DEPARTMENT OF THE NAVY
OFFICE OF THE CHIEF OF NAVAL OPERATIONS
2000 NAVY PENTAGON
WASHINGTON, DC 20350

IN REPLY REFER TO
9462
Ser N872A/9U181774
2 October 09

From: Head, Undersea Surveillance Branch (N872A)
To: Director, Office of Protected Resources, National Marine Fisheries Service, National Oceanic and Atmospheric Administration

Subj: ANNUAL REPORT NO. 2 FOR THE OPERATION OF THE SURVEILLANCE TOWED ARRAY SENSOR SYSTEM LOW FREQUENCY ACTIVE (SURTASS LFA) SONAR ONBOARD THE USNS ABLE (T-AGOS 20) AND USNS IMPECCABLE (T-AGOS 23)

Ref: (a) Final Rule: Taking and Importing Marine Mammals; Taking Marine Mammals Incidental to Navy Operations of Surveillance Towed Array Sensor System Low Frequency Active Sonar (72 Fed. Reg. 46846-93)
(b) Letter of Authorization Governing the Take of Marine Mammals Incidental to the U.S. Navy's Operation of Surveillance Towed Array Sensor System Low Frequency Active (SURTASS LFA) Sonar on the USNS ABLE (T-AGOS 20), Office of Protected Resources, National Marine Fisheries Service, August 15, 2008
(c) Letter of Authorization Governing the Take of Marine Mammals Incidental to the U.S. Navy's Operation of Surveillance Towed Array Sensor System Low Frequency Active (SURTASS LFA) Sonar on the USNS IMPECCABLE (T-AGOS 23), Office of Protected Resources, National Marine Fisheries Service, August 15, 2008
(d) Biological Opinion for the Employment of Surveillance Towed Array Sensor System Low Frequency Active (SURTASS LFA) Sonar for the Period 16 August 2008 to 15 August 2009, August 15, 2008

Encl: (1) Annual Report No. 2: Operation of the Surveillance Towed Array Sensor System Low Frequency Active (SURTASS LFA) Sonar Onboard the USNS ABLE (T-AGOS 20) and USNS IMPECCABLE (T-AGOS 23) Under the National Marine Fisheries Service Letters of Authorization of 15 August 2008

1. The second Annual Report for the operation of SURTASS LFA sonar onboard the USNS ABLE and the USNS IMPECCABLE (enclosure (1)) is submitted in accordance with references (a) through (d).

Subj: ANNUAL REPORT NO. 2 FOR THE OPERATION OF THE SURVEILLANCE TOWED ARRAY SENSOR SYSTEM LOW FREQUENCY ACTIVE (SURTASS LFA) SONAR ONBOARD THE USNS ABLE (T-AGOS 20) AND USNS IMPECCABLE (T-AGOS 23)

2. My point of contact on this matter is CDR Neil Smith, N872A1, (703) 604-6333.

J. S. CURRER

Copy to:

Chief, Permits, Conservation and Education Division, NMFS OPR1
Chief, Endangered Species Division, NMFS OPR3

Annual Report No. 2:

Operation of the Surveillance Towed Array Sensor System Low Frequency Active (SURTASS LFA) Sonar Onboard the USNS ABLE (T-AGOS 20) *and* USNS IMPECCABLE (T-AGOS 23)

Under the National Marine Fisheries Service Letters of Authorization of 15 August 2008

Department of the Navy
Chief of Naval Operations
October 2009

Annual Report No. 2:

Operation of the Surveillance Towed Array Sensor System

Low Frequency Active (SURTASS LFA) Sonar

Onboard the
USNS ABLE (T-AGOS 20)
and
USNS IMPECCABLE (T-AGOS 23)

Under the National Marine Fisheries Service

Letters of Authorization

of 15 August 2008

October 2009

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ACRONYMS AND ABBREVIATIONS

ANSI	American National Standards Institute
APA	Administrative Procedures Act
ASW	Anti-Submarine Warfare
BRS	Behavioral Response Study
CFR	Code of Federal Regulations
CLFA	Compact Low Frequency Active
CNP	Central North Pacific (Stock)
CNO	Chief of Naval Operations
CW	Continuous Wave
DASN(E)	Deputy Assistant Secretary of the Navy for Environment
dB	Decibel(s)
DoC	Department of Commerce
DON	Department of the Navy
DSEIS	Draft Supplemental Environmental Impact Statement
EIS	Environmental Impact Statement
EO	(Presidential) Executive Order
ESA	Endangered Species Act
FOEIS/EIS	Final Overseas Environmental Impact Statement/Environmental Impact Statement
FM	Frequency Modulated
FR	Federal Register
FSEIS	Final Supplemental Environmental Impact Statement
ft	Feet
FY	Fiscal Year
HF	High Frequency
HF/M3	High Frequency Marine Mammal Monitoring
HLA	Horizontal Line Array
Hz	Hertz
IA	Inshore Archipelago
IUCN	International Union for Conservation of Nature and Natural Resources
kg	Kilogram
km	Kilometer(s)
kph	Kilometer(s) per hour
Lb	Pound
LF	Low Frequency
LFA	Low Frequency Active
LFAS	Low Frequency Active Sonar
LFS SRP	Low Frequency Sound Scientific Research Program
LOA	Letter of Authorization
LTM	Long Term Monitoring
m	Meter(s)
MAI	Marine Acoustics, Incorporated
MF	Mid-Frequency
MFA	Mid-Frequency Active
MILDET	Military Detachment
MMPA	Marine Mammal Protection Act
NDAA	National Defense Authorization Act
NEPA	National Environmental Policy Act of 1969
NGO	Non-Governmental Organization
nmi	Nautical mile(s)
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent

NP	North Pacific (Stock)
NRC	National Research Council
OBIA	Offshore Biologically Important Area(s)
OIC	Officer in Charge
ONR	Office of Naval Research
RL	Received Level
rms	Root Mean Squared
ROD	Record of Decision
R/V	Research Vessel
SEIS	Supplemental Environmental Impact Statement
SEL	Sound Exposure Level
SERDP	Strategic Environmental Research and Development Program
SL	Source Level
SONAR	SOund Navigation And Ranging
SPL	Sound Pressure Level
SPLASH	Structure of Population, Levels of Abundance, and Status of Humpbacks
SURTASS	Surveillance Towed Array Sensor System
T-AGOS	Ocean Surveillance Ship
U.S.	United States
U.S.C.	United States Code
USNS	United States Naval Ship
VLA	Vertical Line Array
WNP	Western North Pacific (Stock)

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1.0 INTRODUCTION

Under the Surveillance Towed Array Sensor System Low Frequency Active (SURTASS LFA) Sonar Final Rule 50 CFR § 216.186(b) and Condition 8(b) of the annual SURTASS LFA sonar Letters of Authorization (LOAs) for the USNS ABLE (T-AGOS 20)[1] and USNS IMPECCABLE (T-AGOS 23), this annual report provides an unclassified summary of the classified quarterly reports of SURTASS LFA sonar operations for the period 16 August 2008 through 15 August 2009.

1.1 Purpose of this Report

As a requirement of the Regulations for the Taking of Marine Mammals Incidental to Navy Operations of SURTASS LFA Sonar, 50 CFR § 216 Subpart Q (72 *Federal Register* [FR] 46890-93), this annual report for operations of SURTASS LFA sonar systems onboard the USNS ABLE (T-AGOS 20) and USNS IMPECCABLE (T-AGOS 23) has been prepared in accordance with the requirements of the LOAs issued by the United States Department of Commerce (DoC), National Oceanic and Atmospheric Administration (NOAA), National Marine Fisheries Service (NMFS) (APPENDIX A). The primary purpose of this annual report is to provide NMFS with an unclassified summary of the year's quarterly reports and an analysis of any Level A and/or Level B harassment takings by SURTASS LFA sonar operations.

1.2 SURTASS LFA Sonar Description

SURTASS LFA sonar is a long-range sonar system that operates in the low frequency (LF) band (100-500 Hertz [Hz]). During the period of this report, there were two SURTASS LFA sonar systems, one each onboard the USNS ABLE (T-AGOS 20) and USNS IMPECCABLE (T-AGOS 23), operating in the northwestern Pacific Ocean and central Pacific Ocean south of Hawaii. These systems have both passive and active components.

1.2.1 Passive System Component—SURTASS

The passive, or listening, part of the system is SURTASS, which detects sounds generated by submerged objects, such as 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 signal processing system of the sonar. The SURTASS hydrophones are mounted on a horizontal line array (HLA) that is towed behind the vessel. The SURTASS HLA length is 1,500 m (4,920 ft) with an operational depth of 152 m (500 ft) to 457 m (1,500 ft). The SURTASS LFA sonar ship must maintain a minimum speed of approximately 5.6 kilometers per hour (kph) (3 knots) through the water in order to tow the hydrophone array in the horizontal plane. The sounds or echoes, which are usually below background or ambient noise level, are then processed and evaluated to identify and classify potential underwater targets.

[1] LFA systems were initially installed on two SURTASS vessels: Research Vessel (R/V) *Cory Chouest* and USNS IMPECCABLE (T-AGOS 23). R/V *Cory Chouest* was retired in August 2008 and replaced by the USNS ABLE (T-AGOS 20).

1.2.2 Active System Component—LFA

The active system component, LFA, is an adjunct to the passive detection system, SURTASS, and is planned for use when passive system performance proves inadequate. LFA is a set of acoustic transmitting source elements suspended by cable from under an ocean surveillance vessel. These elements, called projectors, transform electrical energy to mechanical energy that set up vibrations or pressure disturbances within the water to produce the active sound pulse, or ping.

The characteristics and operating features of LFA are provided below:

- The source is a vertical line array (VLA) of up to 18 source projectors suspended below the vessel. LFA's transmitted sonar beam is omnidirectional (i.e., a full 360 degrees) in the horizontal (nominal depth of the LFA array center is 122 m [400 ft]), with a narrow vertical beamwidth that can be steered above or below the horizontal.
- The source frequency is between 100 and 500 Hz (the LFA system's physical design does not allow for transmissions below 100 Hz). A variety of signal types can be used, including continuous wave (CW) and frequency-modulated (FM) signals. Signal bandwidth is approximately 30 Hz.
- The source level (SL) of an individual source projector is approximately 215 decibels (dB) or less. The sound field of the LFA array can never be higher than the SL of an individual projector.
- The typical LFA transmitted sonar signal is not a constant tone, but a transmission of various waveforms that vary in frequency and duration. A complete sequence of transmissions is referred to as a wavetrain (also known as a "ping"). These wavetrains last from 6 to 100 seconds, although the duration of each continuous frequency 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 (2003-2008) are nominally 7.5 to 10 percent.
- The time between pings is typically from 6 to 15 minutes.

References to Underwater Sound Levels
1. References to underwater sound pressure levels (SPL) in this document are values given in dBs and are assumed to be standardized at 1 microPascal at 1 m (dB re 1 µPa at 1 m [root mean squared-rms]) for source level (SL) and dB re 1 m (rms) for received level (RL), unless otherwise specified. 2. References to underwater sound exposure level (SEL) in this document refer to the squared pressure over a duration of the sound referenced to the standard underwater sound reference level (1 µPa) expressed in dB, and are assumed to be standardized at dB re 1 μPa^2-s, unless otherwise specified. Sources: Urick (1983); ANSI S1.8-1989

Figure 1. USNS ABLE (T-AGOS 20) Ocean Surveillance Ship

1.2.3 System Upgrades

As future undersea warfare requirements continue to transition to littoral[2] ocean regions, the introduction of a compact active system deployable on SURTASS ships was needed. This system upgrade is known as Compact LFA, or CLFA. CLFA consists of smaller, lighter-weight source elements than the current LFA system, and is compact enough to be installed on the VICTORIOUS Class platforms (T-AGOS 19). The initial CLFA installation was completed on the USNS ABLE (T-AGOS 20) (Figure 1) in 2008 and at-sea-testing commenced in August 2008. CLFA improvements include:

- Operational frequency matched to shallow water environments with little loss of detection performance in deep water environments;
- Improved reliability and ease of deployment; and
- Lighter-weight design (mission weight of 64,410 kg [142,000 lb] vice 155,129 kg [324,000 lb] mission weight of LFA).

[2] The term "littoral" is one of the most misunderstood terms used in naval warfare. Based on a dictionary definition, the adjective "littoral" indicates that something pertains to or exists on the shore. In noun form, the word means a shore or coastal region.

The Navy's meaning differs because it is based on tactical, not geographic, perspective relating to the overall coastal operations including all assets supporting a particular operation regardless of how close, or far, from the shore they may be operating. The Navy defines littoral as the region that horizontally encompasses the land/water mass interface from fifty (50) statute miles (80 kilometers [km]) ashore to two hundred (200) nautical miles (370 km) at sea; extends vertically from the bottom of the ocean to the top of the atmosphere and from the land surface to the top of the atmosphere (Naval Oceanographic Office, 1999).

The operational characteristics of the compact system are comparable to the existing LFA systems as presented above. Therefore, the potential effects from CLFA are expected to be similar to, and not greater than, 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.
`

The three VICTORIOUS Class vessels (T-AGOS 20, T-AGOS 21, and T-AGOS 22), which are, or will be, equipped with CLFA, will also be outfitted with the newer Twin-Line 29A (TL-29A) passive array. The TL-29A array is an upgrade to SURTASS for surface ships, based on TB-29A array architecture utilized on submarines. TL-29A consists of a "Y" shaped array with two apertures, which are approximately two thirds (2/3) the length of a standard SURTASS array. The TL-29A delivers enhanced capabilities, such as its ability:

- To be towed in the littoral zones;
- To provide significant directional noise rejection; and
- To resolve bearing ambiguities without having to change vessel course.

1.3 The Critical Need for SURTASS LFA Sonar

The Navy's primary mission is to maintain, train, equip, and operate combat-ready naval forces capable of accomplishing American strategic objectives, deterring maritime aggression, and assuring freedom of navigation in ocean areas. The Secretary of the Navy and Chief of Naval Operations (CNO) have continually validated that Anti-Submarine Warfare (ASW) is a critical part of that mission – a mission that requires unfettered access to both the high seas and littorals. In order to be prepared for all potential threats, the Navy must maintain ASW core competency through continual training in open-ocean and littoral environments.

The challenges faced by the U.S. Navy today are very different from those faced at the end of the Cold War nearly two decades ago. Since the early 1990s, U.S. Navy ASW strategy has had to shift from a known Soviet adversary to "uncertain potential adversaries with area-denial strategies designed to inflict unacceptable losses" (Benedict, 2005). The wide proliferation of diesel-electric submarines, a Chinese undersea force that is growing in size and tactical capability, and a resurgent Russian submarine service mean that U.S. ASW capability must meet more technologically-capable threats in a wider range of ocean environments. Due to the advancement and use of quieting technologies in diesel-electric and nuclear submarines, undersea threats are becoming increasingly difficult to locate using the passive acoustic technologies that were effective during the Cold War. The range at which U.S. ASW assets are able to identify submarine threats is decreasing and at the same time improvements in torpedo design are extending the effective weapons range of those same threats (Benedict, 2005).

To meet this long range submarine detection need, the U.S. Navy has investigated the use of a broad spectrum of acoustic and non-acoustic technologies. Of the technologies evaluated, low frequency active sonar is the only system capable of meeting the U.S. Navy's long-range ASW detection needs in a variety of weather conditions during the day and night. SURTASS LFA sonar is providing a quantifiable improvement in the Navy's undersea detection capabilities and therefore markedly improving the survivability of U.S. Naval forces in hostile ASW scenarios.

SURTASS LFA sonar meets the need of the U.S. Navy for improved long-range submarine detection capability, which is essential to providing U.S. forces the time necessary to react to and defend against potential undersea threats. It is critical that U.S. forces be able to identify threats while remaining at a safe distance beyond a submarine's effective weapon's range (Davies, 2007).

Excerpts from Declaration of Rear Admiral John M. Bird, U.S. Navy To the United States District Court Northern District of California 15 November 2007
SURTASS LFA (sonar) has enabled the Navy to meet the clearly defined, real-world national security need for improved ASW capability by allowing Navy Fleet units to reliably detect quieter and harder-to-find submarines at long range, before they get within their effective weapons range and can launch missiles or torpedoes against our ships or missiles against land targets, foreign or domestic. The operative word here is <u>has</u>. SURTASS LFA is a combat-ready system. But in order to protect U.S. and allied fleet assets, and merchant shipping, the operation of SURTASS LFA sonar and the training of our personnel must continue uninterrupted.

1.4 Regulatory and Litigation History

Prior to the NMFS promulgating the current (2007) Final Rule (72 FR 46846-93) and LOAs, there were key regulatory and litigation events that influenced these regulations.

1.4.1 National Environmental Policy Act (NEPA)

The NEPA process for SURTASS LFA sonar began on 18 July 1996, when the Navy published its Notice of Intent (NOI) in the *Federal Register* (67 FR 37452) to prepare an EIS/OEIS for SURTASS LFA sonar under NEPA and Presidential Executive Order (EO) 12114, Environmental Effects Abroad of Major Federal Actions. With NMFS as a cooperating agency, the SURTASS LFA sonar Final Overseas Environmental Impact Statement/Environmental Impact Statement (FOEIS/EIS) was completed in January 2001 (DON, 2001). The Record of Decision (ROD) was signed by the Deputy Assistant Secretary of the Navy for Environment (DASN(E)) on 16 July 2002 (67 FR 48145) (DON, 2002). During the NEPA analysis the Navy recognized there were scientific data gaps concerning the potential for moderate-to-low exposure levels to affect cetacean hearing ability or modify biologically important behavior. As a result of this limitation, the Navy sponsored independent, scientific field research referred to as the Low Frequency Sound Scientific Research Program (LFS SRP). This ground-breaking research program found that the potential for SURTASS LFA sonar to cause these effects would be minimal (DON, 2001).

1.4.2 Marine Mammal Protection Act (MMPA) and Endangered Species Act (ESA)

Based on the scientific analyses detailed in the Navy application and further supported by information and data contained in the Navy's FOEIS/EIS for SURTASS LFA sonar operations, NMFS concurred with the Navy that the operations of SURTASS LFA sonar would result in the incidental harassment of only small numbers of marine mammals, have no more than a negligible impact on the affected marine mammal stocks or habitats, and not have an unmitigable adverse impact on Arctic subsistence uses of marine mammals; and thus issued the initial LOA (67 FR 55818) under the MMPA Final Rule (50 CFR Part 216 Subpart Q) (67 FR 46785-89) for the operation of SURTASS LFA Sonar on R/V *Cory Chouest*. The Navy's ESA Section 7 consultation with the NMFS and permitting requirements under the MMPA concluded with NMFS's issuance of the Biological Opinion and Incidental Take Statement (NMFS, 2002a; 2002b). Since the initial LOA was issued in 2002, the Navy requested annual renewals in accordance with 50 CFR § 216.189 for the remaining four years of the 2002 Final Rule for the R/V *Cory Chouest* and USNS IMPECCABLE. NMFS subsequently issued the LOAs (68 FR 50123, 69 FR 51996, 70 FR 49919, 71 FR 48537).

1.4.3 National Defense Authorization Act (NDAA)

On November 24, 2003 the National Defense Authorization Act (NDAA) for Fiscal Year 2004 (NDAA FY04) (Public Law 108-136) was passed by Congress. Included in this law were amendments to the MMPA (16 U.S.C. 1361 *et seq.*) that apply where a "military readiness activity" is concerned. Of special importance for SURTASS LFA sonar take authorization, the NDAA amended Section 101(a)(5) of the MMPA, which governs the taking of marine mammals incidental to otherwise lawful activities. 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. NMFS and the Navy determined that the Navy's SURTASS LFA sonar testing and training operations that are the subject of NMFS's Final Rule constituted military readiness activities 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."

Changes to the MMPA set forth in the NDAA FY04 amended the act in three ways. First, it focused the definition of harassment on biologically significant effects. Second, it removed references to small numbers and specific geographic regions as applied to incidental take authorizations. Third, it provided for a national defense exemption. SURTASS LFA sonar has never been involved in any national defense exemptions.

1.4.4 Initial Litigation

On 7 August 2002, several non-governmental organizations (NGOs) filed suit against the Navy and NMFS over SURTASS LFA sonar use and permitting. The Court recognized the Navy's National Security requirements for operations to continue as the case proceeded. On 15 November 2002, the Court issued a tailored Preliminary Injunction for operations of LFA in a

stipulated area in the northwest Pacific Ocean/Philippine Sea, and south and east of Japan. On 25 January 2003, the R/V *Cory Chouest*, having met all environmental compliance requirements, commenced testing and training in the northwest Pacific Ocean under this tailored Preliminary Injunction.

The Court issued a ruling on the parties' motions for summary judgment in the SURTASS LFA sonar litigation on 26 August 2003. The Court found deficiencies in the Navy's and NMFS' compliance under NEPA, ESA, and MMPA[3]. The Court, however, indicated that a total ban of employment of SURTASS LFA sonar would pose a hardship on the Navy's ability to protect National Security by ensuring military preparedness and the safety of those serving in the military from hostile submarines. Based on mediation, the Court issued a tailored Permanent Injunction on 14 October 2003, allowing SURTASS LFA sonar operations from both R/V *Cory Chouest* and USNS IMPECCABLE in stipulated areas in the northwest Pacific Ocean/Philippine Sea, Sea of Japan, East China Sea, and South China Sea with certain year-round and seasonal restrictions. On 7 July 2005, the Court amended the injunction to expand the potential areas of operation based on real world contingencies, as shown in Figure 2.

