2 DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES

This chapter provides a description of SURTASS LFA sonar technology and the alternatives being considered for its employment, including the No Action Alternative. The proposed action is Navy employment of up to four SURTASS LFA sonar systems.

Based on the Court's findings and DASN(E) direction to the Chief of Naval Operations (N7) to develop a supplemental EIS (SEIS), this document provides additional information regarding the environment that could potentially be affected by employment of SURTASS LFA, and identifies geographic areas and seasonal periods of high marine mammal abundance to assist the Navy in selecting SURTASS LFA operating areas. Further, the Court's opinion found that the Navy violated NEPA by: 1) failing to consider adequate alternatives in the form of considering training in areas that present a reduced risk of harm; 2) failing to adequately consider acoustic transmission shut downs to protect fish; and 3) failing to adequately consider potential impacts to fish. These issues are addressed in this document.

References to Underwater Sound Levels

1. References to underwater sound pressure level (SPL) in this SEIS are values given in decibels (dBs), and are assumed to be standardized at 1 microPascal at 1 m (dB re 1 µPa at 1 m [rms]) for Source Level (SL) and dB re 1 µPa [rms] for Received Level (RL), unless otherwise stated.
2. References to underwater Sound Exposure Level (SEL) in this SEIS are the measure of sound energy flow per unit area expressed in dB, and are assumed to be standardized at dB re 1 μPa^2-s, unless otherwise stated.

2.1 General System Descriptions

SURTASS LFA sonar systems are long-range, all-weather systems operating in the LF band (below 1,000 Hz) within the frequency range of 100 to 500 Hz. These systems are composed of both active and passive components as shown in Figure 2-1.

SONAR is an acronym for SOund NAvigation and Ranging, and its definition includes any system that uses underwater sound, or acoustics, for observations and communications. Sonar systems are used for many purposes, ranging from "fish finders" to military ASW systems for detection and classification of submarines. There are two broad types of sonar:

- Passive sonar detects the sound created by an object (source) in the water. This is a one-way transmission of sound waves traveling through the water from the source to the receiver and is basically the same as people hearing sounds that are created by another source and transmitted through the air to the ear.

- Active sonar detects objects by creating a sound pulse, or "ping," that is transmitted through the water and reflects off the target, returning in the form of an echo. This is a two-way transmission (source to reflector to receiver). Some marine mammals locate prey and navigate utilizing this form of echolocation.

Existing operational LFA systems are installed on two SURTASS vessels: R/V *Cory Chouest* and USNS IMPECCABLE (T-AGOS 23). As future undersea warfare requirements continue to transition to shallow littoral ocean regions, the development and introduction of a compact active system deployable from existing, smaller SURTASS Swath-P ships is paramount. This smaller system is known as Compact LFA, or CLFA. CLFA consists of smaller, lighter-weight source elements than the current LFA system, and will be compact enough to be installed on the existing SURTASS platform, VICTORIOUS Class (T-AGOS 19, 21, and 22). The operational characteristics of the compact system are comparable to the existing LFA systems as presented in the Subchapter 2.1 of the FOEIS/EIS and this document. Therefore, the potential impacts from CLFA are expected to be similar to the effects from the existing SURTASS LFA systems. Hence for this analysis, the term low frequency active, or LFA, will be used to refer to both the existing LFA system and/or the compact (CLFA) system, unless otherwise specified.

