals for subsistence uses identified in MMPA section 101(a)(5)(A)(i), 16 U.S.C. 1371(a)(5)(A)(i).

NEPA

On November 10, 2005 (70 FR 68443), the Environmental Protection Agency (EPA) announced receipt of a Draft SEIS from the U.S. Navy on the deployment of SURTASS LFA sonar. This Final SEIS incorporated by reference the Navy's Final EIS on SURTASS LFA sonar deployment. The public comment period on the Draft SEIS ended on February 10, 2006. On May 4, 2007 (72 FR 25302), EPA announced receipt of a Final SEIS from the U.S. Navy on the deployment of SURTASS LFA sonar. NMFS was a cooperating agency, as defined by the Council on Environmental Quality (40 CFR 1501.6), in the preparation of these documents. NMFS reviewed the Navy's Final SEIS, adopted the Navy Final EIS, as provided for in 40 CFR 1506.3, and has determined it is unnecessary to prepare additional NEPA analyses. The Navy's Final SEIS is available at: *http://www.surtass-LFA sonar-eis.com.*

ESA

On June 9, 2006, the Navy submitted a Biological Assessment to NMFS to initiate consultation under section 7 of the ESA for the 2007–2012 SURTASS LFA sonar activities and NMFS'' authorization for incidental take under the MMPA. NMFS concluded consultation with the Navy on this action on August xx, 2007. The conclusion of that consultation was that operation of the SURTASS LFA sonar system for testing, training and military operations and the issuance by NMFS of MMPA incidental take authorizations for this activity are not likely to jeopardize the continued existence of any endangered or threatened species under the jurisdiction of NMFS or result in the destruction or adverse modification of critical habitat.

Classification

This action has been determined to be significant for purposes of Executive Order 12866.

The Chief Counsel for Regulation of the Department of Commerce certified to the Chief Counsel for Advocacy of the Small Business Administration at the proposed rule stage, that this action would not have a significant economic impact on a substantial number of small entities within the meaning of the Regulatory Flexibility Act. If implemented, this rule would affect only the U.S. Navy which, by definition, is not a small business. Because of this certification, a regulatory flexibility analysis is not required.

List of Subjects in 50 CFR Part 216

Exports, Fish, Imports, Indians, Labeling, Marine mammals, Penalties, Reporting and recordkeeping requirements, Seafood, Transportation.

Dated: August 14, 2007.

William T. Hogarth,

Assistant Administrator for Fisheries, National Marine Fisheries Service.

■ For reasons set forth in the preamble, 50 CFR part 216 is amended as follows:

PART 216—REGULATIONS GOVERNING THE TAKING AND IMPORTING OF MARINE MAMMALS

■ 1. The authority citation for part 216 continues to read as follows:

Authority: 16 U.S.C. 1361 *et seq.*, unless otherwise noted.

■ 2. Subpart Q is added to part 216 to read as follows:

Subpart Q—Taking of Marine Mammals Incidental to Navy Operations of Surveillance Towed Array Sensor System Low Frequency Active (SURTASS LFA sonar) Sonar

Sec.

Subpart Q—Taking of Marine Mammals Incidental to Navy Operations of Surveillance Towed Array Sensor System Low Frequency Active (SURTASS LFA sonar) Sonar

§ 216.180 Specified activity.

Regulations in this subpart apply only to the incidental taking of those marine mammal species specified in paragraph (b) of this section by the U.S. Navy, Department of Defense, while engaged in the operation of no more than four SURTASS LFA sonar systems conducting active sonar operations, in areas specified in paragraph (a) of this section. The authorized activities, as specified in a Letter of Authorization issued under §§ 216.106 and 216.188, include the transmission of low frequency sounds from the SURTASS LFA sonar and the transmission of high frequency sounds from the mitigation

sonar described in § 216.185 during training, testing, and routine military operations of SURTASS LFA sonar.

(a) With the exception of those areas specified in § 216.183(d), the incidental taking by harassment may be authorized in the areas (biomes, provinces, and subprovinces) described in Longhurst (1998), as specified in a Letter of Authorization.