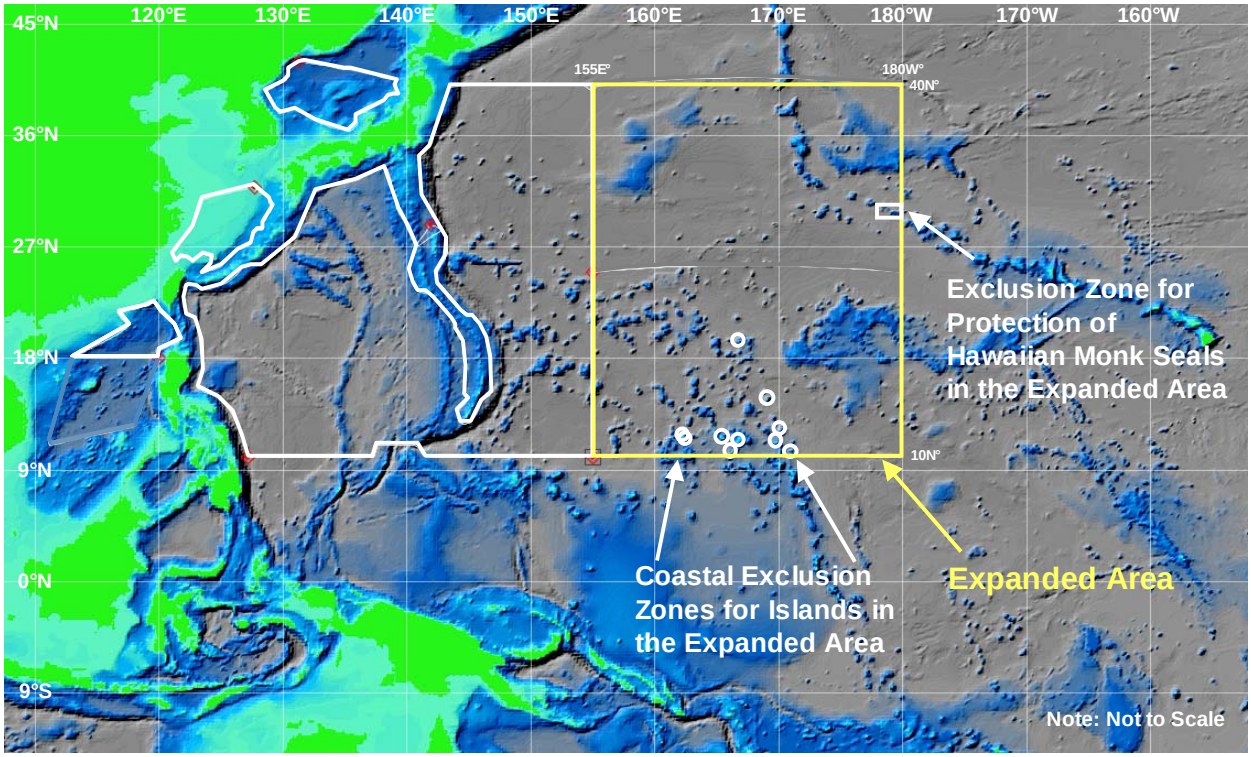

Figure 2. SURTASS LFA Sonar Operations Areas Permitted under Stipulation Regarding Permanent Injunction as Amended on 7 July 2005

[3] On 2 December 2004, the Court vacated and dismissed the MMPA claims based on the National Defense Authorization Act Fiscal Year 2004 (NDAA FY04) amendments to the MMPA.

1.5 Current Regulatory Compliance and Litigation

In response to U.S. District Court ruling on the motion for preliminary injunction, the Deputy Assistant Secretary of the Navy for Environment (DASN(E)) decided that the purposes of NEPA would be served by supplemental analysis of employing SURTASS LFA sonar systems. On 11 April 2003, the DASN(E) directed the Navy to prepare a supplemental EIS (SEIS) to address concerns identified by the Court to provide additional information regarding the environment that could potentially be affected by the SURTASS LFA sonar systems and additional information related to mitigation. On 26 September 2003, the NMFS agreed to be a cooperating agency in the preparation and review of the SEIS. The information developed from this analysis was used to support the Navy's application for the second five-year rule under MMPA (DON, 2006a) and the biological assessment for section 7 consultation under the ESA (DON, 2006b).

1.5.1 Supplemental Environmental Impact Statement

The purpose of the SURTASS LFA Sonar SEIS was to:

- Address concerns of the U.S. District Court for the Northern District of California in its 26 August 2003 Opinion and Order in relation to compliance with the NEPA, ESA, and MMPA[4];
- Provide information necessary to apply for a new five-year Rule for incidental takes under the MMPA when the 2002 rule expired in 2007, taking into account legislative changes to the MMPA and the need to employ up to four SURTASS LFA sonar systems;
- Analyze potential effects of LFA system upgrades; and
- Provide additional information and analyses pertinent to the proposed action.

The Final Supplemental Environmental Impact Statement (FSEIS), which included detailed responses to comments received on the Draft SEIS (DON, 2005), was completed in April 2007 (DON, 2007a). The FSEIS evaluated the potential environmental effects of employment of up to four SURTASS LFA sonar systems in the oceanic areas as presented in Figure 1-1 (SURTASS LFA Sonar Systems Potential Areas of Operations) of the FOEIS/EIS for SURTASS LFA Sonar (DON, 2001). Based on current operational requirements, exercises using these sonar systems would occur in the Pacific, Atlantic, and Indian oceans, and the Mediterranean Sea. To reduce adverse effects on the marine environment, areas would be excluded as necessary to prevent 180-dB sound pressure level (SPL) or greater within specific geographic range of land, in offshore biologically important areas during biologically important seasons, and in areas necessary to prevent greater than 145-dB SPL at known recreational and commercial dive sites.

1.5.2 Current MMPA and ESA Authorizations

On 12 May 2006, the Navy submitted an Application to the NMFS 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 the deployment of SURTASS LFA sonar system for military readiness activities; to include training, testing, and routine military operations. The activities are

[4] Ibid.

associated with the employment of up to four SURTASS LFA sonar systems for a period of five years (16 August 2007 to 15 August 2012) (DON, 2006a).

On 9 June 2006, the Navy submitted a Biological Assessment for the Employment of SURTASS LFA Sonar requesting that NMFS review the document. The Navy further requested a Biological Opinion/Incidental Take Statement under Section 7 on the ESA for a period of five years (16 August 2007 to 15 August 2012) (DON, 2006b).

On 28 September 2006, NMFS published a Notice of Receipt of Application and a request for public comments (71 FR 56965). The public comment period closed on 30 October 2006. These comments were considered in the development of the Proposed and Final Rules. A Proposed Rule for the renewal of the regulations governing SURTASS LFA sonar MMPA authorization was published on 9 July 2007 (72 FR 37404) with a 15-day comment period. NMFS filed the Final Rule on 15 August 2007 and published in the Federal Register on 21 August 2007 (72 FR 46846-93). The initial LOAs under the 2007 Rule were issued by NMFS to the Chief of Naval Operations (N872A) for the R/V *Cory Chouest* and the USNS IMPECCABLE for the period 16 August 2007 to 15 August 2008.

On 14 August 2007, NMFS issued its biological opinion on the effects of the proposed LOAs to take marine mammals incidental to the Navy's employment of SURTASS LFA sonar in accordance with section 7 of the ESA (1973), as amended (16 U.S.C. 1531 et seq.) (NMFS, 2007). The opinion concluded that the proposed LOAs and any take associated with activities authorized under those regulations are not likely to jeopardize threatened or endangered species in the action area. The proposed action is not likely to destroy or adversely modify designated critical habitats.

1.5.3 Current Litigation

On 17 September 2007, several environmental groups filed a lawsuit challenging actions by the Navy and NMFS regarding compliance to the NEPA, MMPA, ESA, and Administrative Procedure Act (APA) for the operation of SURTASS LFA sonar.

On 6 February 2008, the Court issued its opinion and order granting in part Plaintiffs' motion for a preliminary injunction and required the parties to meet and confer on the precise terms. Case Management Conferences were held on 26 March 2008 and 27 May 2008 at the U.S. District Court, Northern District of California, in San Francisco, CA.

During the mediation on 26 March 2008, agreement was reached that SURTASS LFA sonar would operate in the Western Pacific areas stipulated in the 2003 permanent injunction, as amended in 2005, with the following modifications (Figure 3):

- Stipulated LFA Operational Agreement permitting SURTASS LFA sonar operations up to 22 km (12 nmi) from the coast when necessary to continue tracking an existing underwater contact, or when operationally necessary to detect a new underwater contact to maximize opportunities for detection.

- Additional terms include assuring the LFA sound field does not exceed 180 dB at a distance of less than 18 nmi from:

    - Islands of the Luzon Strait, including the Bashi Channel; and
    - Eastern coastlines of the islands of the Ryukyu Island Chain.

During the mediation on 27 May 2008, agreement was reached that SURTASS LFA sonar could operate in the Hawaii operations area. The stipulated LFA Operational Agreement permits SURTASS LFA sonar operations up to 22 km (12 nmi) from the coast when necessary to continue tracking an existing underwater contact, or when operationally necessary to detect a new underwater contact to maximize opportunities for detection within the Hawaii operations areas (Figure 4).

On 12 August 2008, the Court issued the Stipulated Settlement Agreement Order based on agreements from the 26 March 2008 and 27 May 2008 mediations, which finalized the operational areas as discussed above. On 29 August 2008, the Court signed the Stipulated Voluntary Dismissal with Prejudice, which effectively ended the litigation. (APPENDIX B)

The follow-on LOAs issued by NMFS to the USNS ABLE and USNS IMPECCABLE for the period 16 August 2008 to 15 August 2009 were based on the expanded operations areas described above. (APPENDIX A)

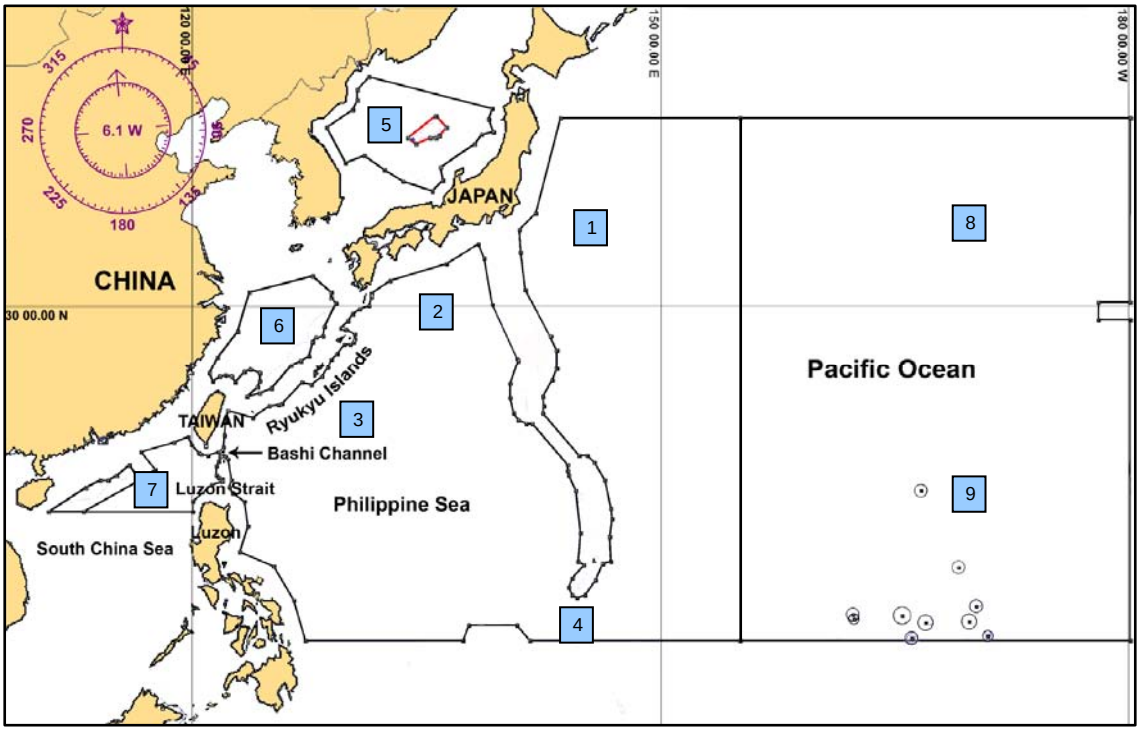

Figure 3. SURTASS LFA Sonar Western Pacific Operations Areas

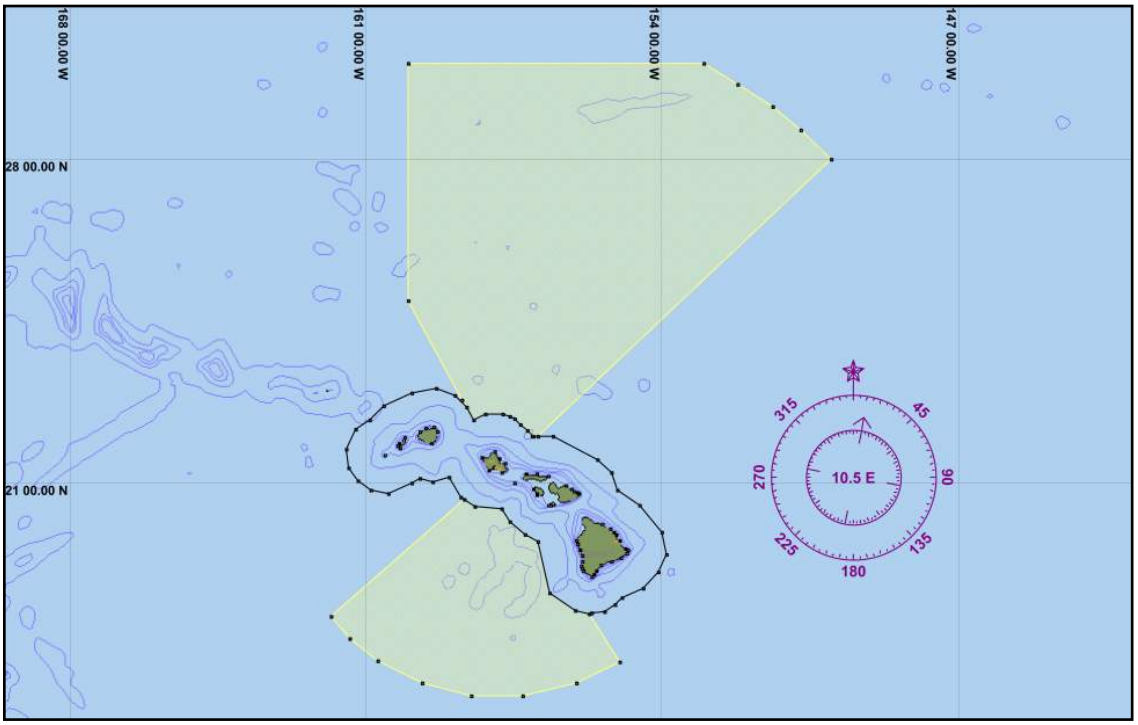

Figure 4. SURTASS LFA Sonar Hawaii Operations Area

2.0 MITIGATION MEASURES

Under the current rule, NMFS issued one-year LOAs for the period 16 August 2008 to 15 August 2009 to the Navy for the USNS ABLE and USNS IMPECCABLE for an estimated total of 22 nominal active sonar missions (16 missions in the northwestern Pacific Ocean and 6 missions in the Hawaii Operations Area) between the two ships (or equivalent shorter missions) not to exceed 432 hours of transmit time per vessel during the annual period of effectiveness of each of these LOAs.

Mitigation protocols and operational restrictions for the LOAs were set forth in the Record of Decision (DON, 2007b), NOAA/NMFS Final Rule (72 FR 46890-93) and LOAs, and Court orders. These were promulgated by the CNO (N872A) via executive direction message of 15 August 2008. Strict adherence to these measures ensures that there will be no significant effects on marine mammal stocks, sea turtle stocks, and recreational or commercial divers; and provide the means of affecting the least practicable adverse impacts on the affected species or stocks of marine mammals and their habitats, and the availability of marine mammals for subsistence.

2.1 Mitigation and Monitoring Requirements

The objective of these mitigation measures is to prevent incidental injury to marine mammals, sea turtles, and human divers. This objective is met by:

- Ensuring that coastal waters within 22 km (12 nmi) of shore are not exposed to SURTASS LFA sonar signal levels $\geq$ 180 dB received level (RL)[5];
- Ensuring that no offshore biologically important areas (OBIAs) are exposed to SURTASS LFA sonar signal levels $\geq$ 180 dB RL during critical seasons;
- Minimizing exposure of marine mammals and sea turtles to SURTASS LFA sonar signal levels below 180 dB RL by monitoring for their presence and suspending transmissions when one of these organisms approaches the SURTASS LFA sonar mitigation (safety) and buffer zones as shown in Figure 5; and
- Ensuring that no known recreational or commercial dive sites are subjected to LF sound pressure levels greater than 145 dB RL.

Table 1 is a summary of the mitigation, the criteria for each, and the actions required.

In the SURTASS LFA sonar 2007 Final Rule under the MMPA (72 FR 46890-93), NMFS added interim operational restrictions by the establishment of a 1-km (0.54-nmi) buffer shutdown zone:

- Outside of the 180-dB LFA mitigation zone, which may extend up to 2 km (1.1 nmi) from the vessel, depending on oceanographic conditions (50 CFR § 216.184(b)), and
- Seaward of the outer perimeter of any offshore biologically important area designated in 50 CFR § 216.184(f).

At this distance, SPLs will be significantly lower than 180 dB.

[5] This was further restricted by the Court as described in Chapter 3.0 and shown in Figures 3 and 4.

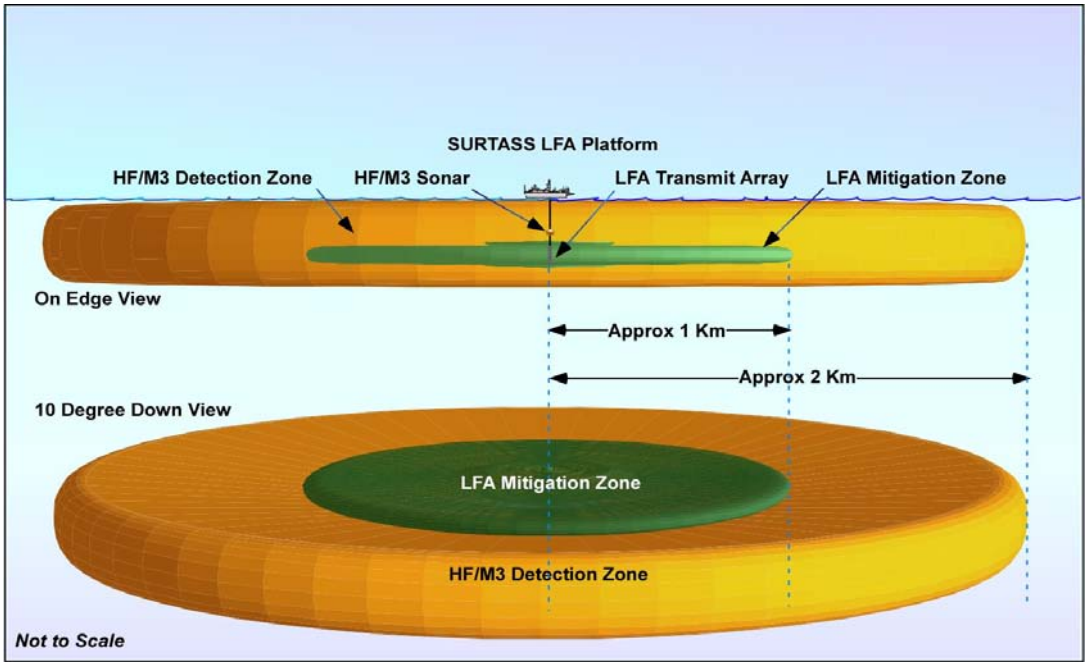

Figure 5. HF/M3 Sonar Detection and LFA Mitigation/Buffer Zones

2.1.1 Geographic Restrictions

The following geographic restrictions apply to the employment of SURTASS LFA sonar:

- SURTASS LFA sonar-generated sound field will be below 180 dB RL within 22 km (12 nmi) of any coastlines;
- SURTASS LFA sonar-generated sound field will be below 180 dB RL 1 km (0.54 nmi) seaward of the outer perimeter of any offshore biologically important area designated in 50 CFR § 216.184(f); and
- When in the vicinity of known recreational or commercial dive sites, SURTASS LFA sonar will be operated such that the sound fields at those sites will not exceed 145 dB RL.

2.1.1.1 Offshore Biologically Important Areas

Offshore Biologically Important Areas (OBIAs) are areas of the world's oceans outside of 22 km (12 nmi) of a coastline where marine animals of concern (those animals listed under the ESA and/or marine mammals) congregate in high densities to carry out biologically important activities. These areas include:

- Migration corridors;
- Breeding and calving grounds; and
- Feeding grounds.

Table 1. Summary of Mitigation

Mitigation	Criteria	Actions
Geographic Restrictions		
22 km (12 nmi) from any coastline[6]	Sound field below 180 dB RL, based on SPL modeling.	Delay/suspend SURTASS LFA sonar operations.
1 km (0.54 nmi) seaward of outer perimeter of any offshore biologically important areas during biologically important seasons outside of 22 km (12 nmi)	Sound field below 180 dB RL, based on SPL modeling.	Delay/suspend SURTASS LFA sonar operations.
Recreational and commercial dive sites (known)	Sound field not to exceed 145 dB RL, based on SPL modeling.	Delay/suspend SURTASS LFA sonar operations.
Monitoring to Prevent Injury to Marine Mammals and Sea Turtles		
Visual Monitoring	Potentially affected species sighted near the vessel but outside of the LFA mitigation and/or buffer zones.	Notify Officer in Charge (OIC).
	Potentially affected species sighted within the LFA mitigation or buffer zones.	Delay/suspend SURTASS LFA sonar operations.
Passive Acoustic Monitoring	Potentially affected species detected.	Notify OIC.
Active Acoustic Monitoring	Contact detected and determined to have a track that would pass within the LFA mitigation or buffer zones.	Notify OIC.
	Potentially affected species detected inside of the LFA mitigation or buffer zones.	Delay/suspend SURTASS LFA sonar operations.