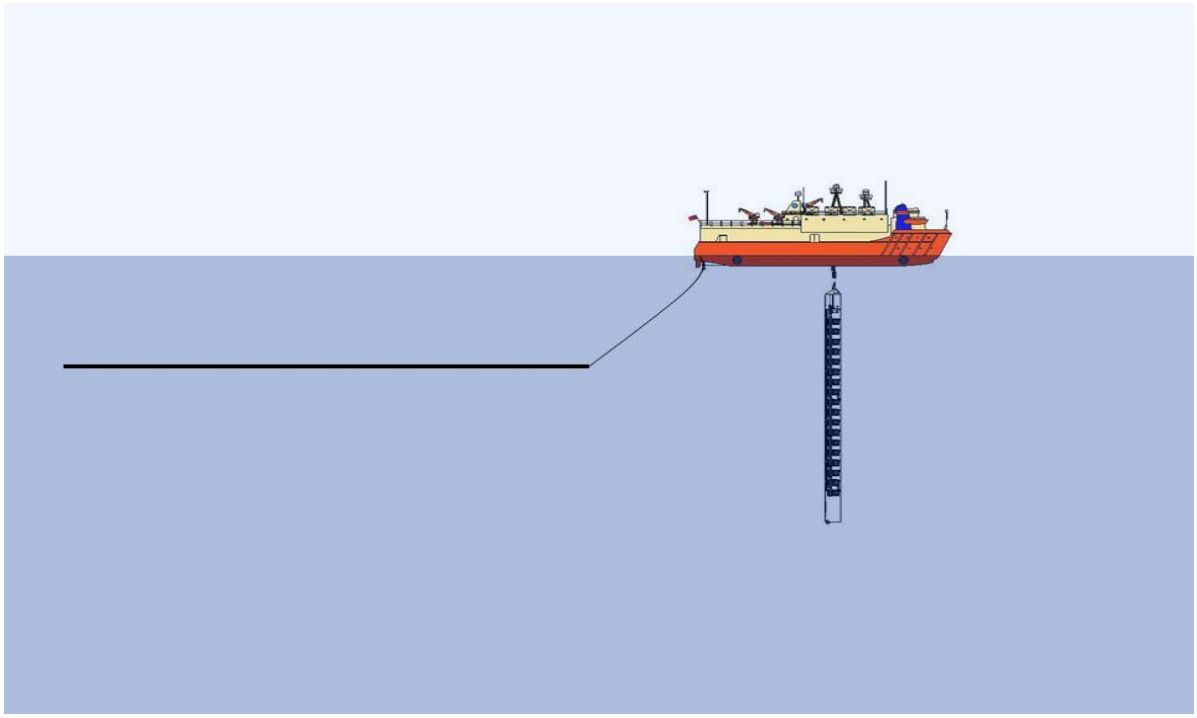

Figure 2-1. SURTASS LFA Sonar Systems

At present, there are two existing SURTASS LFA sonar systems onboard the R/V *Cory Chouest* and USNS IMPECCABLE (T-AGOS 23). Three additional CLFA systems are planned for the T-AGOS 19, 21, and 22. Figure 2-2 shows the projected availability of these systems. With the R/V *Cory Chouest* retiring in FY 2008, only two or three systems will be operational through FY 2010. Early in FY 2011 the potential exists for four vessels to be operational. At no point are there expected to be more than four systems in use, and thus this SEIS considers the employment of up to four systems.

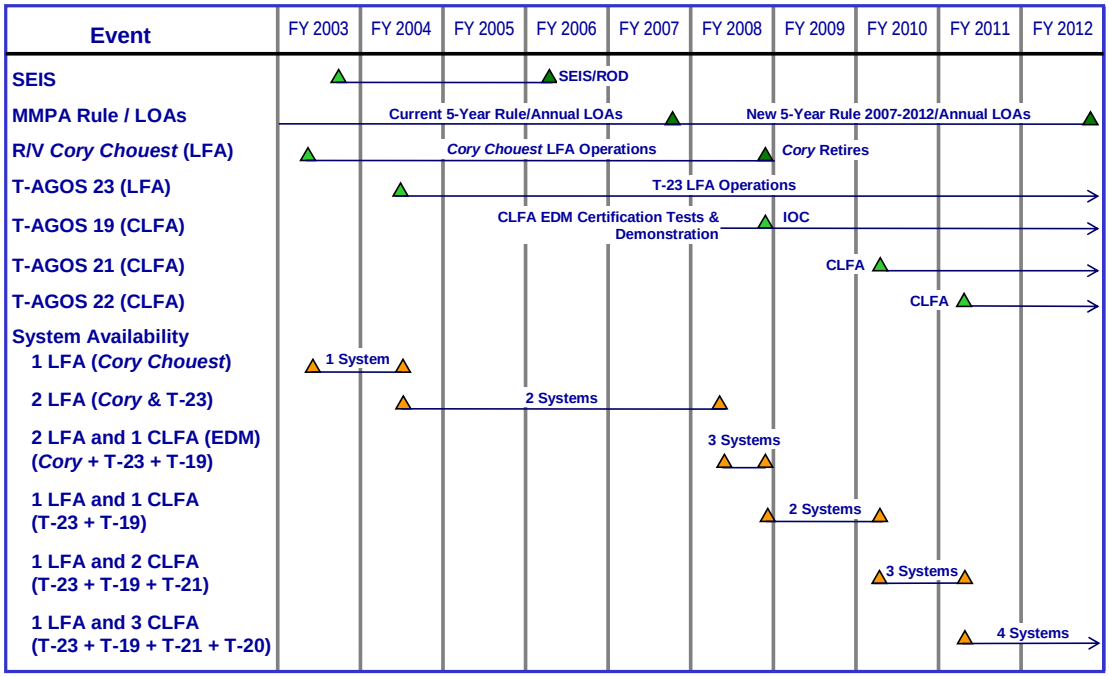

Figure 2-2. Projected LFA and CLFA Sonar Systems Availability

2.1.1 Active System Component

The active component of the existing SURTASS LFA sonar system, LFA, is an active adjunct to the SURTASS passive capability and is planned for use when passive system performance is inadequate. LFA complements SURTASS passive operations by actively acquiring and tracking submarines when they are in quiet operating modes, measuring accurate target range, and re-acquiring lost contacts.