(b) The incidental take, by Level A and Level B harassment, of marine mammals from the activity identified in this section is limited to the following species and species groups:

(1) Mysticete whales—blue (*Balaenoptera musculus*), fin (*Balaenoptera physalus*), minke (*Balaenoptera acutorostrata*), Bryde's (*Balaenoptera edeni*), sei (*Balaenoptera borealis*), humpback (*Megaptera novaeangliae*), North Atlantic right (*Eubalaena glacialis*), North Pacific right (*Eubalena japonica*) southern right (*Eubalaena australis*), pygmy right (*Capera marginata*), bowhead (*Balaena mysticetus*), and gray (*Eschrichtius robustus*) whales.

(2) Odontocete whales—harbor porpoise (*Phocoena phocoena*), spectacled porpoise (*Phocoena dioptrica*), beluga (*Dephinapterus leucas*), *Stenella spp.*, Risso's dolphin (*Grampus griseus*), rough-toothed dolphin (*Steno bredanensis*), Fraser's dolphin (*Lagenodelphis hosei*), northern right-whale dolphin (*Lissodelphis borealis*), southern right whale dolphin (*Lissodelphis peronii*), short-beaked common dolphin (*Delphius delphis*), long-beaked common dolphin (*Delphinus capensis*), very long-beaked common dolphin (*Delphinus tropicalis*), *Lagenorhynchus spp.*, *Cephalorhynchus spp.*, bottlenose dolphin (*Tursiops truncatus*), Dall's porpoise (*Phocoenoides dalli*), melon-headed whale (*Peponocephala spp.*), beaked whales (*Berardius spp., Hyperoodon spp., Mesoplodon spp.*, Cuvier's beaked whale (*Ziphius cavirostris*), Shepard's beaked whale (*Tasmacetus shepherdi*), Longman's beaked whale (*Indopacetus pacificus*), killer whale (Orcinus orca), false killer whale (*Pseudorca crassidens*), pygmy killer whale (*Feresa attenuata*), sperm whale (*Physeter macrocephalus*), dwarf and pygmy sperm whales (*Kogia simus and K. breviceps*), and short-finned and long-finned pilot whales (*Globicephala macrorhynchus* and *G. melas*).

(3) Pinnipeds—hooded seal (*Cystophora cristata*), harbor seal (*Phoca vitulina*), spotted seal (*P. largha*), ribbon seal (*P. fasciata*), gray seal (*Halichoerus grypus*), elephant seal (*Mirounga angustirostris and M. leonina*), Hawaiian monk seal (*Monachus schauinslandi*), Mediterranean monk seal (*Monachus monachus*), northern fur seal (*Callorhinus ursinus*), southern fur seal (*Arctocephalus spp.*), harp seal (*Phoca groenlandica*), Galapagos sea lion (*Zalophus californianus wollebaeki*), Japanese sea lion (*Zalophus californianus japonicus*), Steller sea lion (*Eumetopias jubatus*), California sea lion (*Zalophus californianus*), Australian sea lion (*Neophoca cinerea*), New Zealand sea lion (*Phocarctos hookeri*), and South American sea lion (*Otaria flavescens*).

§ 216.181 Effective dates.

Regulations in this subpart are effective from August 16, 2007 through August 15, 2012.

§ 216.182 Permissible methods of taking.

(a) Under Letters of Authorization issued pursuant to §§ 216.106 and 216.188, the Holder of the Letter of Authorization may incidentally, but not intentionally, take marine mammals by Level A and Level B harassment within the areas described in § 216.180(a), provided the activity is in compliance with all terms, conditions, and requirements of these regulations and the appropriate Letter of Authorization.

(b) The activities identified in § 216.180 must be conducted in a manner that minimizes, to the greatest extent practicable, any adverse impacts on marine mammals and their habitat.

§ 216.183 Prohibitions.

No person in connection with the activities described in § 216.180 shall:

(a) Take any marine mammal not specified in § 216.180(b);

(b) Take any marine mammal specified in § 216.180(b) other than by incidental, unintentional Level A and Level B harassment;

(c) Take a marine mammal specified in § 216.180(b) if such taking results in more than a negligible impact on the species or stocks of such marine mammal; or

(d) Violate, or fail to comply with, the terms, conditions, and requirements of the regulations in this subpart or any Letter of Authorization issued under §§ 216.106 and 216.188.

§ 216.184 Mitigation.