There are ten areas designated by NMFS as offshore areas of critical biological importance for marine mammals in the 2007 Final Rule (72 FR 46890-93). These are:

- Shoreward of the 200-meter isobath off the North American East Coast, from 28 to 50 degrees North latitude, west of 40 degrees West longitude—year-round.
- Antarctic Convergence Zone, delimited by the following: 1) 30 to 80 degrees East longitude along the 45-degree South latitude; 2) 80 to 150 degrees East longitude along the 55-degree South latitude; 3) 150 degrees East to 50 degrees West longitude along the 60-degree South latitude; and 4) 50 degrees West to 30 degrees East longitude along the 50-deg South latitude—October through March (IUCN, 1995).
- Costa Rica Dome, centered at 9 degrees N latitude and 88 degrees W longitude—year round (Longhurst, 1998; Chandler et al., 1999).
- Hawaiian Islands Humpback Whale National Marine Sanctuary—Penguin Bank, Hawaiian Archipelago, centered at 21 degrees North latitude and 157 degrees 30 minutes West longitude—November 1 through May 1.

[6] Ibid.

- Cordell Bank National Marine Sanctuary, boundaries in accordance with 15 CFR § 922.110—year-round.
- Gulf of the Farallones National Marine Sanctuary, boundaries in accordance with 15 CFR § 922.80—year-round.
- Monterey Bay National Marine Sanctuary, boundaries in accordance with 15 CFR § 922.130—year-round.
- Olympic Coast National Marine Sanctuary, boundaries within 23 nmi of the coast from 47 degrees 07 minutes North latitude to 48 degrees 30 minutes North latitude—December, January, March and May.
- Flower Garden Banks National Marine Sanctuary, boundaries in accordance with 15 CFR § 922.120—year-round.
- The Gully, 44 degrees 13 minutes North latitude; 59 degrees 06 minutes West longitude to 43 degrees 47 minutes N latitude; 58 degrees 35 minutes West longitude to 43 degrees 35 minutes North latitude; 58 degrees 35 minutes West longitude to 43 degrees 35 minutes North latitude; 59 degrees 08 minutes West longitude to 44 degrees 06 minutes North latitude; 59 degrees 20 minutes West longitude—year round.

None of these areas were within the authorized operational areas for SURTASS LFA sonar during the period of this report.

2.1.1.2 Recreational and Commercial Dive Sites

SURTASS LFA sonar operations are constrained in the vicinity of known recreational and commercial dive sites to ensure that the sound field at such sites does not exceed 145 dB RL. Recreational dive sites are generally defined as coastal areas from the shoreline out to the 40-m (130-ft) depth contour, which are frequented by recreational divers; but it is recognized that there are other sites that may be outside this boundary.

2.1.1.3 Sound Field Modeling

SURTASS LFA sonar operators will estimate SPL prior to and during operations to provide the information necessary to modify operations, including the delay or suspension of transmissions, in order not to exceed the 180-dB and 145-dB RL sound field criteria cited above. Sound field limits are estimated using near-real-time environmental data and underwater acoustic performance prediction 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.

If the sound field criteria listed above were exceeded, the sonar operator would notify the Officer in Charge (OIC) of the Military Detachment (MILDET), who would order the delay or suspension of transmissions. If it were predicted that the SPLs would exceed the criteria within the next 12 hours, the OIC would also be notified in order to take the necessary action to ensure that the sound field criteria would not be exceeded.

2.1.2 Monitoring to Prevent Injury to Marine Animals

The following monitoring to prevent injury to marine animals is required by the ROD (DON, 2007b), the 2007 Rule (50 CFR § 216.185), and LOA condition 7 when employing SURTASS LFA sonar:

- **Visual monitoring** for marine mammals and sea turtles from the vessel bridge during daylight hours by personnel trained to detect and identify marine mammals and sea turtles;
- **Passive acoustic monitoring** using the passive low frequency (LF) SURTASS array to listen for sounds generated by marine mammals as an indicator of their presence; and
- **Active acoustic monitoring** using the High Frequency Marine Mammal Monitoring (HF/M3) sonar, which is a Navy-developed, enhanced high frequency (HF) commercial sonar, to detect, locate, and track marine mammals and, to some extent, sea turtles, that may pass close enough to the SURTASS LFA sonar's transmit array to enter the LFA mitigation and buffer zones.

Monitoring will commence at least 30 minutes before the first SURTASS LFA sonar transmissions (30 minutes before sunrise for visual monitoring); continue between transmission pings; and continue for at least 15 minutes after the completion of SURTASS LFA sonar transmissions (30 minutes after sunset for visual), or if marine mammals are showing abnormal behavioral patterns, for a period of time until those patterns return to normal or the conditions prevent continued observations.

2.1.2.1 Visual Monitoring

Visual monitoring includes daytime observations for marine mammals and sea turtles from the vessel. Daytime is defined as 30 minutes before sunrise until 30 minutes after sunset. Visual monitoring begins 30 minutes before sunrise or 30 minutes before the SURTASS LFA sonar is deployed. Monitoring continues until 30 minutes after sunset or at least 15 minutes after the completion of SURTASS LFA sonar transmissions. Observations are made by personnel trained in detecting and identifying marine mammals and sea turtles. The objective of these observations is to maintain a track of marine mammals and/or sea turtles observed and to ensure that none approach the source close enough to enter the LFA mitigation and buffer zones. A marine mammal/sea turtle observation log will be maintained during operations that employ SURTASS LFA sonar. The numbers and identification of marine mammals/sea turtles sighted, as well as any unusual behavior, is entered into the log. A designated ship's officer monitors the conduct of the visual watches and periodically reviews the log entries. There are two potential visual monitoring scenarios.

First, if a potentially affected marine mammal or sea turtle is sighted outside of the LFA mitigation and buffer zones, the observer notifies the OIC. The OIC then notifies the HF/M3 sonar operator to determine the range and projected track of the animal. If it is determined that the animal will pass within the LFA mitigation and buffer zones, the OIC orders the delay or suspension of SURTASS LFA sonar transmissions when the animal enters the LFA mitigation or

buffer zones. The observer continues visual monitoring/recording until the animal is no longer seen.

Second, if the potentially affected animal is sighted anywhere within the LFA mitigation or buffer zones, the observer notifies the OIC, who orders the immediate delay or suspension of SURTASS LFA sonar transmissions.

All sightings are recorded in the log and provided as part of the Long Term Monitoring (LTM) Program as discussed in FOEIS/EIS Subchapter 2.4.2 (DON, 2001) for the monitoring of potential long-term environmental effects.

2.1.2.2 Passive Acoustic Monitoring

Passive acoustic monitoring is conducted using the SURTASS towed horizontal line array (HLA) 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 potentially affected by SURTASS LFA sonar, the technician notifies the OIC, who alerts the HF/M3 sonar operator and visual observers. If prior to or during transmissions, the OIC then orders the delay or suspension of SURTASS LFA sonar transmissions when the animal enters the LFA mitigation or buffer zones.

All contacts are recorded in the log and provided as part of the LTM Program.

2.1.2.3 Active Acoustic Monitoring

HF active acoustic monitoring uses the HF/M3 sonar to detect, locate, and track marine mammals (and possibly sea turtles) that could pass close enough to the SURTASS LFA sonar array to enter the LFA mitigation and buffer zones. Prior to full-power operations, the HF/M3 sonar power level is increased over a period of 5 minutes 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 $\geq$ 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 mitigation and buffer zones, the HF/M3 sonar operator determines the range and projected track of the animal. If it is determined that the animal will pass within the LFA mitigation and buffer zones, 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 mitigation or buffer zones.

Second, if a contact is detected by the HF/M3 sonar within the LFA mitigation or buffer zones, the observer notifies the OIC, who orders the immediate delay or suspension of transmissions.

All contacts are recorded in the log and provided as part of the LTM Program.

2.2.2.4 Resumption of SURTASS LFA Sonar Transmissions

SURTASS LFA sonar transmissions can commence/resume 15 minutes after there is no further detection by the HF/M3 sonar and there is no further visual observation of the animal within the LFA mitigation and buffer zones.

3.0 COURT CONSTRAINTS FOR SURTASS LFA SONAR OPERATIONS

During the period of this report, the SURTASS LFA sonar systems onboard the USNS ABLE and USNS IMPECCABLE were operated under the conditions of the two LOAs (APPENDIX A) and the under the Stipulated Settlement Agreement Order (APPENDIX B) described in Subchapter 1.5.3. The exception was that the Navy may operate the LFA sonar system within the coastal exclusion zones set forth in APPENDIX B only when necessary to continue tracking an existing underwater contact detected outside of the exclusion zone, or when necessary to detect a new underwater contact that would place the LFA sonar system within the coastal exclusion zone to maximize opportunities for detection. These restrictions remained in effect for the entire period of this annual report.

Details of the authorized areas of operation are shown in Figures 3 and 4.

4.0 SUMMARY OF SURTASS LFA SONAR OPERATIONS FOR SECOND YEAR ANNUAL REPORT

Under 50 CFR § 216.186(b) and LOA Condition 8(b), this annual report consists of an unclassified summary of the quarterly reports under the second year LOAs for the USNS ABLE and USNS IMPECCABLE for the period of 16 August 2008 through 15 August 2009.

4.1 SURTASS LFA Sonar Operations for First Annual Report

Two SURTASS LFA sonar systems operated under the LOAs issued by NMFS for the period 16 August 2008 to 15 August 2009 (APPENDIX A). The SURTASS LFA sonar systems onboard USNS ABLE and USNS IMPECCABLE operated in the northwestern Pacific Ocean and central Pacific Ocean south of Hawaii. This report includes three missions by the USNS ABLE and six missions by the USNS IMPECCABLE.

4.1.1 USNS ABLE Missions

The USNS ABLE conducted three missions for the at-sea testing of the newly-installed CLFA components. These tests covered a period of 14.1 days with 22.9 hours of transmissions by the CLFA array and included the operation of the HF/M3 sonar and compliance with all other applicable mitigation requirements. These missions occurred in the waters south of the Hawaiian Islands and in the North Philippine Sea during the period of the LOA.

4.1.2 USNS IMPECCABLE Missions

The USNS IMPECCABLE conducted six missions covering a period of 9.6 days with 9.6 hours of transmissions by the LFA array and included the operation of the HF/M3 sonar and compliance to the mitigation requirements. These missions occurred in the North and West Philippine Sea, and the South China Sea during the period of the LOA.

4.2 Estimates of Marine Mammal Stocks Potentially Affected

In its annual LOA applications, the Navy provides estimates of the percentage of marine mammal stocks that could potentially be affected in the biogeographic regions of proposed SURTASS LFA sonar operations for the 12-month period of the LOA(s). In this annual report, the Navy provides a post-operational assessment of whether incidental harassment occurred within the LFA mitigation zone and estimates of the percentages of marine mammal stocks possibly harassed incidentally using predictive modeling based on dates/times/location of operations, system characteristics, oceanographic/environmental conditions, and animal demographics. The basis for the methodology used for the acoustic modeling to analyze risk and produce the incidental harassment estimates was essentially the scientific analysis process used in the SURTASS LFA sonar Final OEIS/EIS (DON, 2001) and detailed in the Subchapter 4.4 of the SURTASS LFA sonar Final SEIS (DON, 2007a).

During the period of the LOAs (16 August 2008 to 15 August 2009), SURTASS LFA sonar operational missions were conducted in areas generally defined as Sites 2, 3, and 7 (Figure 3)

and the Hawaii Operations Area (Figure 4) in the LOA application (DON, 2008a) and Provinces 53, 56, 60, and 64 as defined in the Final Rule (50 CFR § 216.180(a)) and Condition 3(b) of the LOAs.

4.2.1 Pre-Operational Estimates of Marine Mammal Stocks Potentially Affected

Overall planning for operations during the LOA periods was based on the determination of the best operational sites and seasons that would have the least potential for impacts on marine mammals while meeting the Navy's operational requirements. Potential mission sites within each mission area were then analyzed with regard to spatial and temporal factors, and operational requirements for SURTASS LFA sonar. The general ocean areas for the pre-operational estimates were within the Philippine Sea, northwest Pacific Ocean, Sea of Japan, East China Sea, South China Sea, and Hawaii Operations Area. Marine mammal density and stock/abundance estimates were then assembled.

APPENDIX C provides updated information on how the density and stock/abundance estimates were derived for the operational areas shown in Figures 3 and 4. These data were derived from best available published source documentation, and provided general area information for mission areas, with species-specific information on the animals that could potentially occur in those areas, including estimates for their stock/abundance and density. Animal demographics (stocks and densities) are based on current literature reviews of the western Pacific Ocean as cited in APPENDIX C.

Analyses for pre-operational estimates were performed at nominal potential operational sites, encompassing four seasons, which provide a conservative estimate of the potential for effects on marine mammal stocks in those provinces where operations were proposed. These estimates were based on 22 missions of 7 days each (16 missions in the northwestern Pacific Ocean and 6 missions in the Hawaii Operations Area).

Tables 2 through 5 provide pre-operational risk estimates for marine mammal stocks in these operating areas as presented in the Navy's application for LOAs (DON, 2008a). These values supported the conclusion that these pre-operational risk estimates for marine mammal stocks were below—for most cases, well below—the criteria delineated by NMFS in LOA Condition 6(g) and the Final Rule (72 FR 46886). Upon completion of the missions under the requested authorization, these estimates were refined and submitted to NMFS under the reporting requirements of the Final Rule (50 CFR § 216.186(a)) and the condition 8(a) of the LOAs.

4.2.2 Post-Operational Estimates of Marine Mammal Stocks Potentially Affected

Operations occurred in the north and west Philippine Sea (sites 2 and 3), the South China Sea (site 7), and the Hawaii Operations Area south of Hawaii as shown in Figures 3 and 4. Post-operational estimates were based on the actual operating hours whereas the pre-operational estimates were based on projected operations over the course of each annual LOA.

SURTASS LFA sonar operations during the period of this annual report comprised nine missions totaling 23.7 days of operations with 32.5 hours of active transmissions by the LFA arrays. The

general areas of these missions were the Philippine Sea in LOA Provinces 53 and 56, the South China Sea in LOA Provinces 64,; and the Hawaii Operations Area in LOA province 60 as depicted in Figures 3 and 4.

Tables 6 through 9 provide post-operational estimates of the percentage of marine mammal stocks affected by the 23.7 days of SURTASS LFA sonar operations both within and outside the 180-dB mitigation zone. The same methodology was utilized as that used for the pre-operational analysis discussed above, except that the durations of each mission were based on actual transmission times and oceanographic environmental conditions were based on the date/time/location of the actual operations. Animal density and stock/abundance estimates were updated based on current literature reviews of the northwestern Pacific Ocean and Hawaii Operations Area (APPENDIX C).

4.2.3 Summary of Results

The percentage of marine mammal stocks estimated to be exposed between 120 and 180 dB for both pre- and post-operational estimates are shown in Tables 2 through 9. Tables 6 through 9 demonstrate that the post-operational estimates are considerably below the 12 percent for any marine mammal stock, the maximum percentage authorized in LOA Condition 6(g) and the Final Rule (72 FR 46886).

The post-operational incidental harassment estimates in Tables 6 through 9 show that there were no marine mammal exposures to received levels at or above 180 dB. These results are supported by the results from the visual, passive acoustic and active acoustic monitoring efforts discussed in Subchapter 4.3. In addition, a review of stranding data for the period did not indicate any stranding events associated with the times and locations of SURTASS LFA sonar operations.

Table 2. Pre-Operational Estimates of Marine Mammal Stocks Potentially Affected In Site 2

North Philippine Sea					
Site 2	**Animal**	**Stock**	**# Animals Stock**	**% Affected (w/mit) 120-180 dB**	**% Affected (w/mit) ≥ 180 dB**
	Bryde's whale	WNP	22000	0.25	0.00
	Minke whale	WNP "O" Stock	25049	1.62	0.00
	N. Pacific right whale	WNP	922	0.10	0.00
	Sperm whale	NP	102112	0.12	0.00
	Kogia	NP	350553	0.04	0.00
	Cuvier's beaked whale	NP	90725	0.29	0.00
	Blainville's beaked whale	NP	8032	0.30	0.00
	Ginkgo-toothed beaked whale	NP	22799	0.11	0.00
	Killer whale	NP	12256	0.16	0.00
	False killer whale	WNP	16668	0.84	0.00
	Pygmy killer whale	WNP	30214	0.33	0.00
	Melon-headed whale	WNP	36770	0.16	0.00
	Short-finned pilot whale	WNP	53608	1.37	0.00
	Risso's dolphin	WNP	83289	0.78	0.00
	Common dolphin	WNP	3286163	0.09	0.00
	Bottlenose dolphin	WNP	168791	0.53	0.00
	Spinner dolphin	WNP	1015059	0.00	0.00
	Pantropical spotted dolphin	WNP	438064	0.16	0.00
	Striped dolphin	WNP	570038	0.30	0.00
	Rough-toothed dolphin	WNP	145729	0.21	0.00
	Fraser's dolphin	WNP	220789	0.09	0.00
	Pacific white-sided dolphin	WNP	931000	0.07	0.00

NP—North Pacific Stock
WNP—Western North Pacific Stock
WNP "O" Stock – Pacific waters and the Sea of Okhotsk

Table 3. Pre-Operational Estimates of Marine Mammal Stocks Potentially Affected In Site 3

West Philippine Sea					
Site 3	**Animal**	**Stock**	**# Animals Stock**	**% Affected (w/mit) 120-180 dB**	**% Affected (w/mit) ≥ 180 dB**
	Fin whale	NP	9250	0.25	0.00
	Bryde's whale	WNP	22000	0.32	0.00
	Minke whale	WNP "O" Stock	25049	1.55	0.00
	Humpback whale (winter only)	WNP	394	0.00	0.00
	Sperm whale	NP	102112	0.05	0.00
	Kogia	NP	350553	0.02	0.00
	Cuvier's beaked whale	NP	90725	0.02	0.00
	Blainville's beaked whale	NP	8032	0.33	0.00
	Ginkgo-toothed beaked whale	NP	22799	0.11	0.00
	False killer whale	WNP	16668	1.06	0.00
	Pygmy killer whale	WNP	30214	0.43	0.00
	Melon-headed whale	WNP	36770	0.20	0.00
	Short-finned pilot whale	WNP	53608	0.87	0.00
	Risso's dolphin	WNP	83289	0.95	0.00
	Common dolphin	WNP	3286163	0.12	0.00
	Bottlenose dolphin	WNP	168791	0.64	0.00
	Spinner dolphin	WNP	1015059	0.00	0.00
	Pantropical spotted dolphin	WNP	438064	0.22	0.00
	Striped dolphin	WNP	570038	0.20	0.00
	Rough-toothed dolphin	WNP	145729	0.28	0.00
	Fraser's dolphin	WNP	220789	0.13	0.00
	Pacific white-sided dolphin	WNP	931000	0.18	0.00

NP—North Pacific Stock
WNP—Western North Pacific Stock
WNP "O" Stock – Pacific waters and the Sea of Okhotsk

Table 4. Pre-Operational Estimates of Marine Mammal Stocks Potentially Affected In Site 7

South China Sea					
Site 7	**Animal**	**Stock**	**# Animals Stock**	**% Affected (w/mit) 120-180 dB**	**% Affected (w/mit) ≥ 180 dB**
	Fin whale	WNP	9250	0.07	0.00
	Bryde's whale	WNP	22000	0.08	0.00
	Minke whale	WNP "O" Stock	25049	0.41	0.00
	Gray whale (winter only)	WNP	100	0.00	0.00
	N Pac Right whale	WNP	922	0.04	0.00
	Sperm whale	NP	102112	0.02	0.00
	Kogia	NP	350553	0.01	0.00
	Cuvier's beaked whale	NP	90725	0.00	0.00
	Blainville's beaked whale	NP	8032	0.09	0.00
	Ginkgo-toothed beaked whale	NP	22799	0.03	0.00
	False killer whale	IA	9777	0.22	0.00
	Pygmy killer whale	WNP	30214	0.01	0.00
	Melon-headed whale	WNP	36770	0.22	0.00
	Short-finned pilot whale	WNP	53608	0.06	0.00
	Risso's dolphin	WNP	83289	0.32	0.00
	Common dolphin	WNP	3286163	0.03	0.00
	Bottlenose dolphin	IA	105138	0.38	0.00
	Spinner dolphin	WNP	1015059	0.69	0.00
	Pantropical spotted dolphin	WNP	219032	0.14	0.00
	Striped dolphin	WNP	570038	0.06	0.00
	Rough-toothed dolphin	WNP	145729	0.06	0.00
	Fraser's dolphin	WNP	220789	0.04	0.00

NP—North Pacific Stock
WNP—Western North Pacific Stock
IA—Inshore Archipelago Stock
WNP "O" Stock – Pacific waters and the Sea of Okhotsk

Table 5. Pre-Operational Estimates of Marine Mammal Stocks Potentially Affected for the Hawaii Operations Area

Hawaii Operations Area				
Animal	**Stock**	**# Animals Stock**	**% Affected (w/mit) 120-180 dB**	**% Affected (w/mit) ≥ 180 dB**
Blue whale	WNP	1548	2.95	0.00
Fin whale	Hawaii	2099	7.62	0.00
Bryde's whale	Hawaii	469	9.74	0.00
Minke whale	Hawaii	25000	0.18	0.00
Humpback whale	CNP	4491	2.03	0.00
Sperm whale	Hawaii	6919	4.81	0.00
Kogia	Hawaii	24657	4.85	0.00
Cuvier's beaked whale	Hawaii	15242	4.84	0.00
Longman's beaked whale	Hawaii	1007	4.72	0.00
Blainville's beaked whale	Hawaii	2872	4.84	0.00
Killer whale	Hawaii	349	5.03	0.00
Pygmy killer whale	Hawaii	956	7.34	0.00
False killer whale	Hawaii	236	7.43	0.00
Melon-headed whale	Hawaii	2950	7.13	0.00
Short-finned pilot whale	Hawaii	8870	7.12	0.00
Risso's dolphin	Hawaii	2372	9.45	0.00
Bottlenose dolphin	Hawaii	3215	9.06	0.00
Spinner dolphin	Hawaii	3351	8.76	0.00
Pantropical spotted dolphin	Hawaii	8978	8.74	0.00
Striped dolphin	Hawaii	13143	8.74	0.00
Rough-toothed dolphin	Hawaii	8709	8.74	0.00
Fraser's dolphin	Hawaii	10226	8.80	0.00
Hawaiian monk seal	Hawaii	1302	2.10	0.00