LFA is a set of acoustic transmitting source elements suspended by cable under an ocean surveillance vessel, such as the R/V *Cory Chouest*, USNS IMPECCABLE (T-AGOS 23), and the VICTORIOUS Class (T-AGOS 19 Class) (Figure 2-1). These elements, called projectors, are devices that produce the active sound pulse, or ping. The projectors transform electrical energy to mechanical energy that set up vibrations or pressure disturbances within the water to produce a ping.

The characteristics and operating features of the active component (LFA) are:

- The source is a vertical line array (VLA) of up to 18 source projectors suspended below the vessel. LFA's transmitted beam is omnidirectional (360 degrees) in the horizontal, with a narrow vertical beamwidth that can be steered above or below the horizontal.
- The source frequency is between 100 and 500 Hz. A variety of signal types can be used, including continuous wave (CW) and frequency-modulated (FM) signals.
- The source level (SL) of an individual source projector of the SURTASS LFA sonar array is approximately 215 dB or less. The sound field of the array can never be higher than the SL of an individual source projector.
- The typical LFA signal is not a constant tone, but rather a transmission of various waveforms that vary in frequency and duration. A complete sequence of sound transmissions is referred to as a wavetrain (also known as a "ping"). These wavetrains last between 6 and 100 seconds with an average length of 60 seconds. Within each wavetrain the duration of each continuous frequency sound transmission is never longer than 10 seconds.
- Average duty cycle (ratio of sound "on" time to total time) is less than 20 percent. The typical duty cycle, based on historical LFA operational parameters, is nominally 7.5 percent.
- The time between wavetrain transmissions is typically from 6 to 15 minutes.

2.1.2 Passive System Component

The passive, or listening, part of the system is SURTASS. SURTASS detects returning echoes from submerged objects, such as threat submarines, through the use of hydrophones. These devices transform mechanical energy (received acoustic sound wave) to an electrical signal that can be analyzed by the processing system of the sonar. The SURTASS hydrophones are mounted on a receive array (horizontal line array [HLA]) that is towed astern of the vessel (Figure 2-1). The SURTASS LFA sonar vessel must maintain a minimum speed of 5.6 kilometers per hour (kph) (3 knots [kt]) through the water in order to tow the hydrophone array. The return signals, which are usually below background or ambient noise level, are then processed and evaluated to identify and classify potential underwater threats.

The general characteristics of the SURTASS passive HLA are:

- Array length: 1,500 m (4,920 ft);
- Operational depth: 152 m (500 ft) to 457 m (1,500 ft);
- Minimum speed for deployment: 5.6 kph (3 kt); and
- Frequency: 0 to 500 Hz.

2.2 Operating Profile

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 operations since January 2003 and projected Fleet requirements. As shown in Table 2-1, a SURTASS LFA sonar deployment schedule for a single vessel could involve up to 294 days per year at sea (underway). A nominal at-sea mission will occur over a 49-day period, with 40 days of operations and 9 days transit. Based on a 7.5 percent duty cycle (based on historical LFA operating parameters), the system will 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. 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.

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 in order to maintain both the material condition of the vessel and its systems, and the morale of the crew.

This operating profile differs somewhat from the one provided in the FOEIS/EIS because that profile was based on estimations of operational requirements, not actual operations and real-time Fleet requirements. Key comparisons are provided in Table 2-2.

2.3 Potential Operational Areas

Because of uncertainties in the world's political climate, a detailed account of future operating locations and conditions cannot be delineated over the next five years. SURTASS LFA sonar operations, including testing of new systems as they come on line, will not be concentrated in specific sites, but will take place within any of the potential operational areas defined in Chapter 1 (Figure 1-1) in the Final OEIS/EIS. Polar Regions are excluded because of the inherent inclement weather conditions, including the danger of icebergs. To reduce adverse effects on the marine environment, areas will also be excluded as necessary to prevent 180-decibel (dB) sound pressure level (SPL) or greater within 22 kilometers (km) (12 nautical miles [nm]) of land, in offshore biologically important areas during biologically important seasons (see Figure 1-1), and in areas necessary to prevent greater than 145-dB SPL at known recreational and commercial dive sites.

Potential operations for SURTASS LFA vessels over the next five years, based on current operational requirements, will most likely include areas located in the Pacific, Indian, and Atlantic oceans, and the Mediterranean Sea.