The activity identified in § 216.180(a) must be conducted in a manner that minimizes, to the greatest extent practicable, adverse impacts on marine mammals and their habitats. When conducting operations identified in § 216.180, the mitigation measures described in this section and in any Letter of Authorization issued under §§ 216.106 and 216.188 must be implemented.

(a) Through monitoring described under § 216.185, the Holder of a Letter of Authorization must act to ensure, to the greatest extent practicable, that no marine mammal is subjected to a sound pressure level of 180 dB or greater.

(b) If a marine mammal is detected within or about to enter the mitigation zone (the area subjected to sound pressure levels of 180 dB or greater plus the 1 km (0.54 nm) buffer zone extending beyond the 180-dB zone), SURTASS LFA sonar transmissions will be immediately delayed or suspended. Transmissions will not resume earlier than 15 minutes after:

(1) All marine mammals have left the area of the mitigation and buffer zones; and

(2) There is no further detection of any marine mammal within the mitigation and buffer zones as determined by the visual and/or passive or active acoustic monitoring described in § 216.185.

(c) The high-frequency marine mammal monitoring sonar (HF/M3) described in § 216.185 will be ramped-up slowly to operating levels over a period of no less than 5 minutes:

(1) At least 30 minutes prior to any SURTASS LFA sonar transmissions;

(2) Prior to any SURTASS LFA sonar calibrations or testings that are not part of regular SURTASS LFA sonar transmissions described in paragraph (c)(1) of this section; and

(3) Anytime after the HF/M3 source has been powered down for more than 2 minutes.

(d) The HF/M3 sound pressure level will not be increased once a marine mammal is detected; ramp-up may resume once marine mammals are no longer detected.

(e) The Holder of a Letter of Authorization will not operate the SURTASS LFA sonar, such that:

(1) the SURTASS LFA sonar sound field exceeds 180 dB (re 1 microPa(rms)) at a distance less than 12 nautical miles (nm) (22 kilometers (km)) from any coastline, including offshore islands;

(2) the SURTASS LFA sonar sound field exceeds 180 db (re 1 microPa(rms)) at a distance of 1 km (0.5 nm) seaward of the outer perimeter of any offshore biologically important area designated in 216.184(f) during the biologically important period specified.

(f) The following areas have been designated by NMFS as Offshore Biologically Important Areas (OBIAs) for marine mammals (by season if appropriate):

Name of area	Location of area	Months of importance
(1) 200-m isobath North American East Coast ..	From 28° N. to 50° N., west of 40° W	Year-round.
(2) Antarctic Convergence Zone	30° E. to 80° E. to 45°; 80° E. to 150° E. to 55°; S. 150° E. to 50° W. to 60° S.; 50° W. to 30° E. to 50° S.	October 1–March 31.
(3) Costa Rica Dome	Centered at 9° N. and 88° W	Year-round.
(4) Hawaiian Islands Humpback Whale National Marine Sanctuary-Penguin Bank.	Centered at 21° N. and 157° 30' W	November 1 through May 1.
(5) Cordell Bank National Marine Sanctuary	Boundaries in accordance with 15 CFR 922.110.	Year-round.
(6) Gulf of the Farallones National Marine Sanctuary.	Boundaries in accordance with 15 CFR 922.80.	Year-round.
(7) Monterey Bay National Marine Sanctuary	Boundaries in accordance with 15 CFR 922.30.	Year-round.
(8) Olympic Coast National Marine Sanctuary ...	Boundaries within 23 nm of the coast from 47°07′ N. to 48°30′ N. latitude.	December January, March and May.
(9) Flower Garden Banks National Marine Sanctuary.	Boundaries in accordance with 15 CFR 922.120.	Year-round.
(10) The Gully	44°13′ N., 59°06′ W. to 43°47′ N.; 58°35′ W. to 43°35′ N.; 58°35′ W. to 43°35′ N.; 59°08′ W. to 44°06′ N.; 59°20′ W.	Year-round.

§ 216.185 Requirements for monitoring.

(a) In order to mitigate the taking of marine mammals by SURTASS LFA sonar to the greatest extent practicable, the Holder of a Letter of Authorization issued pursuant to §§ 216.106 and 216.188 must:

(1) Conduct visual monitoring from the ship's bridge during all daylight hours (30 minutes before sunrise until 30 minutes after sunset);

(2) Use low frequency passive SURTASS sonar to listen for vocalizing marine mammals; and

(3) Use the HF/M3 (high frequency) sonar developed to locate and track marine mammals in relation to the SURTASS LFA sonar vessel and the sound field produced by the SURTASS LFA sonar source array.