CNP—Central North Pacific Stock
WNP—Western North Pacific Stock
Hawaii—Hawaii Stock

Table 6. Post-Operational Estimates of Marine Mammal Stocks Potentially Affected - Totals for USNS IMPECCABLE 2nd Year LOA

LOA 2—USNS IMPECCABLE								
Animal	**Stock**	**# Animals in Stock**	**% Affected (w/mit) 120 – 180 dB**					**% Affected (w/mit) ≥ 180 dB**
			Q1	**Q2**	**Q3**	**Q4**	**AN**	**Annual Total**
Blue Whale	N. Pacific	9250	na	na	na	na	na	na
Fin Whale	N. Pacific	9250	0.02	na	na	0.01	0.03	0.00
Bryde's Whale	Western N. Pacific	22000	0.02	na	0.03	0.02	0.07	0.00
Minke Whale	Western N. Pacific	25049	0.14	na	0.17	0.07	0.38	0.00
N. Pacific Right Whale (spr/fall/win)	Western N. Pacific	922	0.00	na	0.01	na	0.01	0.00
Humpback Whale (winter only)	Western N. Pacific	394	0.00	na	na	na	0.00	0.00
Gray Whale (winter only)	Western N. Pacific	100	na	na	na	na	na	na
Sperm Whale	N. Pacific	102112	0.00	na	0.01	0.00	0.01	0.00
Kogia	N. Pacific	350553	0.00	na	0.00	0.00	0.00	0.00
Cuvier's Beaked Whale	N. Pacific	90725	0.01	na	0.03	0.00	0.04	0.00
Blainville's Beaked Whale	N. Pacific	8032	0.03	na	0.03	0.02	0.08	0.00
Ginkgo-Toothed Beaked Whale	N. Pacific	22799	0.01	na	0.01	na	0.02	0.00
Killer Whale	Western N. Pacific	12256	0.00	na	0.02	na	0.02	0.00
False Killer Whale	Western N. Pacific	16668	0.10	na	0.09	0.02	0.21	0.00
False Killer Whale	Inshore Archipelago	9777	na	na	na	0.03	0.03	0.00
Pygmy Killer Whale	Western N. Pacific	30214	0.04	na	0.04	0.01	0.09	0.00
Melon-Headed Whale	Western N. Pacific	36770	0.01	na	0.02	0.03	0.06	0.00
Short-Finned Pilot Whale	Western N. Pacific	53608	0. 09	na	0.15	0.02	0.26	0.00
Risso's Dolphin	Western N. Pacific	83289	0.08	na	0.08	0.05	0.21	0.00
Common Dolphin	Western N. Pacific	3286163	0. 01	na	0.01	0.00	0.02	0.00
Bottlenose Dolphin	Western N. Pacific	168791	0.06	na	0.06	0.01	0.13	0.00
Bottlenose Dolphin	Inshore Archipelago	105138	na	na	na	0.05	0.05	0.00
Spinner Dolphin	Western N. Pacific	1015059	0.00	na	0.00	0.09	0.09	0.00
Pantropical Spotted Dolphin	Western N. Pacific	438064	0. 02	na	0.02	0.02	0.06	0.00
Striped Dolphin	Western N. Pacific	570038	0. 02	na	0.03	0.01	0.06	0.00
Rough-Toothed Dolphin	Western N. Pacific	145729	0.02	na	0.02	0.01	0.05	0.00
Fraser's Dolphin	Western N. Pacific	220789	0.01	na	0.01	0.01	0.03	0.00
Pacific White-Sided Dolphin	Western N. Pacific	931000	0. 01	na	0.01	0.00	0.02	0.00

Table 7. Post-Operational Estimated of Marine Mammal Stocks Potentially Affected - Totals for USNS ABLE 2nd Year LOA

LOA 2—USNS ABLE								
Animal	**Stock**	**# Animals in Stock**	**% Affected (w/mit) 120 – 180 dB**					**% Affected (w/mit) ≥ 180 dB**
			Q1	**Q2**	**Q3**	**Q4**	**AN**	**Annual Total**
Blue Whale	N. Pacific	9250	na	na	na	na	na	na
Blue Whale	Western N. Pacific	1548	0.33	na	na	na	0.33	0.00
Fin Whale	N. Pacific	9250	na	na	na	na	na	na
Fin Whale	Hawaii	2099	0.86	na	na	na	0.86	0.00
Bryde's Whale	Western N. Pacific	22000	na	0.08	0.02	na	0.10	0.00
Bryde's Whale	Hawaii	469	1.09	na	na	na	1.09	0.00
Minke Whale	Western N. Pacific	25049	na	0.51	0.11	na	0.62	0.00
Minke Whale	Hawaii	25000	0.02	na	na	na	0.02	0.00
N. Pacific Right Whale (spr/fall/win)	Western N. Pacific	922	na	0.03	0.01	na	0.04	0.00
Humpback Whale (winter only)	Western N. Pacific	394	na	na	na	na	na	na
Gray Whale (winter only)	Western N. Pacific	100	na	0.00	na	na	0.00	0.00
Sperm Whale	N. Pacific	102112	na	0.04	0.01	na	0.05	0.00
Sperm Whale	Hawaii	6919	0.54	na	na	na	0.54	0.00
Kogia	N. Pacific	350553	na	0.01	0.00	na	0.01	0.00
Kogia	Hawaii	24657	0.54	na	na	na	0.54	0.00
Cuvier's Beaked Whale	N. Pacific	90725	na	0.09	0.02	na	0.11	0.00
Cuvier's Beaked Whale	Hawaii	15242	0.54	na	na	na	0.54	0.00
Longman's Beaked Whale	Hawaii	1007	0.53	na	na	na	0.53	0.00
Blainville's Beaked Whale	N. Pacific	8032	na	0.09	0.02	na	0.11	0.00
Blainville's Beaked Whale	Hawaii	2872	0.54	na	na	na	0.54	0.00
Ginkgo-Toothed Beaked Whale	N. Pacific	22799	na	0.03	0.01	na	0.04	0.00
Killer Whale	Western N. Pacific	12256	na	0.05	0.01	na	0.06	0.00
Killer Whale	Hawaii	349	0.56	na	na	na	0.56	0.00
False Killer Whale	Western N. Pacific	16668	na	0.26	0.06	na	0.32	0.00
False Killer Whale	Inshore Archipelago	9777	na	na	na	na	na	na
False Killer Whale	Hawaii	236	0.83	na	na	na	0.83	0.00
Pygmy Killer Whale	Western N. Pacific	30214	na	0.11	0.02	na	0.13	0.00
Pygmy Killer Whale	Hawaii	956	0.82	na	na	na	0.82	0.00
Melon-Headed Whale	Western N. Pacific	36770	na	0.05	0.01	na	0.06	0.00
Melon-Headed Whale	Hawaii	2950	0.80	na	na	na	0.80	0.00
Short-Finned Pilot Whale	Western N. Pacific	53608	na	0.43	0.09	na	0.52	0.00
Short-Finned Pilot Whale	Hawaii	8870	0.80	na	na	na	0.80	0.00

LOA 2—USNS ABLE								
Animal	**Stock**	**# Animals in Stock**	**% Affected (w/mit) 120 – 180 dB**					**% Affected (w/mit) ≥ 180 dB**
			Q1	**Q2**	**Q3**	**Q4**	**AN**	**Annual Total**
Risso's Dolphin	Western N. Pacific	83289	na	0.25	0.05	na	0.30	0.00
Risso's Dolphin	Hawaii	2372	1.06	na	na	na	1.06	0.00
Common Dolphin	Western N. Pacific	3286163	na	0.03	0.01	na	0.04	0.00
Bottlenose Dolphin	Western N. Pacific	168791	na	0.17	0.03	na	0.20	0.00
Bottlenose Dolphin	Inshore Archipelago	105138	na	na	na	na	na	0.00
Bottlenose Dolphin	Hawaii	3215	1.02	na	na	na	1.02	0.00
Spinner Dolphin	Western N. Pacific	1015059	na	0.00	0.00	na	0.00	0.00
Spinner Dolphin	Hawaii	3351	0.98	na	na	na	0.98	0.00
Pantropical Spotted Dolphin	Western N. Pacific	438064	na	0.05	0.01	na	0.06	0.00
Pantropical Spotted Dolphin	Hawaii	8978	0.98	na	na	na	0.98	0.00
Striped Dolphin	Western N. Pacific	570038	na	0.10	0.02	na	0.12	0.00
Striped Dolphin	Hawaii	13143	0.98	na	na	na	0.98	0.00
Rough-Toothed Dolphin	Western N. Pacific	145729	na	0.07	0.01	na	0.08	0.00
Rough-Toothed Dolphin	Hawaii	8709	0.98	na	na	na	0.98	0.00
Fraser's Dolphin	Western N. Pacific	220789	na	0.03	0.01	na	0. 04	0.00
Fraser's Dolphin	Hawaii	10226	0.99	na	na	na	0. 99	0.00
Pacific White-Sided Dolphin	Western N. Pacific	931000	na	0.02	0.01	na	0.03	0.00
Hawaiian Monk Seal	Hawaii	1302	0.24	na	na	na	0.24	0.00

Table 8. Post-Operational Estimates of Marine Mammal Stocks Potentially Affected - Totals for Year LOA

LOA 2—USNS ABLE & USNS IMPECCABLE								
Animal	**Stock**	**# Animals in Stock**	**% Affected (w/mit) 120 – 180 dB**					**% Affected (w/mit) ≥ 180 dB**
			Q1	**Q2**	**Q3**	**Q4**	**Annual**	**Annual Total**
Blue Whale	N. Pacific	9250	na	na	na	na	na	na
Blue Whale	Western N. Pacific	1548	0.33	na	na	na	0.33	0.00
Fin Whale	N. Pacific	9250	0.02	na	na	0.01	0.03	0.00
Fin Whale	Hawaii	2099	0.86	na	na	na	0.86	0.00
Bryde's Whale	Western N. Pacific	22000	0.02	0.08	0.05	0.02	0.17	0.00
Bryde's Whale	Hawaii	469	1.09	na	na	na	1.09	0.00
Minke Whale	Western N. Pacific	25049	0.14	0.51	0.28	0.07	1.00	0.00
Minke Whale	Hawaii	25000	0.02	na	na	na	0.02	0.00
N. Pacific Right Whale (spr/fall/win)	Western N. Pacific	922	0.00	0.03	0.02	na	0.05	0.00
Humpback Whale (winter only)	Western N. Pacific	394	0.00	na	na	na	0.00	0.00
Gray Whale (winter only)	Western N. Pacific	100	na	0.00	na	na	0.00	0.00
Sperm Whale	N. Pacific	102112	0.00	0.04	0.02	0.00	0.06	0.00
Sperm Whale	Hawaii	6919	0.54	na	na	na	0.54	0.00
Kogia	N. Pacific	350553	0.00	0.01	0.00	0.00	0.01	0.00
Kogia	Hawaii	24657	0.54	na	na	na	0.54	0.00
Cuvier's Beaked Whale	N. Pacific	90725	0.01	0.09	0.05	na	0.15	0.00
Cuvier's Beaked Whale	Hawaii	15242	0.54	na	na	na	0.54	0.00
Longman's Beaked Whale	Hawaii	1007	0.53	na	na	na	0.53	0.00
Blainville's Beaked Whale	N. Pacific	8032	0.03	0.09	0.05	0.02	0.19	0.00
Blainville's Beaked Whale	Hawaii	2872	0.54	na	na	na	0.54	0.00
Ginkgo-Toothed Beaked Whale	N. Pacific	22799	0.01	0.03	0.02	na	0.06	0.00
Killer Whale	Western N. Pacific	12256	0.00	0.05	0.03	na	0.08	0.00
Killer Whale	Hawaii	349	0.56	na	na	na	0.56	0.00
False Killer Whale	Western N. Pacific	16668	0.10	0.26	0.15	0.02	0.53	0.00
False Killer Whale	Inshore Archipelago	9777	na	na	na	0.03	0.03	0.00
False Killer Whale	Hawaii	236	0.83	na	na	na	0.83	0.00
Pygmy Killer Whale	Western N. Pacific	30214	0.04	0.11	0.06	0.01	0.22	0.00
Pygmy Killer Whale	Hawaii	956	0.82	na	na	na	0.82	0.00
Melon-Headed Whale	Western N. Pacific	36770	0.01	0.05	0.03	0.03	0.12	0.00
Melon-Headed Whale	Hawaii	2950	0.80	na	na	na	0.80	0.00
Short-Finned Pilot Whale	Western N. Pacific	53608	0.09	0.43	0.24	0.02	0.78	0.00
Short-Finned Pilot Whale	Hawaii	8870	0.80	na	na	na	0.80	0.00

LOA 2—USNS ABLE & USNS IMPECCABLE								
Animal	**Stock**	**# Animals in Stock**	**% Affected (w/mit) 120 – 180 dB**					**% Affected (w/mit) ≥ 180 dB**
			Q1	**Q2**	**Q3**	**Q4**	**Annual**	**Annual Total**
Risso's Dolphin	Western N. Pacific	83289	0.08	0.25	0.13	0.05	0.51	0.00
Risso's Dolphin	Hawaii	2372	1.06	na	na	na	1.06	0.00
Common Dolphin	Western N. Pacific	3286163	0.01	0.03	0.02	0.00	0.06	0.00
Bottlenose Dolphin	Western N. Pacific	168791	0.06	0.17	0.09	0.01	0.33	0.00
Bottlenose Dolphin	Inshore Archipelago	105138	na	na	na	0.05	0.05	0.00
Bottlenose Dolphin	Hawaii	3215	1.02	na	na	na	1.02	0.00
Spinner Dolphin	Western N. Pacific	1015059	0.00	0.00	0.00	0.09	0.09	0.00
Spinner Dolphin	Hawaii	3351	0.98	na	na	na	0.98	0.00
Pantropical Spotted Dolphin	Western N. Pacific	438064	0.02	0.05	0.03	0.02	0.12	0.00
Pantropical Spotted Dolphin	Hawaii	8978	0.98	na	na	na	0.98	0.00
Striped Dolphin	Western N. Pacific	570038	0.02	0.10	0.05	0.01	0.18	0.00
Striped Dolphin	Hawaii	13143	0.98	na	na	na	0.98	0.00
Rough-Toothed Dolphin	Western N. Pacific	145729	0.02	0.07	0.03	0.01	0.13	0.00
Rough-Toothed Dolphin	Hawaii	8709	0.98	na	na	na	0.98	0.00
Fraser's Dolphin	Western N. Pacific	220789	0.01	0.03	0.02	0.01	0. 07	0.00
Fraser's Dolphin	Hawaii	10226	0.99	na	na	na	0. 99	0.00
Pacific White-Sided Dolphin	Western N. Pacific	931000	0.01	0.02	0.02	0.00	0.05	0.00
Hawaiian Monk Seal	Hawaii	1302	0.24	na	na	na	0.24	0.00

4.3 Mitigation Effectiveness

Under LOA Condition 8(b)(i) the following assessment of the effectiveness of the mitigation measures is provided. There are no recommendations for mitigation improvements at this time.

4.3.1 LFA Mitigation and Buffer Zones

During the missions, the minimum radial distance to the safety zone from the LFA array was 1 km (0.54 nmi). Therefore, the safety and buffer zones comprised a 2-km (1.08-nmi) radius.

4.3.2 Visual Monitoring

Visual observers, trained in marine mammal identification in accordance with Condition 7(c) of the LOAs, were posted as specified in LOA Condition 7(a)(i) and CNO executive directive (Chapter 2.0). During the nine missions, three marine mammal sightings were noted.

During operations on the USNS ABLE in the second quarter of the LOA period (16 November 2008 to 15 February 2009), there was one visual sighting of marine mammals. The initial sighting was at 170 degrees relative at 1.0 km (~0.5 nmi); the closest point of approach was at 090 degrees relative at 100 m (~1.0 nmi); and the final sighting was at 340 degrees relative at 1.5 km (~0.8 nmi), and LFA transmissions were suspended. They were identified as most likely to be minke whales (1 adult with 1 or 2 juveniles).

During operations on the USNS IMPECCABLE in the fourth quarter (16 May to 15 August 2009), there were two visual sightings. The first sighting was at 135 degrees relative at 1.0 km (~0.5 nmi), and LFA transmissions were suspended. The second was at 145 degrees relative at 1.9 km (~1.0 nmi), and LFA transmissions were suspended. Both sightings were identified as dolphins, but specific species were unknown.

4.3.3 Passive Acoustic Monitoring

The embarked military detachment (MILDET) and system support engineers monitored the SURTASS passive displays for marine mammal vocalizations as specified in LOA Condition 7(a)(ii). There were no passive acoustic detections.

4.3.4 Active Acoustic Monitoring

The HF/M3 sonar was operated continuously during the course of the missions in accordance with LOA Conditions 6(c) and 7(a)(iii). During two of the nine missions, there were two HF/M3 alerts that were identified as possible marine mammal or sea turtle detections. No additional correlating data were available to further verify, identify, or clarify these detections.

4.3.5 Delay/Suspension of Operations

In accordance with the requisite protocols under LOA Condition 6(b), LFA transmissions were delayed or suspended on eight occasions. On the USNS ABLE, operations were delayed or

suspended one time due to visual detection of marine mammals, one time due to HF/M3 contact, and three times due to the failure of the HF/M3 sonar. On the USNS IMPECCABLE, operations were delayed or suspended two times due to visual detections of marine mammals and one time due to HF/M3 contact.

4.4 Marine Mammal Observer Training

In accordance with Condition 7(c) of the second year LOAs, on-site individuals will be qualified to conduct the mitigation, monitoring, and reporting activities. Specifically, one or more marine mammal biologists, highly experienced in marine mammal observations techniques, will be hired to train observers to conduct visual monitoring during active sonar operations. To meet this requirement, marine mammal observers were trained by qualified Marine Acoustics, Incorporated (MAI) marine biologists onboard USNS IMPECCABLE on 13 December 2008 and onboard the USNS ABLE on 16 March 2009 during in-port periods in Yokohama, Japan.

4.5 Assessment of Long-Term Effects and Estimated Cumulative Impacts

Because the impacts that were encountered during the period of this report are consistent with what was projected in the FSEIS (DON, 2007a) and supporting documentation, the Navy's assessment of the long-term and cumulative impact from employment of SURTASS LFA sonar remain consistent with the analysis of such impacts in the FSEIS.

5.0 LONG TERM MONITORING AND RESEARCH

As part of its continuing commitment to protect the environment, the Navy is continuing a LTM Program to assess and analyze the potential for effects of the employment of SURTASS LFA sonar on the marine environment.

The principal objectives of the LTM Program for the SURTASS LFA sonar system are to:

- Analyze and assess the effectiveness of proposed mitigation measures, and make recommendations for improvements where applicable, to incorporate them as early as possible, with NMFS concurrence;
- Provide the necessary input data for reports on estimates of percentages of marine mammal populations affected by SURTASS LFA sonar operations, using predictive modeling based on operating location, system characteristics, and animal demographics;
- Study the potential effects of Navy SURTASS LFA sonar-generated underwater sound on long-term ecological processes relative to LF sound-sensitive marine animals, focusing on the application of Navy technology for the detection, classification, localization, and tracking of these animals; and
- Collaborate, as feasible, with pertinent Navy, academic, and industry laboratories and research organizations, and where applicable, with Allied navy and academic laboratories.

The LTM Program consists of two parts—reporting and research.

5.1 Reporting Requirements Under the Final Rule and Letters of Authorization

The first part of the LTM Program consists of NMFS-directed reports under the MMPA Final Rule and LOAs. These reports provide information for assessments of whether incidental harassment of marine mammals occurred within the SURTASS LFA sonar mitigation and buffer zones during operations, based upon data from the monitoring mitigation (visual, passive acoustic, active acoustic). Data analysis from the LTM Program and post-operation acoustic information are utilized to estimate the percent of marine mammal stocks potentially exposed to SURTASS LFA sonar received levels below 180 dB.

During routine operations of SURTASS LFA sonar, technical and environmental data are collected and recorded. As part of the LTM Program and as stipulated in the 2007 Final Rule and LOAs, the following reports are required:

- Mission reports are submitted to NMFS on a quarterly basis for each vessel, including all active-mode missions that have been completed 30 days or more prior to the date of the deadline for the report.
- Annual reports are submitted to NMFS 45 days after the expiration of the LOAs.
- A final comprehensive report is submitted to NMFS, which analyzes any impacts of SURTASS LFA sonar on marine mammal stocks during the 5-year period of the regulations.

The summary of SURTASS LFA sonar operations for the second year LOAs (16 August 2008 to 15 August 2009) have been provided in Chapter 4.0 of this report.

5.2 Research

Condition 7(d) of the LOAs and Final Rule (72 FR 46888) included the conduct of additional research involving the topics listed in Table 9. These research activities are to help increase the knowledge of marine mammal species and the determination of levels of effects from potential takes. 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 odontocetes to LF sonar signals.
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.
7. Continue to evaluate improvements in passive sonar capabilities.

According to the LOAs Condition 7(d), the U.S. Navy must conduct research in at least one of these areas during the period of the LOAs.

5.2.1 Research Status

Table 9 below provides the status of research that has been conducted, is underway or is being planned to address NMFS's seven research objectives.