Table 2-1. Nominal SURTASS LFA Sonar Annual and 49-Day Deployment Schedule—Single Ship

I. Nominal Annual Deployment

6 Days		49 Days		6 Days		49 Days		16 Days		49 Days	
In-Port Upkeep	T	Mission Operations Active	T	In-Port Upkeep	T	Mission Operations Active	T	In-Port Upkeep	T	Mission Operations Active	T

6 Days		49 Days		6 Days		49 Days		31 Days		49 Days	
In-Port Upkeep	T	Mission Operations Active	T	In-Port Upkeep	T	Mission Operations Active	T	Regular Overhaul	T	Mission Operations Active	T
Notes: "T" denotes transit periods when there would be no active transmissions											

II. Nominal 49-Day Mission

Transit	LFA Operations	Transit
4.5 Days	40 Days (72 hours active sonar transmissions @ 7.5% duty cycle*)	4.5 Days

*Note: 7.5% duty cycle is based on historical LFA operating parameters, which include downtime for:

- Corrective maintenance (equipment casualties or system failures)
- Preventive maintenance (database maintenance, daily archive, tow-point changes, etc.)
- Ship re-positioning
- De-confliction of mutual interference with other naval sensor systems
- EMCON (emission control) restrictions during naval operations and exercises

III. Nominal Annual Summary

Underway on Mission	Days	Not Underway	Days
Transit	54	In-Port Upkeep	40
Active Operations (432 hours transmissions based on 7.5% duty cycle*)	240	Regular Overhaul	31
Total Underway	294	Total Not Underway	71
Total Underway & Not Underway			365

Table 2-2. Comparison of Final and Supplemental EIS Annual Operating Profiles

	FOEIS/EIS	SEIS
Number of Active Missions	6	6
Number of Days Active per Mission	18	40
Number of Hours Active Ops Per Day	20	24
Duty Cycle	20 percent[1]	7.5 percent[2]
Days Active Ops	108	240
Days Transit/Reposition	108	54
Days In-Port/Regular Overhaul	95	71
Annual Transmission hours per vessel per year	432[3]	432[3]

Notes: 1. 20 percent duty cycle was conservatively based on the maximum LFA duty cycle.
2. 7.5 percent duty cycle is based on historical LFA operational parameters.
3. The FOEIS/EIS analyzed four vessels each with 432 hours of transmission time per year (See FOEIS/EIS Subchapter 2.2). In the ROD, the Navy stated that it would employ only two SURTASS LFA systems because only two systems would be available during the five year period through 2007. In the MMPA Rule, NMFS limited the Navy to two systems, consistent with the ROD, with missions totaling no more than 432 hours of transmissions per vessel per year. Because SURTASS LFA operations were limited to a relatively small area in the northwestern Pacific Ocean by the Court's Permanent Injunction, NMFS restricted the total operating hours to 432 hours for both vessels in the annual LOAs. Because LFA operations are not expected to be geographically restricted (except as noted in the mitigation) in the future, the original planned 432 hours of active transmissions per vessel per year, as analyzed in the FOEIS/EIS, are also proposed in this SEIS.

As an integral part of the SEIS, the Navy must anticipate, or predict, where they have to operate in the next five years or so. Naval forces are presently operating in several areas strategic to U.S national and international interests, including areas in the Mediterranean Sea, the Indian Ocean and Persian Gulf, and the Pacific Rim. National Security needs may dictate that many of these operational areas will be close to ports and choke points, such as entrances to straits, channels, and canals. It is anticipated that many future naval conflicts are likely to occur within littoral or coastal areas. The Navy must balance National Security needs with environmental requirements and impacts, while protecting both our freedom and the world's natural resources.

It is infeasible to analyze all potential mission areas for all species' stocks for all seasons. The FOEIS/EIS acoustic modeling analysis for 31 worldwide sites remains valid, and deals with potential SURTASS LFA operating areas adequately. In addition, the Navy is required to develop an annual process, in consultation with NMFS, that identifies, through LOA application procedures, the locations that the Navy intends to operate within that year. Additional analysis (including acoustic modeling, if needed) is undertaken if it is deemed necessary (e.g., updated marine mammal distribution or density data available for potential operating areas).

SEIS alternatives analyses are based on balancing National Security requirements for ASW/LFA with environmental compliance considerations. LFA must operate near our potential ASW adversaries, so a process to minimize the potential for environmental effects from these operations must be overlaid with the process for identifying the operations areas themselves. Alternatives development and analyses include operational areas of interest to the Navy for National Security reasons (when and where the Navy desires to operate), acoustic environmental data, animal density and distribution (spatial and temporal), and the best processes to determine areas with the least impact that meet National Security requirements. SEIS alternatives analysis is based on the utilization of the process that has been developed for the annual LOA

applications to NMFS to determine desired locations with spatial/temporal analysis (both for biology and LFA operations). The determination of where and when the Navy will operate LFA in the future is a joint, scientifically-based process involving the Navy and NMFS, culminating in NMFS's issuance of annual LOAs. This process is the basis for the analyses of SEIS alternatives and is discussed in Subchapter 4.4

2.4 Mitigation Measures

Based on the results of the FOEIS/EIS and the extensive review process for the SURTASS LFA Final Rule under the MMPA (67 FR 46785), the DASN(E) carefully weighed the operational, scientific, technical, and environmental implications of the alternatives considered. Based on this analysis, the Navy announced its decision to employ SURTASS LFA sonar systems with certain geographical restrictions and monitoring mitigation protocols designed to reduce potential adverse effects on the marine environment. This decision, known as the Record of Decision (ROD), implemented Alternative 1 identified in the FOEIS/EIS for SURTASS LFA Sonar. All practicable means to avoid or minimize environmental harm have been adopted through the incorporation of mitigation measures into operation of the SURTASS LFA sonar and the designation of the LFA Mitigation Zone.