(b) Monitoring under paragraph (a) of this section must:

(1) Commence at least 30 minutes before the first SURTASS LFA sonar transmission;

(2) Continue between transmission pings; and

(3) Continue either for at least 15 minutes after completion of the SURTASS LFA sonar transmission exercise, or, if marine mammals are exhibiting unusual changes in behavioral patterns, for a period of time until behavior patterns return to normal or conditions prevent continued observations;

(c) Holders of Letters of Authorization for activities described in § 216.180 are required to cooperate with the National Marine Fisheries Service and any other federal agency for monitoring the impacts of the activity on marine mammals.

(d) Holders of Letters of Authorization must designate qualified on-site individuals to conduct the mitigation, monitoring and reporting activities specified in the Letter of Authorization.

(e) Holders of Letters of Authorization must conduct all monitoring required under the Letter of Authorization.

§ 216.186 Requirements for reporting.

(a) The Holder of the Letter of Authorization must submit quarterly mission reports to the Director, Office of Protected Resources, NMFS, no later than 30 days after the end of each quarter beginning on the date of effectiveness of a Letter of Authorization or as specified in the appropriate Letter of Authorization. Each quarterly mission report will include all active-mode missions completed during that quarter. At a minimum, each classified mission report must contain the following information:

(1) Dates, times, and location of each vessel during each mission;

(2) Information on sonar transmissions during each mission;

(3) Results of the marine mammal monitoring program specified in the Letter of Authorization; and

(4) Estimates of the percentages of marine mammal species and stocks affected (both for the quarter and cumulatively for the year) covered by the Letter of Authorization.

(b) The Holder of a Letter of Authorization must submit an annual report to the Director, Office of Protected Resources, NMFS, no later than 45 days after the expiration of a Letter of Authorization. This report must contain all the information required by the Letter of Authorization.

(c) A final comprehensive report must be submitted to the Director, Office of Protected Resources, NMFS at least 240 days prior to expiration of these regulations. In addition to containing all the information required by any final year Letter of Authorization, this report must contain an unclassified analysis of new passive sonar technologies and an assessment of whether such a system is feasible as an alternative to SURTASS LFA sonar.

§ 216.187 Applications for Letters of Authorization.

(a) To incidentally take marine mammals pursuant to these regulations, the U.S. Navy authority conducting the activity identified in § 216.180 must apply for and obtain a Letter of Authorization in accordance with § 216.106.

(b) The application for a Letter of Authorization must be submitted to the Director, Office of Protected Resources, NMFS, at least 60 days before the date that either the vessel is scheduled to begin conducting SURTASS LFA sonar operations or the previous Letter of Authorization is scheduled to expire.

(c) All applications for a Letter of Authorization must include the following information:

(1) The date(s), duration, and the area(s) where the vessel's activity will occur;

(2) The species and/or stock(s) of marine mammals likely to be found within each area;

(3) The type of incidental taking authorization requested (i.e., take by Level A and/or Level B harassment);

(4) The estimated percentage of marine mammal species/stocks potentially affected in each area for the 12-month period of effectiveness of the Letter of Authorization; and

(5) The means of accomplishing the necessary monitoring and reporting that will result in increased knowledge of the species and the level of taking or impacts on marine mammal populations.

(d) The National Marine Fisheries Service will review an application for a Letter of Authorization in accordance with § 216.104(b) and, if adequate and complete, issue a Letter of Authorization.

§ 216.188 Letters of Authorization.

(a) A Letter of Authorization, unless suspended or revoked will be valid for a period of time not to exceed one year, but may be renewed annually subject to annual renewal conditions in § 216.189.

(b) Each Letter of Authorization will set forth:

(1) Permissible methods of incidental taking;

(2) Authorized geographic areas for incidental takings;

(3) Means of effecting the least practicable adverse impact on the species of marine mammals authorized for taking, their habitat, and the availability of the species for subsistence uses; and

(4) Requirements for monitoring and reporting incidental takes.

(c) Issuance of each Letter of Authorization will be based on a determination that the total number of marine mammals taken by the activity specified in § 216.180 as a whole will have no more than a negligible impact on the species or stocks of affected marine mammal(s), and that the total taking will not have an unmitigable adverse impact on the availability of species or stocks of marine mammals for taking for subsistence uses.