5.2.2 Navy-Sponsored Research

The Office of Naval Research (ONR) sponsors significant research to study the potential effects of its activities on marine mammals. The Navy has spent an average of $10M to $18M annually over the past six years on marine mammal research at universities, research institutions, federal laboratories, and private companies. In the past, Navy-funded research produced scores of peer-reviewed articles in professional journals. Publication in open professional literature thorough peer review is the 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. These studies, though not specifically related to SURTASS LFA sonar operations, are crucial to the overall knowledge base on marine mammals and the potential effects from underwater anthropogenic noise.

In addition, the Navy has provided funding to support the Structure of Population, Levels of Abundance, and Status of Humpbacks (SPLASH) project. Oregon State University has been funded to integrate available genetic data with humpback whale photo IDs. The goal is to provide further analysis of SPLASH genetic samples to describe individual movement and genetic differentiation of the western North Pacific humpback whales.

Table 9. Research Status

NMFS Research Topics	Status
Systematically observe SURTASS LFA sonar training exercises for injured or disabled marine animals	This research is ongoing based on the mitigation and reporting requirements under the LOAs (APPENDIX A). As reported in the first annual report (DON, 2008b) and this report under the 2007-2012 Rule, post-operational incidental harassment assessments demonstrated that there were no known marine mammal exposures to RLs at or above 180 dB. These findings are supported by the results from the visual, passive acoustic and active acoustic monitoring efforts discussed in the first two annual reports for the initial two-year period 16 August 2007 to 15 August 2009 under the current Rule. In addition, a review of recent strandings did not indicate any stranding events associated with the times and locations of SURTASS LFA sonar operations (Subchapter 5.2.3). This research is continuing under the current LOAs for the period 16 August 2009 to 15 August 2010.
Compare the effectiveness of the three forms of mitigation (visual, passive acoustic, HF/M3 sonar)	A summary of mitigation effectiveness was provided in Subchapter 4.1.8 of the Final Comprehensive Report (DON, 2007c) for the 2002-2007 Rule. Under the current Rule, the Navy is also required to summarize the effectiveness of the mitigation in a final comprehensive report. Therefore, data collection and analyses are continuing as part of the reporting requirements of the LTM Program.
Conduct research on the responses of deep-diving odontocetes to LF sonar signals	• The Navy funded national and international research on the responses of beaked whales to MF/LF sonar signals. • Independent scientists from Cornell University, Woods Hole Oceanographic Institution, and St. Andrews University, developed a plan of action with milestones for the 2007 and 2008 beaked whale behavioral response studies (BRSs). Navy and NOAA funding supported the 2007 and 2008 BRSs. • The following comprise the achievements from BRS-07 (September-October 2007): 1) Demonstrated that the concept for studying beaked whales using playbacks is feasible, with lessons-learned for improvements; 2) Engaged with NGO organizations to argue the case for controlled experimental approaches; 3) Realized a measurable response from beaked whales and possibly from pilot whales, that are clearly within their normal adaptive behavior; and 4) Collected a control data set that is vastly larger than before, increasing the knowledge of basic behavior in beaked whales, such that we can be confident that we can measure responses of animals that are unusual in nature. A Cruise Report on BRS-07 has been prepared (Boyd et al., 2007) • The primary objectives (and accomplishments) of the 2008 BRS (BRS-08), conducted in August-September 2008 were to: 1) Increase sample size of MF sonar signal playbacks and controls from that achieved in BRS-07 (the sample size was increased, but not as much as hoped); 2) Measure received levels of sonar sound that produce a behavioral response during playbacks (done); 3) Investigate variation in responses in relation to context and species (done—four species investigated); 4) Include at least one more killer whale playback to examine whether response of beaked whales might be explained by confusion between sonar signals and killer whale calls (not achieved primarily due to a greater than predicted number of inclement weather days); and 5) Compare responses to MF sonar signals versus more spread spectrum signal with similar overall bandwidth, duration and timing (achieved in some species). A Cruise Report on BRS-08 has

NMFS Research Topics	Status
	been prepared (Boyd et al., 2008). Findings from the Deep-Diving Odontocetes BRSs will be published in peer-reviewed literature.
Conduct research on habitat preferences of beaked whales	The U.S. Navy/SERDP have funded and are funding research on the habitat preferences of beaked whales including distribution, abundance and population based on known (surveys), inferred distributions, and habitat modeling including published literature as presented in the previous annual report (DON, 2008b).
Conduct passive acoustic monitoring using bottom-mounted hydrophones before, during, and after LF sonar operations for the possible silencing of calls of large whales	The Navy has and is continuing to sponsor multi-year research for the acoustic monitoring of marine mammals using fixed passive acoustic monitoring systems in the North Atlantic Ocean. During four of these research efforts (NORLANT, 2004, 2005, 2006-01, 2006-02) no variations in normal behavior patterns for fin, blue, or humpback whales were noted. The fifth research effort was completed in 2007, and a comprehensive paper to discuss the findings is forthcoming. The research reports for these tasks are classified; unclassified summary reports have been produced.
Continued to evaluate the HF/M3 mitigation sonar	The HF/M3 sonar has been upgraded for integration into the installations of Compact Low Frequency Active (CLFA) sonar on the T-AGOS 19 Class vessels. The first installation of the upgraded HF/M3 sonar is onboard the USNS ABLE (T-AGOS 20), which Is currently undergoing at sea testing, which commenced in August 2008 under an LOA issued by NMFS on 15 August 2008.
Continue to evaluate improvements in passive sonar capabilities	Advances in the development of passive acoustic technology include the development of SURTASS Twin-line, a shallow water variant of the SURTASS system which will provide improved littoral capability. USNS ABLE (T-AGOS 20) has a twin-line passive array. The integrated common processor (ICP) is also being installed on both USNS IMPECCABLE and USNS ABLE, which uses enhanced signal processing and automation to get accurate, actionable information to operational decision maker on undersea threats. The capability of passive acoustic sensors is also benefiting from increased processing power in computers, and by network centricity, which is incorporating data from a variety of acoustic and non-acoustic sensors and sources to construct a more complete battlefield picture (Friedman, 2007).

5.2.3 Incident Monitoring

The Navy monitors and reviews data on strandings from federal, state, and international organizations, and the media. During the period of this report, there where no strandings reported that coincided spatially and/or temporally with active operations of either SURTASS LFA vessel.

There was one stranding event in the South China Sea coastal region, on the Island of Luzon, Philippines that was reviewed. Commencing on 10 February 2009, a mass stranding of several hundred melon-headed whales occurred in the shallow waters near the mouth of the Manila Bay delta on the Bataan Peninsula. Before and during the period of this stranding incident, there were no active transmissions from either the USNS ABLE or the USNS IMPECCABLE. The last

active transmission prior to the stranding was in a body of water that is physically isolated from the South China Sea and was several months prior to the stranding.

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APPENDIX A

Letters of Authorization Governing the Take of Marine Mammals Incidental to the U.S. Navy's Operation of Surveillance Towed Array Sensor System Low Frequency Active (SURTASS LFA) Sonar on the USNS ABLE and USNS IMPECCABLE, Office of Protected Resources, National Marine Fisheries Service, August 15, 2007

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Silver Spring, MD 20910

Captain Jeff Currer
Head, Undersea Surveillance Branch
Submarine Warfare Division, N872A
Office of the Chief of Naval Operations
2000 Navy Pentagon
Washington, D.C. 20350-2000

Dear Captain Currer:

Enclosed are two Letters of Authorization (LOAs) for the USNS ABLE (T-AGOS 20) and the USNS IMPECCABLE (T-AGOS 23), issued to the Chief of Naval Operations (N872A), Department of the Navy, under the authority of Section 101(a)(5)(A) of the Marine Mammal Protection Act (16 U.S.C. 1361 *et seq.*), and the regulations governing the take of marine mammals incidental to the U.S. Navy's operation of Surveillance Towed Array Sensor System Low Frequency Active (SURTASS LFA) sonar. These authorizations cover the taking of marine mammals by harassment incidental to SURTASS LFA sonar operations in the Archipelagic Deep Basins Province, the Western Pacific Warm Pool Province, the North Pacific Tropical Gyre West Province and the North Pacific Tropical Gyre East Province all within the Pacific Trade Wind Biome; the Kuroshio Current Province and the Northern Pacific Transition Zone Province within the Pacific Westerly Winds Biome; the North Pacific Epicontinental Sea Province within the Pacific Polar Biome; and the China Sea Coastal Province within the North Pacific Coastal Biome, for a period of one year, provided the mitigation, monitoring and reporting requirements are undertaken as required by the regulations (attached) and the LOAs.

Please note that the 2008 LOAs continue a reporting requirement to include estimates of the percentage of each marine mammal species taken is to be provided in the quarterly reports.

If you have any questions concerning the LOAs or its requirements, please contact Kenneth Hollingshead, Office of Protected Resources, National Marine Fisheries Service at (301) 713-2289. ext 128.

Sincerely,

James H. Lecky, Director
Office of Protected Resources

Enclosures

DEPARTMENT OF COMMERCE

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

NATIONAL MARINE FISHERIES SERVICE

Letter of Authorization

The Chief of Naval Operations (N872A), Department of the Navy, 2000 Navy Pentagon, Washington, D.C. 20350-2000, and persons operating under his authority, are authorized to conduct the activity specified below pursuant to 50 CFR Part 216, Subpart Q--Taking of Marine Mammals Incidental to Navy Operations of Surveillance Towed Array Sensor System Low Frequency Active (SURTASS LFA) sonar subject to the provisions of the Marine Mammal Protection Act (16 U.S.C. 1361 et seq.; MMPA), the Regulations Governing Small Takes of Marine Mammals Incidental to Specified Activities (50 CFR Part 216, Subpart I)(the Regulations) and the following conditions:

1. This Authorization is valid for the period August 16, 2008, through August 15, 2009.

2. This Authorization is valid only for the unintentional taking of the species of marine mammals identified in 50 CFR § 216.180(b) and Condition 3(c) of this Authorization governing the taking of these animals incidental to the activity specified in Condition 3(a) within those biogeographic areas specified in Condition 3(b) and shall be valid only for takings consistent with the provisions in 50 CFR § 216.182 and the terms of this Authorization as specified below.

3. (a) This Authorization is valid only for activities associated with the operation of the SURTASS LFA Sonar onboard the USNS IMPECCABLE (T-AGOS 23). The signals transmitted by the SURTASS LFA sonar source must be between 100 and 500 Hertz (Hz) with a source level for each of the 18 projectors no more than 215 dB (re: 1 micro Pascal (μPa) at 1 meter (m)) and a maximum duty cycle of 20 percent.

(b) This Authorization, combined with an Authorization for the USNS ABLE (T-AGOS 20), is valid for an estimated total of 22 nominal active sonar missions (16 combined missions in the Northwestern Pacific Ocean and 6 combined missions in the Hawaii Range Complex) between the two SURTASS LFA sonar vessels (or equivalent shorter missions but not to exceed a total of 432 hours of transmit time per vessel during the period of effectiveness of this Authorization). These SURTASS LFA sonar operating areas are contained within the Archipelagic Deep Basins Province, the Western Pacific Warm Pool Province, the North Pacific Tropical Gyre West Province, and the North Pacific Tropical Gyre East Province all within the Pacific Trade Wind Biome; the Kuroshio Current Province and the Northern Pacific Transition Zone Province within the Pacific Westerly Winds Biome; the North Pacific Epicontinental Sea Province within the Pacific Polar Biome; and the China Sea Coastal Province within the North Pacific Coastal Biome, as identified in 50 CFR § 216.180(a).

(c) The incidental take of marine mammals under the activity identified in Condition 3(a) is limited to the following species:

(i) Mysticete whales-blue whale (*Balaenoptera musculus*), fin whale (*Balaenoptera physalus*), minke whale (*Balaenoptera acutorostrata*), Bryde's whale (*Balaenoptera edeni*), sei whale (*Balaenoptera borealis*), humpback whale (*Megaptera novaeangliae*), northern Pacific right whale (*Eubalaena japonica*), southern right whale (*Eubalaena australis*), pygmy right whale (*Caperea marginata*), and gray whale (*Eschrichtius robustus*).

(ii) Odontocete whales-sperm whale (*Physeter macrocephalus*), dwarf and pygmy sperm whales (*Kogia simus* and *K. breviceps*), short-finned pilot whale (*Globicephala macrorhynchus*), Risso's dolphin (*Grampus griseus*), rough-toothed dolphin (*Steno bredanensis*), Fraser's dolphin (*Lagenodelphis hosei*), bottlenose dolphin (*Tursiops truncatus*), common dolphin (*Delphinus delphis*), Dall's porpoise (*Phocoenoides dalli*), spinner dolphin (*Stenella longirostris*), pantropical spotted dolphin (*S. attenuata*), striped dophin (*S. coeruleoalba*), Pacific white-sided dolphin (*Lagenorhynchus obliquidens*), melon-headed whale (*Peponocephala spp.*), Baird's beaked whale (*Berardius bairdii*), *Mesoplodon* spp. [including Stejneger's (*Mesoplodon stejnegeri*)], Hubbs' (*M. carlhubbsi*), Blaineville's (*M. densirostris*) beaked whales, ginko-toothed beaked whale (*M. ginkgodens*), Cuvier's beaked whale (*Ziphius cavirostris*), killer whale (*Orcinus orca*), false killer whale (*Pseudorca crassidens*), and pygmy killer whale (*Feresa attenuata*).

(iii) Pinnipeds-Hawaiian monk seal (*Monachus shauinslandi*)

(d) The taking of marine mammals by the Holder of this Authorization is limited to the incidental taking of marine mammal species identified in Condition 3(c) by Level A and Level B harassment (as defined in the MMPA and 50 CFR § 216.3) within those areas authorized under Condition 3(b). Taking of marine mammal species not listed under Condition 3(c) by harassment, injury, or mortality, or the taking by mortality of any marine mammal species listed under Condition 3(c) is prohibited.

4. The Holder of this Authorization, and any individuals operating under his authority, must not broadcast the SURTASS LFA sonar signal at a frequency greater than 500 Hz.

5. The Holder of this Authorization, and any individuals operating under his authority, are required to cooperate with the National Marine Fisheries Service (NMFS) and any other Federal agency with jurisdiction in the monitoring of impacts of the activity on marine mammals.

6. Mitigation

The Holder of this Authorization, and any individuals operating under his authority, must conduct the activity identified in 50 CFR § 216.180 and Condition 3(a) of this Authorization in a manner that minimizes, to the greatest extent practicable, adverse impacts on marine mammals, their habitats, and the availability of marine mammals for subsistence. When conducting

operations identified in 50 CFR § 216.180, the following mitigation measures must be implemented:

(a) Through monitoring described under 50 CFR § 216.185 and Condition 7 of this Authorization, the Holder of this Authorization (and any individuals operating under his authority) must ensure, to the greatest extent practicable, that no marine mammal is subjected to a sound pressure level of 180 dB (re 1 μPa_{rms}) or greater.

(b) If a marine mammal is detected within the area subjected to a sound pressure level of 180-dB (re 1 μ Pa_{rms}) or greater (safety zone) or within the 1 kilometer (km) (0.5 nautical mile (nm)) buffer zone extending beyond the 180-dB (re 1 μ Pa_{rms}) safety zone, SURTASS LFA sonar transmissions will be immediately delayed or suspended. Transmissions will not resume earlier than 15 minutes after:

(i) All marine mammals have left the area of the safety and buffer zones; and

(ii) There is no further detection of any marine mammal within the safety and buffer zones as determined by the visual, passive or active acoustic monitoring described in 50 CFR § 216.185 and Condition 7.

(c) The High Frequency Marine Mammal Monitoring (HF/M3) sonar source referenced in 50 CFR § 216.185 will be ramped-up slowly to operating levels over a period of no less than 5 minutes. The HF/M3 source level will not be increased if a marine mammal is detected during ramp-up. Ramp-up may continue once marine mammals are no longer detected by any of the three monitoring programs. HF/M3 sonar will be ramped-up:

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

(ii) Prior to any SURTASS LFA sonar calibrations or testing that are not part of regular SURTASS LFA sonar transmissions described in Condition 6(c)(i); and

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

(d) The SURTASS LFA sonar will not be operated such that the SURTASS LFA sonar sound field exceeds 180 dB (re 1 μ Pa_{rms}):

(i) At a distance of 12 nm (22 km) or less from any coastline, including offshore islands;

(ii) At a distance of 1 km (0.5 nm) seaward of the outer perimeter of any offshore biologically important area designated for marine mammals under 50 CFR § 216.184(f) and described in Condition 6(e), during biologically important period specified.

(e) The following areas have been designated by NMFS as offshore areas of critical biological importance for marine mammals (by season if appropriate):

Name of Area	Location of Area	Months of Importance
(1) 200-m isobath 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
(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]	Boundaries IAW 15 CFR 922.110	Year-round
(6) Gulf of the Farallones NMS[2]	Boundaries IAW 15 CFR 922.80	Year-round
(7) Monterey Bay NMS[2]	Boundaries IAW 15 CFR 922.130	Year-round
(8) Olympic Coast NMS[2]	Within 23 nm of coast from 47 07'N to 48 30'N latitude	December, January, March, and May
(9) Flower Garden Banks NMS[2]	Boundaries IAW 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

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.

(f) In order to meet the sound pressure level criteria in Conditions 6(b) and 6(d), the SURTASS LFA sonar safety zone (distance to the 180-dB (re 1 μ Pa_{rms}) isopleth) will be estimated prior to and during operations using near-real-time environmental data and underwater acoustic prediction models. These sound field estimates will be updated every 12 hours or more frequently when meteorological or oceanographic conditions change.

(g) All SURTASS LFA sonar missions will be planned to ensure that no greater than 12 percent of any marine mammal stock is incidentally harassed by SURTASS LFA sonar

operations during the effective period of this Authorization. The Holder of this Authorization must coordinate with the Holder of the Letter of Authorization issued to the USNS ABLE (T-AGOS 20) to ensure that this condition is met for all vessels combined.

7. Monitoring

The Holder of this Authorization, and any individuals operating under his authority, must:

(a) Perform the following monitoring mitigation:

(i) Visual monitoring from the ship's bridge during all daylight hours;

(ii) Passive acoustic monitoring using the low frequency, passive SURTASS to listen for vocalizing marine mammals; and

(iii) Active acoustic monitoring using the HF/M3 sonar 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) Perform monitoring under Condition 7(a) to:

(i) Commence at least 30 minutes before the first SURTASS LFA sonar transmission (30 minutes before sunrise for visual monitoring);

(ii) Continue between transmission pings; and

(iii) Continue for at least 15 minutes after completion of the SURTASS LFA sonar transmission exercise (30 minutes after sunset for visual monitoring), or if marine mammals are showing abnormal behavioral patterns, for a period of time until behavior patterns return to normal or conditions prevent continued observations.

(c) Designate qualified on-site individuals to conduct the mitigation, monitoring and reporting activities specified in this Authorization. The Holder of this Authorization will hire one or more qualified marine mammal biologists, highly experienced in marine mammal observation techniques, to train observers for conducting visual monitoring.

(d) Conduct research to supplement monitoring and increase knowledge of the affected marine mammal species. Under this Authorization, NMFS recommends at least one of the following: (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, (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, and (7) continue to evaluate improvements in passive sonar capabilities. In consultation with NMFS, the Holder of this Authorization will determine which of these listed research items should be conducted during the period of this Authorization.

8. Reporting

The Holder of this Authorization must:

(a) Submit quarterly, classified mission reports to the Director, Office of Protected Resources, NMFS no later than 30 days after the end of the quarter beginning on August 16, 2008. Each quarterly, classified mission report will include all active-mode missions during the quarter. Specifically, these reports will include dates/times of exercises, location of vessel, biogeographic province, location of the safety and buffer zones in relation to the LFA sonar array, marine mammal observations, and records of any delays or suspensions of operations. Marine mammal observations will include animal type and/or species, number of animals sighted, date and time of observations, type of detection (visual, passive acoustic, HF/M3 sonar), bearing and range from vessel, abnormal behavior (if any), and remarks/narrative (as necessary). The report will include the Navy's estimates of the percentages of marine mammal stocks affected (both for the quarter and cumulatively for the year covered by the LOA) by SURTASS LFA sonar operations (both within and outside the safety and buffer zones), 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 missions are completed during a quarter, a report of negative activity will be provided.

(b) Submit an annual, unclassified report to the Director, Office of Protected Resources, NMFS, no later than 45 days after expiration of this Authorization. This report will provide NMFS with an unclassified summary of the year's quarterly reports and will include the Navy's estimates of the percentages of marine mammal stocks affected by SURTASS LFA sonar operations (both within and outside the safety and buffer zones), using predictive modeling based on operating locations, dates/times of operations, system characteristics, oceanographic environmental conditions, and animal demographics. The annual report will also include:

(i) Analysis of the effectiveness of the mitigation measures with recommendations for improvements where applicable;

(ii) Assessment of any long-term effects from SURTASS LFA sonar operations; and

(iii) Any discernible or estimated cumulative impacts from SURTASS LFA sonar operations.

9. A copy of this Authorization and the attached Subpart Q of the regulations must be in the possession of the Officer in Charge of the Military Detachment (MILDET) on board the

USNS IMPECCABLE (T-AGOS 23) in order to conduct the activity under the authority of this Letter of Authorization.