The objectives of these current mitigation measures are to avoid injury to marine mammals and sea turtles near the SURTASS LFA sonar source and to protect recreational and commercial divers in the marine environment, involving both geographic restrictions and operational measures. These measures include:

- Geographic Restrictions to ensure that the sound field:
    - Is below 180 dB within a specified distance of any coastline and in the offshore biologically important areas that exist outside the 22-km (12-nm) from any coastline during the biologically important season for that particular area; and
    - Does not exceed 145 dB in the vicinity of known recreational and commercial dive sites.
- Monitoring to prevent injury to marine species by making every effort to detect animals within the LFA mitigation zone before and during transmissions. These monitoring techniques include:
    - Visual monitoring for marine mammals and sea turtles from the SURTASS LFA sonar vessel during daylight hours;
    - Use of the passive (low frequency) SURTASS towed array to listen for sounds generated by marine mammals as an indicator of their presence; and
    - Use of high frequency (HF) active sonar to detect/locate/track potentially affected marine animals near the SURTASS LFA sonar vessel and the sound field which is produced by the SURTASS LFA sonar source array.

These mitigation measures are detailed in Subchapter 2.3.2 and Chapter 5 of the Final OEIS/EIS and form the basis for the alternatives presented in this document. Except as noted below, the contents of Subchapter 2.3.2 and Chapter 5 of the FOEIS/EIS remain valid and are incorporated by reference.

2.5 Interim Operational Restrictions and Proposed Modifications to Mitigation

In the SURTASS LFA Final Rule under the MMPA (67 FR 46785), NMFS added interim operational restrictions in the Final Rule to preclude the potential for injury to marine mammals by resonance effects. These include: 1) establishment of a 1-km (0.54-nm) buffer shutdown zone outside of the 180-dB LFA mitigation zone; and 2) limiting the operational frequency of SURTASS LFA sonar to 330 Hz and below.

In the Court's Opinion, the question was raised concerning the inclusion of requirements for additional monitoring and mitigation through the use of aircraft or small observational craft prior to operating close to shore; and extending source shutdown procedures beyond marine mammals and sea turtles to schools of fish. The Court also found that the FOEIS/EIS was lacking because the Navy should have considered training in areas that present a reduced risk of harm to marine mammals.

2.5.1 NMFS Interim Operational Restrictions

In order to ensure, to the greatest extent practicable, that marine mammals do not receive an SPL equal to, or greater than 180 dB, NMFS amended the mitigation measures to incorporate two interim operational restrictions during the first five-year Rule. The first restriction included a SURTASS LFA sonar system shutdown within a buffer zone that extends 1 km (0.54 nm) from the outer limit of the 180-dB safety zone (SURTASS LFA mitigation zone). This may extend up to 2 km (1.1 nm) from the vessel, depending on oceanographic conditions. At this distance, SPLs will be significantly less intense than 180 dB. Second, NMFS imposed an operational restriction on the frequency of the SURTASS LFA sonar sound to 330 Hz and below. The intentions of these measures were to ensure, to the greatest extent practicable, that marine mammals would not be injured by the SURTASS LFA sonar signal. These protective measures would be retained until scientific documentation could be provided which indicated that they could be modified while still providing sufficient protection for marine mammals.

The LFA rule making process under the MMPA commenced in 1999 and ended when the LFA Rule was promulgated in July 2002. During this period, the potential for LFA, and sonar in general, to cause resonance-related injury in marine mammals above 330 Hz was an open issue. NMFS, therefore, added an interim operational restriction to the LFA Rule and associated LOAs restricting LFA operations to 330 Hz and below. For the SURTASS LFA sonar systems installed onboard the R/V *Cory Chouest* and USNS IMPECCABLE, this change was feasible. However, the frequency requirements for the Compact LFA (CLFA) to be installed onboard the smaller VICTORIOUS Class (T-AGOS 19 Class) are somewhat higher, but still below 500 Hz. In April 2002, NMFS sponsored a workshop of over 30 scientists on acoustic resonance as a source of tissue trauma in cetaceans. In November 2002, NMFS provided its "Report of the Workshop on Acoustic Resonance as a Source of Tissue Trauma in Cetaceans" (NOAA/NMFS, 2002). The report concluded that the tissue-lined air spaces most susceptible to resonance are too large in marine mammals to have resonance frequencies in the range used by either mid or low frequency sonar. Cudahy and Ellison (2002) reached the same conclusion. In addition, they stated that each of their *in vivo* and theoretical studies relating to tissue damage from underwater sound support a

damage threshold on the order of 180 to 190 dB. NOAA/NMFS (2002) and Cudahy and Ellison (2002) provide the empirical and documentary evidence that resonance and/or tissue damage from LFA transmissions are unlikely to occur in marine mammals at levels less than 190 dB for the frequency range 330 to 500 Hz. Therefore, the previous interim operational frequency restriction is not required.