(d) Notice of issuance or denial of an application for a Letter of Authorization will be published in the **Federal Register** within 30 days of a determination.

§ 216.189 Renewal of Letters of Authorization.

(a) A Letter of Authorization issued for the activity identified in § 216.180 may be renewed annually upon:

(1) Notification to NMFS that the activity described in the application submitted under § 216.187 will be undertaken and that there will not be a substantial modification to the described activity, mitigation or monitoring undertaken during the upcoming season;

(2) Notification to NMFS of the information identified in § 216.187(c), including the planned geographic area(s), and anticipated duration of each SURTASS LFA sonar operation;

(3) Timely receipt of the monitoring reports required under § 216.185, which have been reviewed by NMFS and determined to be acceptable;

(4) A determination by NMFS that the mitigation, monitoring and reporting measures required under §§ 216.184 and 216.185 and the previous Letter of Authorization were undertaken and will be undertaken during the upcoming annual period of validity of a renewed Letter of Authorization; and

(5) A determination by NMFS that the number of marine mammals taken by the activity as a whole will have no more than a negligible impact on the species or stock of affected marine mammal(s), and that the total taking will not have an unmitigable adverse impact on the availability of species or stocks of marine mammals for taking for subsistence uses.

(b) If a request for a renewal of a Letter of Authorization indicates that a substantial modification to the described work, mitigation or monitoring will occur, or if NMFS proposes a substantial modification to the Letter of Authorization, NMFS will provide a period of 30 days for public review and comment on the proposed modification. Amending the areas for upcoming SURTASS LFA sonar operations is not considered a substantial modification to the Letter of Authorization.

(c) A notice of issuance or denial of a renewal of a Letter of Authorization will be published in the **Federal Register** within 30 days of a determination.

§ 216.190 Modifications to Letters of Authorization.

(a) Except as provided in paragraph (b) of this section, no substantial modification (including withdrawal or suspension) to a Letter of Authorization subject to the provisions of this subpart shall be made by NMFS until after notification and an opportunity for public comment has been provided. For purposes of this paragraph, a renewal of a Letter of Authorization, without modification, except for the period of validity and a listing of planned operating areas, or for moving the authorized SURTASS LFA sonar system from one ship to another, is not considered a substantial modification.

(b) If the National Marine Fisheries Service determines that an emergency exists that poses a significant risk to the well-being of the species or stocks of marine mammals specified in § 216.180(b), a Letter of Authorization may be substantially modified without prior notice and opportunity for public comment. Notification will be published in the **Federal Register** within 30 days of the action.

§ 216.191 Designation of Offshore Biologically Important Marine Mammal Areas.

(a) Offshore biologically important areas for marine mammals may be nominated under this paragraph by the National Marine Fisheries Service or by members of the public.

(b) Proponents must petition NMFS by requesting an area be added to the list of offshore biologically important areas in § 216.184(f) and submitting the following information:

(1) Geographic region proposed for consideration (including geographic boundaries);

(2) A list of marine mammal species or stocks within the proposed geographic region;

(3) Whether the proposal is for year-round designation or seasonal, and if seasonal, months of years for proposed designation;

(4) Detailed information on the biology of marine mammals within the area, including estimated population size, distribution, density, status, and the principal biological activity during the proposed period of designation sufficient for NMFS to make a preliminary determination that the area is biologically important for marine mammals; and

(5) Detailed information on the area with regard to its importance for feeding, breeding, or migration for those species of marine mammals that have the potential to be affected by low frequency sounds;

(c) Areas within 12 nm (22 km) of any coastline, including offshore islands, or within non-operating areas for SURTASS LFA sonar are not eligible for consideration.

(d) If a petition does not contain sufficient information for the National Marine Fisheries Service to proceed, NMFS will determine whether the nominated area warrants further study. If so, NMFS will begin a scientific review of the area.

(e)(1) If through a petition or independently, NMFS makes a preliminary determination that an offshore area is biologically important for marine mammals and is not located within a previously designated area, NMFS will publish a **Federal Register** notice proposing to add the area to § 216.184(f) and solicit public comment.

(2) The National Marine Fisheries Service will publish its final determination in the **Federal Register**.

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