James H. Lecky, Director
Office of Protected Resources
National Marine Fisheries Service

AUG 15 2008
Date

DEPARTMENT OF COMMERCE

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

NATIONAL MARINE FISHERIES SERVICE

Letter of Authorization

The Chief of Naval Operations (N872A), Department of the Navy, 2000 Navy Pentagon, Washington, D.C. 20350-2000, and persons operating under his authority, are authorized to conduct the activity specified below pursuant to 50 CFR Part 216, Subpart Q--Taking of Marine Mammals Incidental to Navy Operations of Surveillance Towed Array Sensor System Low Frequency Active (SURTASS LFA) sonar subject to the provisions of the Marine Mammal Protection Act (16 U.S.C. 1361 *et seq.*; MMPA), the Regulations Governing Small Takes of Marine Mammals Incidental to Specified Activities (50 CFR Part 216, Subpart I)(the Regulations) and the following conditions:

1. This Authorization is valid for the period August 16, 2008, through August 15, 2009.

2. This Authorization is valid only for the unintentional taking of the species of marine mammals identified in 50 CFR § 216.180(b) and Condition 3(c) of this Authorization governing the taking of these animals incidental to the activity specified in Condition 3(a) within those biogeographic areas specified in Condition 3(b) and shall be valid only for takings consistent with the provisions in 50 CFR § 216.182 and the terms of this Authorization as specified below.

3. (a) This Authorization is valid only for activities associated with the operation of the SURTASS LFA Sonar onboard the USNS ABLE (T-AGOS 20). The signals transmitted by the SURTASS LFA sonar source must be between 100 and 500 Hertz (Hz) with a source level for each of the 18 projectors no more than 215 dB (re: 1 micro Pascal (μPa) at 1 meter (m)) and a maximum duty cycle of 20 percent.

(b) This Authorization, combined with an Authorization for the USNS IMPECCABLE (T-AGOS 23), is valid for an estimated total of 22 nominal active sonar missions (16 combined missions in the Northwestern Pacific Ocean and 6 combined missions in the Hawaii Range Complex) between the two SURTASS LFA sonar vessels (or equivalent shorter missions but not to exceed a total of 432 hours of transmit time per vessel during the period of effectiveness of this Authorization). These SURTASS LFA sonar operating areas are contained within the Archipelagic Deep Basins Province, the Western Pacific Warm Pool Province, the North Pacific Tropical Gyre West Province, and the North Pacific Tropical Gyre East Province all within the Pacific Trade Wind Biome; the Kuroshio Current Province and the Northern Pacific Transition Zone Province within the Pacific Westerly Winds Biome; the North Pacific Epicontinental Sea Province within the Pacific Polar Biome; and the China Sea Coastal Province within the North Pacific Coastal Biome, as identified in 50 CFR § 216.180(a).

(c) The incidental take of marine mammals under the activity identified in Condition 3(a) is limited to the following species:

(i) Mysticete whales-blue whale (*Balaenoptera musculus*), fin whale (*Balaenoptera physalus*), minke whale (*Balaenoptera acutorostrata*), Bryde's whale (*Balaenoptera edeni*), sei whale (*Balaenoptera borealis*), humpback whale (*Megaptera novaeangliae*), northern Pacific right whale (*Eubalaena japonica*), southern right whale (*Eubalaena australis*), pygmy right whale (*Caperea marginata*), and gray whale (*Eschrichtius robustus*).

(ii) Odontocete whales-sperm whale (*Physeter macrocephalus*), dwarf and pygmy sperm whales (*Kogia simus* and *K. breviceps*), short-finned pilot whale (*Globicephala macrorhynchus*), Risso's dolphin (*Grampus griseus*), rough-toothed dolphin (*Steno bredanensis*), Fraser's dolphin (*Lagenodelphis hosei*), bottlenose dolphin (*Tursiops truncatus*), common dolphin (*Delphinus delphis*), Dall's porpoise (*Phocoenoides dalli*), spinner dolphin (*Stenella longirostris*), pantropical spotted dolphin (*S. attenuata*), striped dophin (*S. coeruleoalba*), Pacific white-sided dolphin (*Lagenorhynchus obliquidens*), melon-headed whale (*Peponocephala spp.*), Baird's beaked whale (*Berardius bairdii*), *Mesoplodon* spp. [including Stejneger's (*Mesoplodon stejnegeri*)], Hubbs' (*M. carlhubbsi*), Blaineville's (*M. densirostris*) beaked whales, ginko-toothed beaked whale (*M. ginkgodens*), Cuvier's beaked whale (*Ziphius cavirostris*), killer whale (*Orcinus orca*), false killer whale (*Pseudorca crassidens*), and pygmy killer whale (*Feresa attenuata*).

(iii) Pinnipeds-Hawaiian monk seal (*Monachus shauinslandi*)

(d) The taking of marine mammals by the Holder of this Authorization is limited to the incidental taking of marine mammal species identified in Condition 3(c) by Level A and Level B harassment (as defined in the MMPA and 50 CFR § 216.3) within those areas authorized under Condition 3(b). Taking of marine mammal species not listed under Condition 3(c) by harassment, injury, or mortality, or the taking by mortality of any marine mammal species listed under Condition 3(c) is prohibited.

4. The Holder of this Authorization, and any individuals operating under his authority, must not broadcast the SURTASS LFA sonar signal at a frequency greater than 500 Hz.

5. The Holder of this Authorization, and any individuals operating under his authority, are required to cooperate with the National Marine Fisheries Service (NMFS) and any other Federal agency with jurisdiction in the monitoring of impacts of the activity on marine mammals.

6. Mitigation

The Holder of this Authorization, and any individuals operating under his authority, must conduct the activity identified in 50 CFR § 216.180 and Condition 3(a) of this Authorization in a manner that minimizes, to the greatest extent practicable, adverse impacts on marine mammals, their habitats, and the availability of marine mammals for subsistence. When conducting

operations identified in 50 CFR § 216.180, the following mitigation measures must be implemented:

(a) Through monitoring described under 50 CFR § 216.185 and Condition 7 of this Authorization, the Holder of this Authorization (and any individuals operating under his authority) must ensure, to the greatest extent practicable, that no marine mammal is subjected to a sound pressure level of 180 dB (re 1 μPa_{rms}) or greater.

(b) If a marine mammal is detected within the area subjected to a sound pressure level of 180-dB (re 1 μ Pa_{rms}) or greater (safety zone) or within the 1 kilometer (km) (0.5 nautical mile (nm)) buffer zone extending beyond the 180-dB (re 1 μ Pa_{rms}) safety zone, SURTASS LFA sonar transmissions will be immediately delayed or suspended. Transmissions will not resume earlier than 15 minutes after:

(i) All marine mammals have left the area of the safety and buffer zones; and

(ii) There is no further detection of any marine mammal within the safety and buffer zones as determined by the visual, passive or active acoustic monitoring described in 50 CFR § 216.185 and Condition 7.

(c) The High Frequency Marine Mammal Monitoring (HF/M3) sonar source referenced in 50 CFR § 216.185 will be ramped-up slowly to operating levels over a period of no less than 5 minutes. The HF/M3 source level will not be increased if a marine mammal is detected during ramp-up. Ramp-up may continue once marine mammals are no longer detected by any of the three monitoring programs. HF/M3 sonar will be ramped-up:

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

(ii) Prior to any SURTASS LFA sonar calibrations or testing that are not part of regular SURTASS LFA sonar transmissions described in Condition 6(c)(i); and

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

(d) The SURTASS LFA sonar will not be operated such that the SURTASS LFA sonar sound field exceeds 180 dB (re 1 μ Pa_{rms}):

(i) At a distance of 12 nm (22 km) or less from any coastline, including offshore islands;

(ii) At a distance of 1 km (0.5 nm) seaward of the outer perimeter of any offshore biologically important area designated for marine mammals under 50 CFR § 216.184(f) and described in Condition 6(e), during biologically important period specified.

(e) The following areas have been designated by NMFS as offshore areas of critical biological importance for marine mammals (by season if appropriate):

Name of Area	Location of Area	Months of Importance
(1) 200-m isobath 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
(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]	Boundaries IAW 15 CFR 922.110	Year-round
(6) Gulf of the Farallones NMS[2]	Boundaries IAW 15 CFR 922.80	Year-round
(7) Monterey Bay NMS[2]	Boundaries IAW 15 CFR 922.130	Year-round
(8) Olympic Coast NMS[2]	Within 23 nm of coast from 47 07'N to 48 30'N latitude	December, January, March, and May
(9) Flower Garden Banks NMS[2]	Boundaries IAW 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

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.

(f) In order to meet the sound pressure level criteria in Conditions 6(b) and 6(d), the SURTASS LFA sonar safety zone (distance to the 180-dB (re 1 μ Pa_{rms}) isopleth) will be estimated prior to and during operations using near-real-time environmental data and underwater acoustic prediction models. These sound field estimates will be updated every 12 hours, or more frequently when meteorological or oceanographic conditions change.

(g) All SURTASS LFA sonar missions will be planned to ensure that no greater than 12 percent of any marine mammal stock is incidentally harassed by SURTASS LFA sonar

operations during the effective period of this Authorization. The Holder of this Authorization must coordinate with the Holder of the Letter of Authorization issued to the USNS IMPECCABLE (T-AGOS 23) to ensure that this condition is met for all vessels combined.

7. Monitoring

The Holder of this Authorization, and any individuals operating under his authority, must:

(a) Perform the following monitoring mitigation:

(i) Visual monitoring from the ship's bridge during all daylight hours;

(ii) Passive acoustic monitoring using the low frequency, passive SURTASS to listen for vocalizing marine mammals; and

(iii) Active acoustic monitoring using the HF/M3 sonar 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) Perform monitoring under Condition 7(a) to:

(i) Commence at least 30 minutes before the first SURTASS LFA sonar transmission (30 minutes before sunrise for visual monitoring);

(ii) Continue between transmission pings; and

(iii) Continue for at least 15 minutes after completion of the SURTASS LFA sonar transmission exercise (30 minutes after sunset for visual monitoring), or if marine mammals are showing abnormal behavioral patterns, for a period of time until behavior patterns return to normal or conditions prevent continued observations.

(c) Designate qualified on-site individuals to conduct the mitigation, monitoring and reporting activities specified in this Authorization. The Holder of this Authorization will hire one or more qualified marine mammal biologists, highly experienced in marine mammal observation techniques, to train observers for conducting visual monitoring.

(d) Conduct research to supplement monitoring and increase knowledge of the affected marine mammal species. Under this Authorization, NMFS recommends at least one of the following: (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, (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, and (7) continue to evaluate improvements in passive sonar capabilities. In consultation with NMFS, the Holder of this Authorization will determine which of these listed research items should be conducted during the period of this Authorization.

8. Reporting

The Holder of this Authorization must:

(a) Submit quarterly, classified mission reports to the Director, Office of Protected Resources, NMFS no later than 30 days after the end of the quarter beginning on August 16, 2008. Each quarterly, classified mission report will include all active-mode missions during the quarter. Specifically, these reports will include dates/times of exercises, location of vessel, biogeographic province, location of the safety and buffer zones in relation to the LFA sonar array, marine mammal observations, and records of any delays or suspensions of operations. Marine mammal observations will include animal type and/or species, number of animals sighted, date and time of observations, type of detection (visual, passive acoustic, HF/M3 sonar), bearing and range from vessel, abnormal behavior (if any), and remarks/narrative (as necessary). The report will include the Navy's estimates of the percentages of marine mammal stocks affected (both for the quarter and cumulatively for the year covered by the LOA) by SURTASS LFA sonar operations (both within and outside the safety and buffer zones), 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 missions are completed during a quarter, a report of negative activity will be provided.

(b) Submit an annual, unclassified report to the Director, Office of Protected Resources, NMFS, no later than 45 days after expiration of this Authorization. This report will provide NMFS with an unclassified summary of the year's quarterly reports and will include the Navy's estimates of the percentages of marine mammal stocks affected by SURTASS LFA sonar operations (both within and outside the safety and buffer zones), using predictive modeling based on operating locations, dates/times of operations, system characteristics, oceanographic environmental conditions, and animal demographics. The annual report will also include:

(i) Analysis of the effectiveness of the mitigation measures with recommendations for improvements where applicable;

(ii) Assessment of any long-term effects from SURTASS LFA sonar operations; and

(iii) Any discernible or estimated cumulative impacts from SURTASS LFA sonar operations.

9. A copy of this Authorization and the attached Subpart Q of the regulations must be in the possession of the Officer in Charge of the Military Detachment (MILDET) on board the

USNS ABLE (T-AGOS 20) in order to conduct the activity under the authority of this Letter of Authorization.

James H. Lecky, Director
Office of Protected Resources
National Marine Fisheries Service

AUG 15 2008
Date

adversely affect" green sea turtles, hawksbill sea turtles, leatherback sea turtles, loggerhead sea turtles, and Pacific ridley sea turtles that occur in the various mission areas.

7.0 Conclusion

After reviewing the current status of the endangered Hawaiian monk seal, endangered blue whale, fin whale, western Pacific gray whale, humpback whale, right whale, sei whale, sperm whale and threatened and endangered sea turtles, the environmental baseline for the action area, the effects of the proposed letters of authorization, and the cumulative effects, it is NMFS' biological opinion that NMFS proposal to issue a letters of authorization to take marine mammals that would allow the Navy to "take" (through harassment) marine mammals incidental to the employment of SURTASS LFA sonar in the Pacific Oceans between August 16, 2008, and August 15, 2009, and the Navy's proposed employment of SURTASS LFA sonar are not likely to jeopardize the continued existence of endangered blue whale, fin whale, western Pacific gray whale humpback whale, right whale, sei whale, sperm whale, and Hawaiian monk seals, and threatened and endangered green, hawksbill, leatherback, loggerhead, and olive ridley sea turtles. The proposed action is not likely to adversely affect critical habitat that has been designated for these species; therefore, the action is not likely to result in the destruction or adverse modification of critical habitat.

8.0 Incidental Take Statement

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by NMFS to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering (50 CFR 222.102). Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of the Incidental Take Statement.

The measures described below, which are non-discretionary, must be implemented by NMFS' Permits, Conservation and Education Division so they become binding conditions of any permit issued to the U.S. Navy, as appropriate, in order for the exemption in section 7(o)(2) to apply. NMFS' Permits, Conservation, and Education Division has a continuing duty to regulate the activity covered by this Incidental Take Statement. If NMFS' Permits, Conservation and Education Division (1) fails to require the U.S. Navy to adhere to the terms and conditions of the Incidental Take Statement through enforceable terms that are added to the permit or grant document, and/or (2) fails to retain oversight

to ensure compliance with these terms and conditions, the protective coverage of section 7(o)(2) may lapse.

8.1 Amount or Extent of Take Anticipated

The effects analysis contained in this Opinion concluded that individual blue whales, fin whales, western Pacific gray whales, humpback right whales, sei whales, sperm whales, and Hawaiian monk seals and listed sea turtles have small probabilities of being exposed to the proposed operations of the SURTASS LFA sonar system in the Pacific Ocean. Any animals that would be exposed to LFA sonar transmissions would occur in portions of the Archipelagic Deep Basins Province, North Pacific Tropical Gyre (West) Province, North Pacific Tropical Gyre (East) Province, and Western Pacific Warm Pool Province in the Pacific Trade Wind Biome; the Kuroshio Current Province and Northern Pacific Transition Zone Province in the Pacific Westerly Winds Biome; the North Pacific Epicontinental Sea Province in the Pacific Polar Biome; and the China Sea Coastal Province in the North Pacific Coastal Biome.

Any threatened or endangered species that are exposed to LFA sonar transmissions may elicit behavioral responses that might be considered "harassment." NMFS does not expect any threatened or endangered species to be injured or killed as a result of exposure to LFA sonar transmissions (refer to the *Effects of the Action* section of this Biological Opinion, the May 30, 2002, and the August 2007 Biological Opinion on SURTASS LFA for further discussion).

The section 7 regulations require NMFS to estimate the number of individuals that may be taken by proposed actions or the extent of land or marine area that may be affected by an action, if we cannot assign numerical limits for animals that could be incidentally taken during the course of an action (Federal Register 51, June 3, 1986, page 19953).

The amount of take resulting from LFA sonar transmissions was difficult to estimate because we have no empirical information on (a) the actual number of listed species that are likely to occur in the different site, (b) the actual number of individuals of those species that are likely to be exposed to LFA sonar transmissions, (c) the circumstances associated with any exposure, and (d) the range of responses we would expect different individuals of the different species to exhibit upon exposure.

Because this information was not available, this biological opinion relied on the Navy's computer simulations to estimate the "number" of certain marine mammals that might be harassed during the employment of SURTASS LFA sonar; the results of these simulations appear in Tables 8 and 9. As discussed in the preamble to the *Effects of the Action* section of this biological opinion, because these estimates were produced by computer simulations, they should not be treated literally; instead, they should be treated as an index of the order of magnitude of potential exposure rather than the actual number of animals that would be exposed.

For the purposes of this biological opinion and incidental take statement, we assumed that any non-zero value in Table 8 indicated that an individual whale had a probability of being exposed to received levels that might be expected to result in behavioral responses characteristic of an animal that has been harassed. That assumption resulted in the following estimates:

a. *Blue whales, fin whales, western Pacific gray whales, Pacific right whales, sei whales, sperm whales.* Based on the Navy's Acoustic Integration Model simulations, the number of instances in which individuals of these different species may be taken, in the form of harassment is as follows: 46 instances involving blue whales; 160 instances involving fin whales, 0 instances involving western Pacific gray whales, 203 instances involving humpback whales (adjusting the Navy's population estimates to reflect updated estimates), 0 instances involving Pacific right whales, 19 instances involving sei whales, and 333 instances involving sperm whales (see Tables 8 and 9 and the accompanying text for explanation).

b. *Hawaiian monk seals.* Based on the Navy's Acoustic Integration Model simulations, identified 27 instances in which Hawai'ian monk seals might be taken, in the form of harassment. We assume that, because of their limited hearing ability at low frequencies, Hawaiian monk seals are not likely to detect coherent energy from LFA sonar transmissions within their normal distribution in the Hawaiian Islands or within the exclusion zone. Although the probability is low, migrating Hawaiian monk seals might be exposed to LFA sonar transmissions in the waters between Kure Atoll and the pinnacle contained in the exclusion zone northwest of Kure Atoll and might exhibit behavioral responses to this exposure that might rise to the level of harassment.

Take of these species will have been exceeded if the monitoring program detects any individuals of these species that have been harmed, injured, or killed as result of exposure to LFA sonar transmissions (from which NMFS might infer that they had been exposed to received levels greater than 180 dB).

We did not conduct computer simulations for sea turtles because the data necessary to develop computer models were not available. In the *Exposure Analysis* subsection of this biological opinion, we established that we could not assign numerical limits for take estimates. Rather than specifying an amount of take for sea turtles, this incidental take statement specifies an extent of take as follows:

c. *Sea turtles.* Adult and sub-adult sea turtles may be taken, in the form of harassment, in the LFA mitigation zone and the additional buffer zone required by the letters of authorization. (Because they tend to remain at or within a few meters of the ocean surface, we do not expect hatchling or juvenile sea turtles to

be exposed to LFA sonar transmissions.) Because of their size and the density of their shells, we assume that the Navy's monitoring programs, particularly the HFM3 sonar system, will detect these larger turtles if they are in the mitigation zone). Take will have been exceeded if the monitoring program detects sea turtles that have been harmed, injured, or killed as result of exposure to LFA sonar transmissions (from which NMFS might infer that they had been exposed to received levels greater than 180 dB).

8.2 Effect of the Take

In the accompanying biological opinion, NMFS determined that this level of anticipated take is not likely to result in jeopardy to the species. The proposed action would not likely result in destruction or adverse modification of critical habitat. Studies of marine mammals and LFA sonar transmissions have shown behavioral responses by blue whales, fin whales, gray whales, and humpback whales to LFA sonar transmissions. Although the biological significance of the animal's behavioral responses remains unknown, exposure to LFA sonar transmissions could disrupt one or more behavioral patterns that are essential to an individual animal's life history or to the animal's contribution to a population. For the proposed action, behavioral responses that result from LFA sonar transmissions and any associated disruptions are expected to be temporary and would not affect the reproduction, survival, or recovery of these species.

8.3 Reasonable and Prudent Measures

The National Marine Fisheries Service believes the following reasonable and prudent measures are necessary and appropriate to minimize the impacts of incidental take on threatened and endangered species:

1. The authorization shall be valid for a period August 16, 2008 through August 15, 2009.

2. The authorization shall be valid only for the unintentional taking of the species of marine mammals identified in 50 CFR 216.180(b) and condition 3(b) of the Authorization governing the taking of these animals incidental to the activity specified below and shall be valid only for takings consistent with the terms and conditions set out in 50 CFR 216.182 and the terms of NMFS' Letters of Authorization.

3. NMFS' Permits, Conservation and Education Division shall require the U.S. Navy to implement a program to mitigate the potential effects of LFA sonar transmissions on threatened or endangered species as specified in the final regulations for the Taking of Marine Mammals Incidental to Operation of the Surveillance Towed Array Sensor System Low Frequency Active Sonar (50 CFR 216 Subpart Q).

4. NMFS' Permits, Conservation and Education Division shall require the U.S. Navy to implement a program to monitor potential interactions between LFA sonar transmissions and threatened or endangered species.

8.4 Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the Endangered Species Act of 1973, as amended, NMFS' Permits, Conservation and Education Division and the U.S. Navy must comply with the following terms and conditions, which implement the reasonable and prudent measures described above and outline reporting and monitoring requirements, as required by the section 7 regulations (50 CFR 402.14(i))

1. The authorization shall be valid only for the activities associated with the operation of the Surveillance Towed Array Sensor System Low Frequency Active Sonar onboard the USNS IMPECCABLE and USNS ABLE. The signals transmitted by the SURTASS LFA source must be between 100 and 500 Hertz (Hz) with a source level for each projector no more than 215 dB (re: 1 micro Pascal (μPa) at 1 meter (m)) and a maximum duty cycle of 20 percent.

2. The U.S. Navy shall be required to (a) establish shut-down criteria for the SURTASS LFA sonar whenever a marine mammal is detected within the 1-km (0.54-nm) buffer zone beyond the SURTASS LFA safety zone (180-dB sound field), (b) not broadcast the SURTASS LFA sonar signal at a frequency greater than 500 Hz, and (c) plan its missions to ensure no greater than 12 percent of any marine mammal stock is incidentally harassed during the effective period of the letters of authorization.