2.5.2 Court's Issues

The Court found the FOEIS/EIS lacking because the Navy: 1) should have considered training in areas that present a reduced risk of harm to marine life and the marine environment when practicable; 2) should have further considered extending the shutdown procedures beyond marine mammals and sea turtles to schools of fish; 3) failed to adequately consider potential impacts to fish; and 4) raised the question concerning the inclusion of requirements for additional monitoring and mitigation through the use of aircraft or small observational craft prior to operating close to shore.

2.5.2.1 Training in Areas of Reduced Risk

Subchapter 4.4 of the SEIS provides the risk assessment approach for addressing this issue presented by the Court. Contrary to common perception, the identification of a SURTASS LFA operating area that is particularly devoid of marine life is not straightforward. The reason that certain areas are believed to have minimal marine mammal activity could very well be because of gaps in animal distribution, abundance and density data there. It usually is more feasible to identify areas of high marine life concentrations and avoid them when practicable. This sensitivity/risk process is the methodology applied to SURTASS LFA sonar operations.

The process starts with the Navy's antisubmarine warfare (ASW) requirements to be met by SURTASS LFA sonar. Based on this information, mission areas are proposed by the CNO and fleet commands. Thereupon, available published data are collected, collated, reduced and analyzed with respect to marine mammal populations and stocks, marine mammal habitat and seasonal activities, and marine mammal behavioral activities. Where data are unavailable, best scientific estimates are made by highly-qualified marine biologists, based on known data for like species and/or geographic areas, and known marine mammal seasonal activity. If marine mammal densities prove to be high and/or sensitive animal activities are expected, the mission areas are changed and/or refined and the process is re-initiated for the modified area. Next standard acoustic modeling and risk analysis are performed, taking into account spatial, temporal or operational restrictions. Then standard mitigation is applied and risk estimates for marine mammal stocks in the proposed mission area are calculated. Based on these estimates, a decision is made as to whether the proposed mission area meets the restrictions on marine mammal/ animal impacts from SURTASS LFA sonar. If not, the proposed mission area is changed or refined, and the entire process is re-initiated. If the mission area risk estimates are below the required restrictions, than the Navy has identified and selected the potential mission area with minimal marine mammal/animal activity consistent with its operational readiness requirements.

This process is provided in detail in Subchapter 4.4.1 and 4.4.2.

2.5.2.2 Modification of Shutdown Procedures to Schools of Fish

Modifying the current SURTASS LFA shutdown protocols to include schools of fish must be weighed against the feasibility and practicality of such a mitigation procedure in the context of military readiness and training. First, based on recent field experimentation (see Subchapter 4.1.1 of this document) for a fish to suffer injury, it must be close to the source array during transmission (nominally transmitting less than 10 percent of the time). The SURTASS LFA vessel travels at an average speed of 3 knots in two dimensions and fish travel in three dimensions at nominal speeds of 3 knots (e.g., herring, pike, carp) up to 40-50 knots (e.g., tuna, swordfish) (Iwai and Hisada, 1998; Nagai, 1999). Thus, the opportunity for a fish or a school of fish to be exposed to sound pressure levels from SURTASS LFA transmissions that could cause harm must be considered to be negligible. Moreover, the implementation of fish mitigation procedures is impractical. Visual monitoring (daylight only) cannot be relied upon to detect fish schools, passive acoustic detection is infeasible, and active acoustics would give so many false alarms that the impact on the effectiveness of the military readiness activity (and, hence impact on National Security) would be intolerably high. Subchapter 4.1.1.6 of this document provides additional discussion on this issue.

2.5.2.3 Potential Injury to Fish

The Court also found the FOEIS/EIS lacking because the Navy failed to adequately consider potential impacts to fish. This issue is addressed in Subchapter 4.1 of this document.

2.5.2.4 Pre-Operational Surveys

In order to determine if pre-operational aerial or small boat surveys are feasible and necessary mitigation measures according to the MMPA's treatment of such considerations in military readiness context, an evaluation is presented in Subchapter 5.4. This evaluation considered the feasibility of these surveys based on the following factors: 1) weather conditions, 2) time of day, 3) availability of small craft or small aircraft, 4) proximity to hostile territory, 5) sea state, 6) logistics, 7) overall safety considerations, and 8) National Security.