3. If a marine mammal is detected within the area subjected to a sound pressure level of 180-dB or greater (safety zone) or within the 1 km (0.5 nm) buffer zone extending beyond the 180-dB safety zone, SURTASS LFA sonar transmissions shall be immediately delayed or suspended. Transmissions shall not resume earlier than 15 minutes after:
   a. All marine mammals have left the area of the safety and buffer zones; and
   b. There is no further detection of any marine mammal within the safety and buffer zones as determined by the visual and/or passive or active acoustic monitoring.

4. The High Frequency Marine Mammal Monitoring (HF/M3) sonar source described in 50 CFR 216.185 shall be ramped-up slowly to operating levels over a period of no less than 5 minutes. The HF/M3 source level shall not be increased if a marine mammal is detected during ramp-up. Ramp-up may continue once marine mammals are no longer detected. HF/M3 sonar shall be ramped-up:
   a, At least 30 minutes prior to any SURTASS LFA sonar transmissions;

b. Prior to any SURTASS LFA sonar calibrations or testing that are not part of regular SURTASS LFA sonar transmissions described in condition 6(c)(1); and

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

5. The SURTASS LFA sonar shall not be operated such that the SURTASS LFA sonar sound field exceeds 180 dB (re 1 microPascal (rms)):

a. At a distance of 12 nautical miles (nm) (22 kilometers (km)) from any coastline, including offshore islands;

b. At a distance of 1 km seaward of the outer perimeter of any offshore area that has been designated as biologically important for marine mammals during the biologically important season for that particular area in accordance with 50 CFR 216.184(f).

6. The U.S. Navy shall deliver an annual report no later than 90 days prior to the expiration of the Letters of Authorization. This report must include numbers and locations of threatened and endangered species sightings, and all information required by the Letters of Authorization, including the results, if any, of coordination with coastal marine mammal stranding networks. The annual reports shall be submitted to the following NMFS offices: (1) Chief, Permits, Conservation, and Education Division, 1315 East-West Highway, Room 13635, Silver Spring, Maryland; and (2) Chief, Endangered Species Division, 1315 East-West Highway, Room 13635, Silver Spring, Maryland.

7. The Navy shall collect specific data on any apparent avoidance reactions of threatened or endangered species in response to exposure to LFA sonar transmissions, including the distance from the LFA sonar transmission, conditions of the exposure (location coordinates, depth of the species, time of day, ocean conditions, the animal's behavior before and after the exposure, and estimates of the received levels that elicited the response). These data must be reported in the annual reports described in condition 1 (above).

8 If the Navy's monitoring programs identify any threatened or endangered species that demonstrate acute effects in response to exposure to LFA sonar transmissions, such as injury or death, the Navy shall immediately initiate the source shut-down procedure for the sonar system.

9. The U.S. Navy shall carry out all mitigation, monitoring and reporting requirements contained in the Letters of authorization issued under section 101(a)(5)(A) of the Marine Mammal Protection Act.

10. If dead or injured marine mammals are observed during the studies and monitoring, the U.S. Navy shall contact NMFS and marine mammal stranding networks immediately (if available and as appropriate). The U.S. Navy shall coordinate with marine mammal stranding networks to help determine any potential relationship of any stranding to LFA sonar transmissions and to detect long-term trends in stranding.

These reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize the impact of incidental take that might otherwise result from the proposed action. If, during the course of the action, this level of incidental take is exceeded, such incidental take represents new information requiring reinitiation of consultation and review of the reasonable and prudent measures provided. NMFS' Permits, Conservation, and Education Division and U.S. Navy must immediately provide an explanation, in wiritng, of the causes of any take and discuss possible modifications to the reasonable and prudent measures with NMFS' Endangered Species Division.

9.0 Reinitiation Statement

This concludes formal consultation on the Navy's proposal to employ the Surveillance Towed Array Sensor System Low Frequency Active Sonar in portions of the North Pacific Ocean and NMFS' Permits, Conservation, and Education Division's proposed letters of authorization for the U.S. Navy's pursuant to the provisions of section 10 of the Endangered Species Act and Marine Mammal Protection Act. As provided in 50 CFR 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, section 7 consultation must be reinitiated immediately.

APPENDIX B

Stipulated Settlement Agreement Order, U.S. District Court, Northern District of California, San Francisco Division, Civ. Action No. 07-4771-EDL, 12 August 2008

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UNITED STATES DISTRICT COURT
NORTHERN DISTRICT OF CALIFORNIA
SAN FRANCISCO DIVISION

NATURAL RESOURCES DEFENSE COUNCIL, INC., et al.,	) Civ. Action No. 07-4771-EDL
Plaintiffs,	)
v.	) STIPULATED SETTLEMENT AGREEMENT
CARLOS GUTIERREZ, SECRETARY OF THE UNITED STATES DEPARTMENT OF COMMERCE, et al.	) [~~PROPOSED~~] ORDER
Defendants.	) Judge: Hon. Elizabeth D. Laporte

Pursuant to the Court's February 6, 2008 Opinion and Order Granting in Part Plaintiffs' Motion for Preliminary Injunction ("Opinion and Order") and Order Referring Case for Settlement Conference, the parties, Defendants United States Navy ("Navy") and National Marine Fisheries Service ("NMFS") and the Natural Resources Defense Council, Inc. ("NRDC") on

behalf of itself and other Plaintiffs, attended settlement conferences on March 26, 2008, and May 27, 2008, before Magistrate Judge Spero to meet and confer on the precise terms of a preliminary injunction consistent with the Court's Opinion and Order. During mediation, the parties agreed to settle the case in its entirety on the terms memorialized in this Stipulation. In the event that any party seeks to alter the agreed upon operating areas described in paragraph 4 and in Tabs 1-4, paragraph 6 of the Stipulation establishes a procedure for the parties to meet and confer with the assistance of a court-designated mediator. Accordingly, the parties agree to the following:

WHEREAS in 2002, Plaintiffs NRDC, International Fund for Animal Welfare, The Humane Society of The United States, Cetacean Society International, League for Coastal Protection, Ocean Futures Society, and Jean-Michel Cousteau filed suit in this Court alleging that Defendants had violated the Marine Mammal Protection Act ("MMPA"), National Environmental Policy Act ("NEPA"), Endangered Species Act ("ESA"), and Administrative Procedure Act ("APA") by publishing a Final Rule under the MMPA, 67 Fed. Reg. 46712 (July 16, 2002), and issuing a Record of Decision ("ROD") under NEPA, 67 Fed. Reg. 48145 (July 23, 2002), regarding the Navy's use of Surveillance Towed Array Sensor System Low Frequency Active ("SURTASS LFA") sonar;

WHEREAS on October 31, 2002, the Court granted in part and denied in part Plaintiffs' motion for a preliminary injunction and on August 26, 2003, granted in part and denied in part Plaintiffs' motion for summary judgment and ordered the parties to meet and confer on the precise terms of the permanent injunction;

WHEREAS on October 8, 2003, the parties filed a joint stipulation regarding the permanent injunction and use of SURTASS LFA in the western Pacific Ocean, which the Court approved on October 14, 2003;

WHEREAS both the July 16, 2002 Final Rule and the permanent injunction expired by their own terms on August 15, 2007;

WHEREAS in April 2007, the Navy published a Final Supplemental Environmental Impact Statement ("SEIS") and on August 15, 2007, signed a ROD under NEPA regarding the Navy's use of SURTASS LFA sonar;

WHEREAS on August 15, 2007, Plaintiffs filed a motion for leave to file a supplemental complaint in the foregoing action, alleging that Defendants had failed to meet their obligations under NEPA and the permanent injunction;

WHEREAS on August 15, 2007, NMFS issued a Final Rule under the MMPA, 72 Fed. Reg. 46846 (August 21, 2007), 50 C.F.R. Part 216 Subpart Q (Taking of Marine Mammals Incidental to Navy Operations of Surveillance Towed Array Sensor System Low Frequency Active (SURTASS LFA) Sonar) ("Final Rule"), and on August 15, 2007, NMFS issued Letters of Authorization ("LOAs") to the Navy pursuant to the Final Rule;

WHEREAS the Navy and NMFS consulted under the ESA, and on August 15, 2007, NMFS issued biological opinions concluding that the Navy's use of SURTASS LFA sonar was not likely to jeopardize the continued existence of any endangered or threatened species and was not likely to adversely affect any designated critical habitat;

WHEREAS, after stipulating with Defendants on August 28, 2007, to file a new complaint and to withdraw their pending motion requesting leave of the Court to file supplemental pleadings in the prior action, Plaintiffs filed the above-captioned lawsuit on September 17, 2007, challenging Defendants' actions under the MMPA, NEPA, ESA, and APA, and subsequently moved for preliminary injunctive relief;

WHEREAS to avoid unnecessary emergency litigation and to ensure that the Court had sufficient time to render a decision on Plaintiffs' motion for preliminary injunction, on August 28, 2007, the parties agreed via e-mail correspondence, and stipulated on October 5, and December 19, 2007, to extend the terms of the October 8, 2003 permanent injunction, as amended in 2005, "with the exception that [the Navy] may operate the LFA sonar system within the coastal exclusion zones set forth in that injunction only when necessary to continue tracking an existing underwater contact detected outside the exclusion zone or when operationally necessary to detect a new underwater contact that would place the LFA sonar system within the coastal exclusion

zone to maximize opportunities for detection," until the earlier of the Court's decision on Plaintiffs' motion or a date certain specified in the stipulation;

WHEREAS the Court's February 6, 2008 Opinion and Order granted in part and denied in part Plaintiffs' Motion for Preliminary Injunction, and ordered the parties to meet and confer on the precise terms of a preliminary injunction consistent with the Court's Opinion and Order;

WHEREAS the parties attended settlement conferences on March 26, 2008, and May 27, 2008, before Magistrate Judge Spero;

WHEREAS Plaintiffs and Defendants, through their authorized representatives, and without any admission or final adjudication of the issues of fact or law with respect to Plaintiffs' claims, have reached a settlement resolving the claims raised in Plaintiffs' Complaint;

WHEREAS all parties agree that settlement of this action in this manner is in the public interest and is an appropriate way to resolve the dispute between them;

THE PARTIES THEREFORE STIPULATE AS FOLLOWS:

1. The parties agree that all negotiations leading up to this Stipulation are confidential. The parties further agree that this Stipulation supersedes all prior stipulations regarding injunctive relief entered into by the parties in this case.

2. The parties agree that this Stipulation shall remain in effect until the earliest of the following: (a) a modification by the Court, either as the Court elects or pursuant to a noticed motion or stipulation by the parties, that this Stipulation has been superseded by subsequent relevant events or authority, including but not limited to the outcome of further negotiations described in paragraph 6 below; (b) the expiration of the Final Rule, 72 Fed. Reg. 46846 (August 21, 2007), 50 C.F.R. Part 216 Subpart Q; or (c) the issuance of a new final rule and regulations that supersede the Final Rule.

3. The parties agree that the Final Rule will be remanded voluntarily without vacatur for reconsideration in light of the Court's conclusions in the February 6, 2008 Opinion and Order, and that Defendants will conduct their activities pursuant to this Stipulation during the period that the Stipulation is in effect. Nothing in this Stipulation shall be construed to modify or limit the discretion afforded to NMFS under the MMPA, NEPA, and ESA or principles of administrative

law on remand; nor shall the Stipulation, or the dismissal with prejudice required by it, operate to modify or limit Plaintiffs' rights or arguments with respect to NMFS's actions on remand, including seeking potential judicial review of such actions in a new civil action. No provision of this Stipulation shall be interpreted as or constitute a commitment or requirement that the United States is obligated to pay funds in contravention of the Anti-Deficiency Act, 31 U.S.C. § 1341, or any other provisions of law. No provision of this Stipulation shall be interpreted as or constitute a commitment or requirement that Plaintiffs or Defendants take actions in contravention of, or waive any rights under, the MMPA, NEPA, ESA, APA, or any other law or regulation, either substantive or procedural. However, the parties waive their rights to seek appellate review of the Court's February 6, 2008 Opinion and Order and this Stipulation.

4. Except as provided for in paragraph 5 below, the parties agree that the attached maps and associated text (Tabs 1-4) will govern the Navy's use of SURTASS LFA sonar for testing, training, and military operations under the current LOAs and any future LOAs issued during the pendency of the Stipulation. In the event of a discrepancy between the maps and the associated text, the associated text controls. For the Western Pacific operating area, the Navy will ensure that its use of SURTASS LFA sonar for testing, training, and military operations does not result in received sound pressure levels exceeding 180 dB at a distance less than the specified distances from coastlines or baselines drawn between islands in an archipelagic chain as defined in Tab 2; however, this limitation shall not apply to the circumstances described in paragraph 5.

5. The parties agree that the Navy may operate the SURTASS LFA sonar system outside the agreed upon operating areas described in Tabs 1-4, but within the areas authorized under the current LOA for the Western Pacific operating area and future LOAs for the Western Pacific and Hawaiian operating areas, when necessary to continue tracking an existing underwater contact or when operationally necessary to detect a new underwater contact to maximize opportunities for detection. This exception applies to operations only, and does not apply to any testing or training activities, including multinational training exercises such as the Rim of the Pacific Exercise ("RIMPAC").

6. The parties agree that if either Plaintiffs or Defendants seek an alteration to the agreed-upon operating areas described in Tabs 1-4, the parties shall first engage in a meet-and-confer process with the assistance of a court-designated mediator. This meet-and-confer process shall be subject to the Opinion and Order and any subsequent relevant opinions, orders, or other applicable authority. If the meet-and-confer process does not yield an agreement, any party may apply to the Court for resolution of the dispute.

7. Use of SURTASS LFA sonar pursuant to this Stipulation shall remain subject to the current Final Rule and applicable LOAs issued by NMFS. In the event of a conflict between this Stipulation and any LOA issued under the current Final Rule, the more restrictive condition, provision, or requirement will apply.

8. Defendants agree to pay Plaintiffs a reasonable amount for their costs of litigation (including reasonable attorneys' fees). The parties agree to employ good faith efforts to reach an expeditious negotiated resolution of the amount of such costs and fees. By this agreement, Defendants do not waive any right to contest specific fees or expenses claimed by either Plaintiffs or the Plaintiffs' counsel, including hourly rates, in this litigation or in any future litigation. Pursuant to Civil Local Rule 6-2, the parties stipulate that the deadlines established by the Equal Access to Justice Act ("EAJA"), 28 U.S.C. § 2412, shall govern any application of attorneys' fees and costs in this matter, notwithstanding any deadline provisions of the Civil Local Rules, including Local Rule 54-1 and 54-6. Pursuant to EAJA, 28 U.S.C. § 2412, if a negotiated resolution is not arrived at by that time, an initial application for attorneys' fees and costs will be made within 30 days of the Court's entry of Plaintiffs' request for dismissal with prejudice to be filed pursuant to Paragraph 11 below. Plaintiffs shall then have up to 120 days following the filing of an initial EAJA application to file any supplementary or modified applications, related pleadings to advance the adjudication of the application, and/or supporting materials they deem appropriate. The length of any brief or memorandum of points and authorities filed in support of Plaintiffs' EAJA application shall be governed by the Civil Local Rules. If Plaintiffs' initial EAJA application is filed within 30 days of the Court's entry of Plaintiffs' request for dismissal with prejudice, Defendants hereby agree not to argue that any supplementary or modified

applications, related pleadings and/or supporting materials filed within the 120 days following the filing of an initial EAJA application are untimely, should have been filed with the initial EAJA application or, except as provided above, are otherwise out of order.

9. This Stipulation is not to be construed as a concession by either party as to (a) the potential impacts on marine mammals or other animals of operating SURTASS LFA sonar, (b) the absence or presence of marine mammals or other animals in any areas depicted in the attached maps, or (c) the validity of any other fact or legal position concerning the claims or defenses in this action. This Stipulation applies to the SURTASS LFA sonar system and is not intended to serve as precedent in any future rulemaking, in any other geographical areas, or regarding any other Navy activities, including the use of any other sonar system.

10. Nothing in this Stipulation shall prevent any party from filing an application with the Court at any time to seek relief from its terms. Before any such application is filed, the parties shall meet and confer in good faith.

11. Upon notification of approval of this Stipulation by the Court, Plaintiffs shall, within no more than 15 days, submit a request that the Court dismiss the Complaint with prejudice. During the time period between the filing of this Stipulation and the Court's dismissal of the Complaint with prejudice, the parties hereby agree not to file any pleadings or motions in this matter that are not expressly contemplated by this Stipulation. Notwithstanding the dismissal of Plaintiffs' Complaint, the parties agree that the Court shall retain jurisdiction for the purpose of resolving attorneys' fees and cost reimbursement issues under EAJA in the event that the parties do not reach a negotiated resolution thereof, to oversee compliance with the terms of this Stipulation, and to resolve any future disputes concerning the interpretation or implementation of the Stipulation or motions to modify its terms.

Dated: August 8, 2008

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I hereby attest that I have on file all holograph signatures for any signatures indicated by a "conformed" signature (/s/) within this efiled document.

By: /s/ Robin Stafford
Robin Stafford

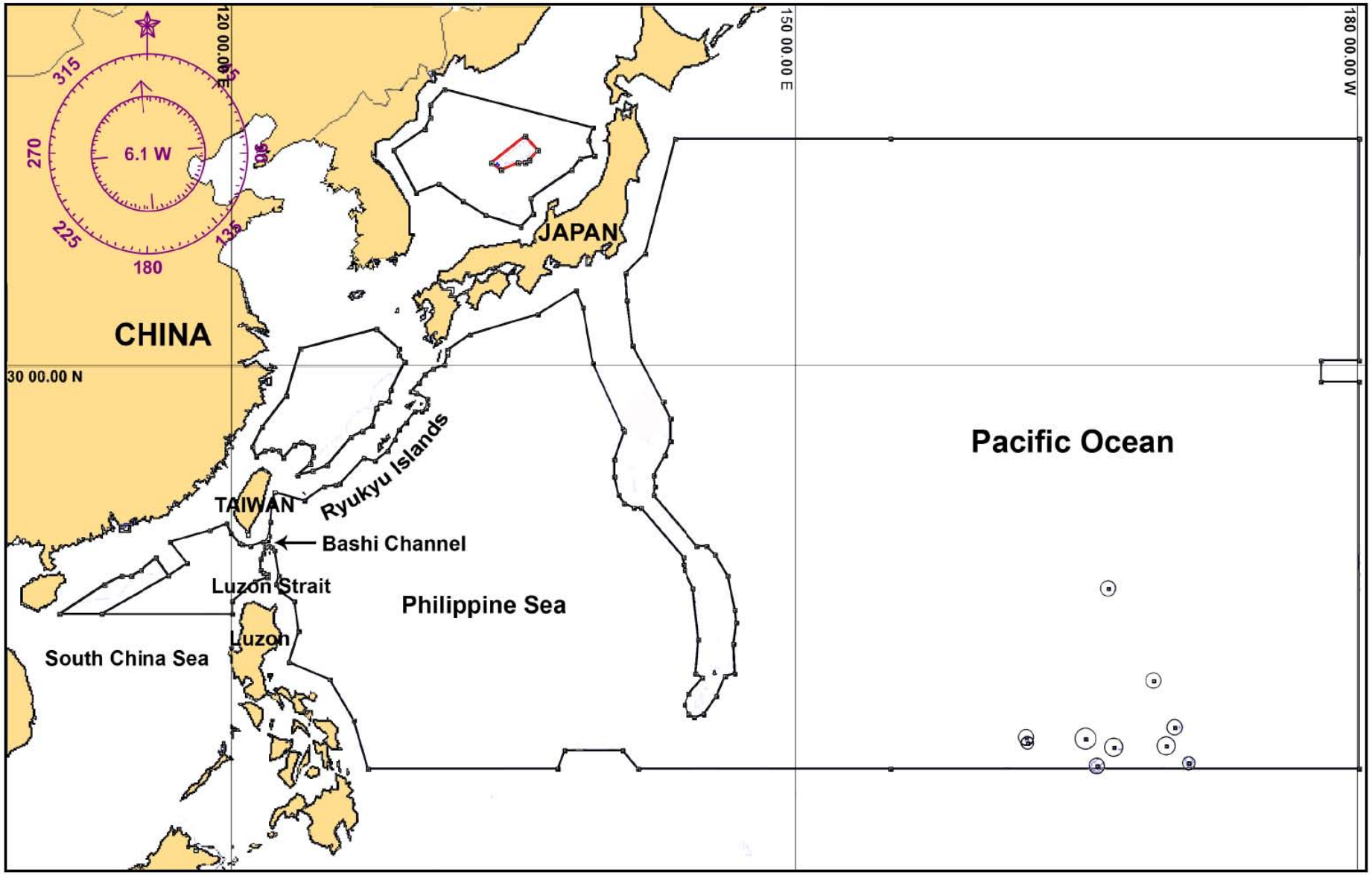
PURSUANT TO STIPULATION, IT IS SO ORDERED.

Dated: August 12, 2008.

By: _____
Hon. Elizabeth D. Laporte
United States Magistrate Judge

UNITED STATES DISTRICT COURT
NORTHERN DISTRICT OF CALIFORNIA
IT IS SO ORDERED
Judge Elizabeth D. Laporte

Tab 1: Western Pacific



Case No. 07-4771-EDL

Tab 2: Western Pacific

(1) PHILIPPINE SEA AREA - OPERATIONS AUTHORIZED YEAR ROUND. Note: Between 17º 09.8' N., 123º 32.2' E and 30º 50.6' N., 131º 25.4' E., boundaries for the Philippine Sea are defined as set forth in coordinate sets (3) through (5); i.e., the Ryukyu Island Chain, the Luzon Strait, and Taiwan.