2.6 Alternatives

NEPA requires federal agencies to prepare an EIS that discusses the environmental effects of a reasonable range of alternatives (including the No Action Alternative). Reasonable alternatives are those that will accomplish the purpose and meet the need of the proposed action, and those that are practical and feasible from a technical and economic standpoint. However, the lead agency is not required to engage in speculation or contemplation about possible future plans that could influence the EIS's analysis of potential direct and indirect effects at some nebulous point in the future. In the FOEIS/EIS, alternatives included the No Action Alternative, Alternative 1 (employment with geographic restrictions and monitoring mitigation), and Alternative 2 (unrestricted operation). Alternative 1 was the Navy's preferred alternative in the FOEIS/EIS.

The FOEIS/EIS also considered alternatives to LFA, such as other passive acoustic and non-acoustic technologies, as discussed in FOEIS/EIS Subchapters 1.1.2, 1.1.3, and 1.2.1; Table 1-1;

and Responses to Comments (RTCs) 1-1.3, 1-2.1, 1-2.2, and 1-2.3, whose contents are incorporated into the SEIS by reference. These were also addressed in the NMFS Final Rule (67 FR 46785) and the ROD (67 FR 48145). These alternatives were eliminated from detailed study in the FOEIS/EIS in accordance with CEQ Regulation §1502.14 (a). These acoustic and non-acoustic detection methods included radar, laser, magnetic, infrared, electronic, electric, hydrodynamic, and biological technologies, and high- or mid-frequency sonar. It was concluded in the FOEIS/EIS that these technologies did not meet the purpose and need of the proposed action to provide Naval forces with reliable long-range detection and, thus, did not provide adequate reaction time to counter potential threats. Furthermore, they were not considered to be practical and/or feasible for technical and economic reasons.

This subchapter provides a description of the proposed alternatives for the employment of SURTASS LFA sonar as summarized in Table 2-3. These alternatives will be analyzed in Chapter 4. In addition to the No Action Alternative, the SEIS provide analyses of four alternatives. The analyses of these five alternatives are intended to address NEPA deficiencies identified in the District Court's 26 August 2003 opinion, as well as to fulfill the Navy's responsibilities under NEPA with regard to changes in the proposed action. Among other things, the SEIS considers mitigation measures including coastal standoff restrictions of 22 and 46 km (12 and 25 nm), seasonal restrictions, the designation of additional offshore biologically important areas (OBIAs), and shutdown procedures for schools of fish. The five alternatives considered in the SEIS are as follows:

- No Action Alternative;
- Alternative 1—Same as the FOEIS/EIS Preferred Alternative;
- Alternative 2 (Preferred Alternative)—Alternative 1 with additional OBIAs;
- Alternative 3—Alternative 1 with extended coastal standoff distance to 46 km (25 nm); and
- Alternative 4—Alternative 1 with additional OBIAs, extended coastal standoff distance to 46 km (25 nm), and shutdown procedures for schools of fish.

Table 2-3. SURTASS LFA Sonar System Alternatives Matrix

Proposed Restrictions/ Monitoring	No Action Alternative	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Dive Sites	NA	145 dB	145 dB	145 dB	145 dB
Coastline Restrictions	NA	<180 dB at 12 nm	<180 dB at 12 nm	<180 dB at 25 nm	<180 dB at 25 nm
Seasonal Variations	NA	Yes	Yes	Yes	Yes
Original OBIAs	NA	Yes	Yes	Yes [1]	Yes [1]
Additional OBIAs	NA	No	Yes	No	Yes [1]
Shutdown Procedures for Schools of Fish	NA	No	No	No	Yes
Visual Monitoring	NA	Yes	Yes	Yes	Yes
Passive Acoustic Monitoring	NA	Yes	Yes	Yes	Yes
Active Acoustic Monitoring	NA	Yes	Yes	Yes	Yes
Reporting	NA	Yes	Yes	Yes	Yes

Note: 1. Only those OBIAs, or portion thereof, that are outside of coastal standoff distance.

2.6.1 No Action Alternative

Under this alternative, operational deployment of the active component (LFA) of SURTASS LFA sonar will not occur. The No Action Alternative is the same as the No Action Alternative presented in Subchapter 2.3.1 of the FOEIS/EIS, and the contents are incorporated by reference.

2.6.2 Alternative 1

Alternative 1 is the same as Alternative 1 presented in Subchapter 2.3.2 of the FOEIS/EIS, which is incorporated into the SEIS by reference. This alternative proposes the employment of SURTASS LFA sonar technology with geographical restrictions to include maintaining sound pressure level below 180 dB within 22 km (12 nm) of any coastline and within the originally designated OBIAs (see Table 2.3 of the FOEIS/EIS) that are outside of 22 km (12 nm). Restrictions for OBIAs are year-round or seasonal, as dictated by marine animal abundances. LFA sound fields will not exceed 145 dB within known recreational and commercial dive sites. Monitoring mitigation includes visual, passive acoustic, and active acoustic (HF/M3 sonar) to prevent injury to marine animals when employing SURTASS LFA sonar by providing methods to detect these animals within the 180-dB LFA mitigation zone.

2.6.3 Alternative 2 (The Preferred Alternative)

Alternative 2 is the Navy's preferred alternative. This alternative is the same as Alternative 1, but with additional OBIAs, including seasonal restrictions, as listed in Table 2-4. OBIAs are defined in Subchapter 2.3.2.1 of the FOEIS/EIS and the content of that discussion is incorporated by reference. Table 2-4 lists seven additional OBIAs based on consultation with the NOAA's Office of National Marine Sanctuaries and Presidential EO 13178. To determine an all inclusive list of OBIAs within the potential operating areas over the next five years would be infeasible, and because of constantly changing data, would require repeated reviews and updates. It is the intention in this SEIS alternative to propose that during the annual LOA process under the new MMPA rule that the Navy evaluate potential OBIAs within the proposed operating areas for each ship and incorporate restrictions, as required into the LOA applications for NMFS's review and action.

2.6.4 Alternative 3

Alternative 3 is the same as Alternative 1, but with a greater coastal standoff distance. This alternative proposes the employment of SURTASS LFA sonar technology with geographical restrictions to include maintaining sound pressure level to below 180 dB within 46 km (25 nm) of any coastline and within designated OBIAs that are outside of 46 km (25 nm).

2.6.5 Alternative 4

Alternative 4 is the same as Alternative 1, but with additional OBIAs, extended coastal standoff distance to 46 km (25 nm), and shutdown procedures for fish.

Table 2-4. Offshore Biologically Important Areas

Area Number	Name of Area	Location of Area	Months of Importance
1	200 m isobath of North American East Coast[1]	From 28°N to 50°N west of 40°W	Year Round
2	Costa Rica Dome	Centered at 9°N and 88°W	Year Round; no resident stock
3	Antarctic Convergence Zone	30°E to 80°E: 45°S. 80°E to 150°E: 55°S 150°E to 50°W: 60°S 50°W to 30°E: 50°S	October through March
4	Hawaiian Island Humpback Whale NMS—Penguin Bank[2]	Centered at 21°N and 157° 30''W	November 1 through May 1
5	Cordell Bank NMS[2]		Year Round
6	Gulf of the Farallones NMS[2]		Year Round
7	Monterey Bay NMS[2]		Year Round
8	Olympic Coast NMS[2]	Within 23 nm of coast	December, January, March and May
9	Flower Garden Banks (NMS)[2]		Year Round
10	NW Hawaiian Islands Coral Reef Ecosystem Reserve (Proposed NMS)[3]	Within 12 or 25 nm	Year Round

Note: 1. OBIA boundaries encompass Northern Right Whale Critical Habitat, Stellwagen Bank NMS, Monitor NMS, and Gray's Reef NMS.
2. Office of National Marine Sanctuaries, National Ocean Service, NOAA, letter dated 15 May 2001.
3. Presidential EO 13178—Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve.

2.7 Additional Research

NMFS's original Letter of Authorization (67 FR 55818) included the conduct of research that involved at least one of the five topics listed in Table 2-5 below. The table provides the status of research conducted, underway or planned to address NMFS's research topics.

Table 2-5. Additional Research Status

NMFS Research Topics	Status
Behavioral reactions of whales to sound levels that were not tested during the research phase, specifically between 155 and 180 dB.	Preliminary assessment of the feasibility of conducting such research has yielded no logical way forward. Intentions are to hold discussions with NMFS on the possibility of future research of this nature.
Responses of sperm and beaked whales to LF sonar signals.	Expert marine bio-acousticians agree that the conduct of controlled exposure experiments (CEEs) with sperm and/or beaked whales will prove to be extremely complicated and expensive. Nevertheless, the Navy is going forward with sponsoring the planning for beaked whale CEEs. An October 2005 meeting of the leading scientists in the fields of marine bio-acoustics and beaked whale research, in Oxford UK, has produced a draft detailed planning document for experimental tests of effects of LF sonar on deep-diving marine mammals. This will provide the framework for future national and international research on the responses of beaked whales to LF sonar signals.
Habitat preferences of beaked whales.	The Navy-sponsored planning document cited above also has identified three "top-tier," three "second-tier" and eight "third-tier" sites (i.e., habitat preferences of beaked whales).
Passive acoustic monitoring for the possible silencing of calls of large whales using bottom-mounted hydrophones.	Two research efforts in the North Atlantic (2004, 2005) have addressed this topic.
Long-term, cumulative effects on a stock of marine mammals that is expected to be regularly exposed to LFA and monitor it for population changes throughout the five-year period.	This topic will be addressed in the final report for the first five-year Rule.

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