LATITUDE	LONGITUDE
17 09.8 N	123 32.2 E
15 33.5 N	123 00.9 E
14 41.2 N	125 07.7 E
12 31.3 N	126 28.6 E
10 00.0 N	127 09.5 E
10 00.0 N	137 16.0 E
11 00.0 N	137 37.0 E
11 00.0 N	140 44.6 E
10 00.0 N	141 31.9 E
10 00.0 N	180 00.0 E
29 20.0 N	180 00.0 E
29 20.0 N	178 00.0 E
30 20.0 N	178 00.0 E
30 20.0 N	180 00.0 E
40 00.0 N	180 00.0 E
40 00.0 N	143 32.7 E
35 09.6 N	141 55.4 E
34 17.2 N	140 55.2 E
33 06.7 N	140 58.4 E
31 02.2 N	141 17.3 E
28 24.4 N	142 52.1 E
27 10.0 N	140 44.8 E
30 10.7 N	139 10.3 E
32 45.7 N	138 35.4 E
33 34.3 N	138 14.5 E
32 29.3 N	136 12.3 E
31 34.6 N	132 38.6 E
30 50.6 N	131 25.4 E

(2) PHILIPPINE SEA EXCLUSION ZONE - NO OPERATIONS

LATITUDE	LONGITUDE
28 24.4 N	142 52.1 E
27 39.4 N	143 15.9 E
26 33.3 N	143 16.6 E
25 51.3 N	142 57.4 E
24 54.2 N	142 22.7 E
24 22.9 N	142 26 2 E
23 57.5 N	142 24.2 E
21 26.0 N	144 44.6 E
21 24.5 N	145 13.5 E
21 01.1 N	145 43.5 E
19 55.5 N	146 21.7 E
18 14.8 N	146 46.6 E
17 33.4 N	146 49.8 E
16 30.0 N	146 42.4 E
15 00.0 N	146 43.0 E
14 51.2 N	146 13.5 E
13 47.4 N	145 44.3 E
12 50.1 N	145 04.4 E
12 40.5 N	144 35.8 E
12 52.2 N	144 14.9 E
13 19.9 N	144 01.1 E
13 57.6 N	144 15.4 E
14 45.4 N	145 01.0 E
15 00.0 N	144 37.4 E
16 44.9 N	144 46.6 E
19 17.6 N	144 31.1 E
20 15.0 N	144 00.7 E
20 32.5 N	143 56.1 E
20 50.2 N	143 59.3 E
23 20.0 N	141 41.6 E
23 19.3 N	141 18.8 E
23 31.0 N	140 50.2 E
23 55.9 N	140 31.0 E
24 51.7 N	140 15.3 E
25 39.0 N	140 18.3 E
27 10.0 N	140 44.8 E
30 10.7 N	139 10.3 E

(3) WESTERN PHILIPPINE SEA AREA - RYUKYU ISLAND CHAIN - OPERATIONS AUTHORIZED YEAR ROUND

LATITUDE	LONGITUDE
24 07.2 N	122 13.8 E
23 42.3 N	123 49.3 E
24.22.6 N	124 51.2 E
24 25.9 N	125 28.4 E
24 29.8 N	125 42.7 E
25 44.4 N	126 57.6 E
25 35.7 N	127 35.4 E
26 03.2 N	128 13.1 E
26 37.6 N	128 37.5 E
27 06.0 N	128 50.8 E
27 27.3 N	129 12.5 E
27 57.2 N	129 39.6 E
27 59.1 N	130 01.8 E
28 05.7 N	130 16.3 E
28 18.5 N	130 22.4 E
28 32.9 N	130 21.5 E
28 49.1 N	129 46.2 E
28 52.4 N	129 31.0 E
28 54.8 N	129 26.9 E
29 15.2 N	129 53.1 E
29 39.3 N	130 11.9 E
29 57.1 N	130 39.4 E
30 09.4 N	131 13.8 E
30 40.0 N	131 25.9 E
30 50.6 N	131 25.4 E
31 34.6 N	132 38.6 E

(4) WESTERN PHILIPPINE SEA AREA - LUZON STRAIT (INCLUDING BASHI CHANNEL) - OPERATIONS AUTHORIZED YEAR ROUND

LATITUDE	LONGITUDE
15 33.5 N	123 00.9 E
17 09.8 N	123 32.3 E
18 39.6 N	123 18.9 E
19 09.5 N	122 31.0 E
19 32.2 N	122 18.3 E
19 55.8 N	122 29.3 E
21 15.4 N	122 15.1 E
21 23.0 N	122 06.7 E
21 25.3 N	121 55.0 E
21 20.6 N	121 42.2 E
21 05.5 N	121 35.7 E
20 47.3 N	121 28.6 E
20 14.3 N	121 27.8 E
20 04.1 N	121 37.6 E
20 00.0 N	121 50.8 E
19 50.7 N	121 51.2 E
19 37.9 N	121 12.1 E
18 39.1 N	119 58.1 E
18 00.0 N	119 56.4 E

(5) WESTERN PHILIPPINE SEA AREA - TAIWAN - OPERATIONS AUTHORIZED YEAR ROUND

LATITUDE	LONGITUDE
22 34.1 N	119 41.6 E
22 04.9 N	119 53.0 E
21 33.1 N	120 22.2 E
21 28.3 N	120 31.6 E
21 26.6 N	120 56.6 E
21 39.1 N	121 39.6 E
21 43.5 N	121 49.9 E
21 55.6 N	121 55.5 E
22 38.6 N	122 01.9 E
23 26.6 N	122 03.2 E
24 07.2 N	122 13.8 E
23 42.3 N	123 49.3 E

(6) SEA OF JAPAN - NO OPERATIONS MAY THRU JULY

LATITUDE	LONGITUDE
42 00.0 N	131 14.9 E
40 28.7 N	139 10.7 E
39 58.3 N	138 57.5 E
39 18.1 N	139 13.9 E
39 13.4 N	138 27.5 E
38 43.6 N	138 03.1 E
37 33.6 N	135 51.5 E
36 53.0 N	135 57.6 E
36 18.2 N	135 19.2 E
36 48.9 N	133 27.8 E
37 24.1 N	132 13.0 E
38 07.6 N	130 57.8 E
37 45.7 N	129 43.1 E
39 31.2 N	128 33.2 E
40 25.3 N	130 12.2 E
40 51.4 N	130 28.4 E
41 24.1 N	130 28.9 E

(7) SEA OF JAPAN - YAMATO RISE - NO OPERATIONS

LATITUDE	LONGITUDE
40 05.9 N	135 31.3 E
39 34.0 N	136 12.0 E
39 06.0 N	135 45.4 E
39 01.9 N	135 32.9 E
39 02.4 N	135 11.6 E
38 41.8 N	134 15.0 E
39 01.9 N	133 42.9 E

(8) EAST CHINA SEA AREA - OPERATIONS AUTHORIZED YEAR ROUND

LATITUDE	LONGITUDE
31 49.2 N	127 40.3 E
30 55.6 N	128 50.1 E
30 36.6 N	128 49.5 E
30 18.0 N	129 09.4 E
28 56.1 N	128 22.3 E
28 23.6 N	128 20.8 E
28 23.2 N	127 52.5 E
28 03.7 N	127 38.8 E
27 18.5 N	127 25.9 E
27 00.5 N	126 53.1 E
26 45.7 N	126 17.0 E
25 24.0 N	124 59.3 E
25 08.7 N	124 14.0 E
24 54.1 N	123 25.7 E
25 27.9 N	124 05.0 E
25 48.9 N	124 15.8 E
26 16.2 N	124 14.7 E
26 29.1 N	123 39.5 E
26 20.4 N	123 17.6 E
25 44.5 N	122 42.6 E
26 03.9 N	122 25.3 E
26 10.2 N	122 06.9 E
26 04.6 N	121 42.8 E
25 46.3 N	121 17.3 E
26 16.9 N	121 03.3 E
27 11.8 N	121 33.8 E
28 41.6 N	122 47.9 E
30 54.3 N	123 33.5 E

(9) SOUTH CHINA SEA AREA - OPERATIONS AUTHORIZED YEAR ROUND

LATITUDE	LONGITUDE
18 39.1 N	119 58.1 E
18 00.0 N	119 56.4 E
18 00.0 N	112 58.9 E
19 55.9 N	116 35.5 E
20 35.8 N	117 32.2 E
21 40.2 N	116 38.4 E
22 10.8 N	118 46.4 E
22 34.1 N	119 41.6 E
22 04.9 N	119 53.0 E

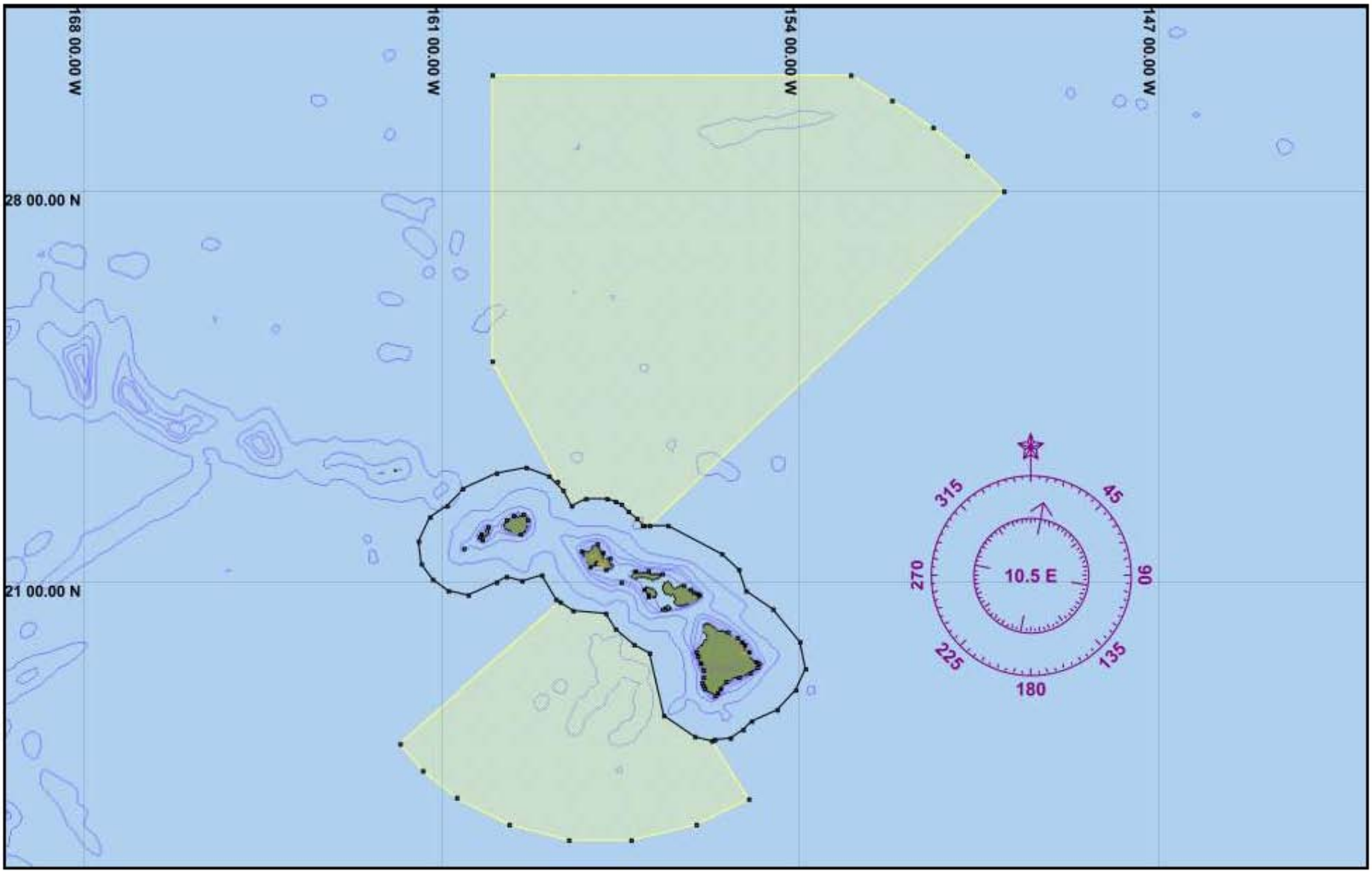
(10) SOUTH CHINA SEA - NO OPERATIONS NOV THRU APR

LATITUDE	LONGITUDE
18 00.0 N	112 58.9 E
18 00.0 N	110 43.5 E
19 30.2 N	113 06.3 E
19 58.1 N	114 03.7 E
19 56.0 N	114 32.1 E
20 14.3 N	115 02.9 E
20 54.1 N	115 53.2 E
19 55.9 N	116 35.5 E

(11) YEAR ROUND OPERATIONS AUTHORIZED OUTSIDE OF RADII FOR THE FOLLOWING ISLANDS IN THE NORTHWESTERN PACIFIC WITHIN THE PHILIPPINE SEA AREA.

LOCATION	LATITUDE (N)	LONGITUDE (E)	RADIUS (NM)
WAKE	19 17.978	166 37.113	30
SIBYLLA	14 36.072	169 00.399	30
BIKAR	12 11.703	170 06.769	30
TAKA/UTRIK	11 11.141	169 43.444	35
MEJIT	10 16.993	170 53.053	30
WOTHO	10 10.639	166 01.002	30
RONGELAP	11 09.158	166 53.636	35
BIKINI	11 36.512	165 23.887	40
ENEWATAK	11 20.015	162 19.518	30
ENJEBI	11 39.878	162 14.245	30

Tab 3: Hawaii


168 00.00 W
161 00.00 W
154 00.00 W
147 00.00 W
28 00.00 N
21 00.00 N
315
45
270
90
225
135
180
10.5 E

Tab 4. Hawaii

Operations are authorized year round

Hawaii North	
Latitude	Longitude
30 00.0N	160 00.0W
30 00.0N	153 00.0W
29 34.2N	152 13.1W
29 06.0N	151 23.5W
28 37.2N	150 42.4W
28 00.0N	150 00.0W
22 03.4N	156 55.5W
22 02.5N	157 03.5W
22 09.9N	157 11.5W
22 18.7N	157.21.2W
22 25.5N	157 28.8W
22 29.1N	157.36.3W
22 32.6N	157 45.9W
22 32.6N	158 10.3W
22 24.5N	158 27.2W
22 42.0N	158 36.5W
22 49.8N	158 44.1W
25 00.0N	160.00.0W

Hawaii South	
Latitude	Longitude
18 01.5N	161 50.3W
20 39.6N	158 41.2W
20 29.6N	158 25.0W
20 26.5N	157 47.5W
20 09.6N	157 35.6W
19 51.6N	157 14.4W
19 42.9N	156 56.5W
18 33.2N	156 38.9W
18 09.1N	156 03.0W
18 04.7N	155 42.4W
17 00.0N	155 00.8W
16 30.3N	156 01.4W
16 13.0N	157 17.3W
16 13.5N	158 30.6W
16 30.3N	159 39.7W
17 00.8N	160 43.5W
17 30.7N	161 23.1W

APPENDIX C

Background for Marine Mammal Density and Stock Estimates for SURTASS LFA Sonar First Annual Report

Appendix (C): Background for Marine Mammal Density and Stock Estimates for SURTASS LFA LOA2

Site #2 North Philippine Sea

Specific Species Information:

Bryde's whale: Yoshida and Kato (1999) identified 3 stocks of Bryde's whales in the western North Pacific: Solomon Islands/Southeast Asia, East China Sea, and offshore western North Pacific. Density estimates were derived from scouting vessels sighting data (Ohsumi, 1977). The IWC website is source of stock estimate for the western North Pacific stock (22,000). Ohizumi et al. (2002) conducted winter sighting surveys, observing Bryde's whales at about 20°N, which is the southern limit of their summer range. Barlow (2006) observed Bryde's whales around the Hawaiian Islands, deriving a comparable density estimate (0.00019/km^2).

minke whale: The south coast of Honshu and Shikoku were whaling grounds for this species (Ohsumi, 1978). Animals are migratory from the offshore western North Pacific waters. Minke whales are migratory animals, with a summer distribution extending north to the Chukchi Sea and a winter distribution extending south to near the equator (Perrin and Brownell, 2002). Two stocks of minke whales are recognized in the western North Pacific, the "O" stock in the Okhotsk Sea and off the eastern side of Japan and the "J" stock around the Korean peninsula and in the Sea of Japan (Pastene et al., 1998). Animals in this region are believed to be part of the "O" stock. Buckland et al. (1992) conducted sighting surveys in July and August in the western North Pacific and Sea of Okhotsk. Density estimates were derived from encounter rates and effective search widths for the offshore population (Standard Error (SE) = 0.17). The stock estimate is for the western North Pacific/Sea of Okhotsk stock (25,049 individuals) (Buckland et al., 1992). Ferguson and Barlow (2001; 2003) computed density estimates in offshore areas of the eastern tropical Pacific an order of a magnitude lower.

North Pacific right whale: The western North Pacific right whale population is considered distinct from the eastern population, arbitrarily separated by the 180° line of longitude (Best et al., 2001). The Okhotsk Sea, Kuril Islands, and eastern Kamchatka coast represent major feeding grounds for the western population (Brownell et al., 2001) where animals are typically found May through September (Clapham et al., 2004). Various areas have been proposed for breeding and calving grounds, including the Ryukyu Islands, Yellow Sea, Sea of Japan, offshore waters far from land, and the Bonin Islands, but a lack of winter sightings (December-February) makes a definitive assessment impossible (Brownell et al. 2001). Clapham et al. (2004) note the extensive offshore component to the right whale's distribution in the 19th century data. Movement north in spring (peak months of February-April) and south in fall (peak months September-Dececember) suggest the possibility of two putative sub-populations in the western population that are kept apart by the Japanese islands, though this seems unlikely (Brownell et al. 2001, Clapham et al. 2004). Data from Japanese sighting cruises in the Okhotsk Sea provide an abundance estimate of 922 animals (CV=0.433, 95% CI=404-2,108) (Best et al. 2001) for the western North Pacific population. The western population may be affected by proposed LFA operations in the spring, fall and winter in the North Philippine Sea.

sperm whale: Three stocks are recognized in U.S. EEZ waters, a North Pacific stock that migrates between Alaska and the western North Pacific, a central North Pacific stock around Hawaii, and a California/Oregon/Washington stock off the U.S. west coast (Angliss and Lodge, 2002). Preliminary data indicate that the best abundance estimate for the western North Pacific is 102,112 individuals (CV=0.155) (Angliss and Lodge 2002). Sightings collected by Kasuya and Miyashita (1988) suggest that that there are two stocks of sperm whales in the western North Pacific, a northwestern stock with females that summer off the Kuril Islands (~50°N) and winter off Hokkaido and Sanriku (~40°N), and the southwestern North Pacific stock with females that summer off Hokkaido and Sanriku (~40°N) and winter around the Bonin Islands (~25°N). The males of these two stocks are found north of the range of the corresponding females, i.e., in the Bering Sea (~55°N) and off Hokkaido and Sanriku (~40°N), respectively, during the summer. As such, the density estimate is considered comparable to 0.00282/km^2 calculated from the summer/fall survey off Hawaii in 2002 (Barlow, 2006) and the density estimate (0.00123/km^2) calculated from the winter/spring survey around Guam and Mariana Islands (Department of the Navy, 2007) and to Mobley's estimate (0.0010

animals/km^2) where sperm whales were generally seen in the outer 5% of survey effort (Mobley et al., 2000) during the spring, summer and fall.

Kogia: Evans (1987) reported records of *Kogia* spp. off the Japanese coast with primarily an oceanic distribution, not believed to be concentrated anywhere. Summing the abundances of *Kogia breviceps, Kogia simus, and Kogia* spp. in the geographic strata defined by Ferguson and Barlow (2001), an overall abundance of 350,553 animals was computed in the eastern tropical Pacific. At this northern latitude, only expect *Kogia breviceps*. Reviewing density estimates calculated in the eastern Pacific Ocean at about 30° N (Ferguson and Barlow, 2003), a density estimate of 0.0031/km^2 and an abundance estimate of 166,553 was modeled. This is comparable to the density estimates for pygmy sperm whale (0.00291/km^2 (CV=1.12) and dwarf sperm whale (0.00714/km^2 (CV=0.74) observed within the Hawaii EEZ (Barlow, 2006).

Cuvier's beaked whale: No density or stock estimate data are available for this region. Considering habitat preferences (e.g., water temperature, bathymetry), it was determined that best data available are a density estimate (0.0054/km^2) and an abundance estimate of 90,725 animals from the eastern Pacific (Ferguson and Barlow, 2003). This is comparable to that estimated for the Hawaii EEZ (0.00621/km^2; (Barlow, 2006)) and the mean predicted density estimate for the ETP (0.00455/km^2; (Ferguson et al., 2006b)).

Blainville's beaked whale: Miyazaki et al. (1987) reported 2 strandings on Taiwan and one stranding on the southern Ryukyu Archipelago. Without any data on stock or density estimates for the western North Pacific, it is roughly estimated that the data from the eastern tropical Pacific (Ferguson and Barlow 2001, 2003) are appropriate. The *Mesoplodon densirostris* estimate added to one-fifth of the *Mesoplodon* spp. abundance estimate is 8,032. This density estimate is comparable to that for Blainville's beaked whales in the Hawaii EEZ (0.00117/km^2; (Barlow, 2006)), in the main Hawaiian Islands (0.0012/km^2; Mobley et al., 2001), and the mean predicted density estimate for the ETP *Mesoplodon* spp. (0.000296/km^2; (Ferguson et al., 2006b)).

ginkgo-toothed beaked whale: Miyazaki et al. (1987) reported 5 strandings of *M. ginkgodens* from the east coast of Japan and 2 strandings from the east coast of Taiwan. Of the 15 known strandings of *M. ginkgodens*, Palacios (1996) reported 8 off Taiwan and Japan. Without any data on stock or density estimates for the western North Pacific, it is roughly estimated that the data on *Mesoplodon* spp. from the eastern Pacific (0.0005/km^2; Ferguson and Barlow 2001, 2003) are appropriate. This density estimate is comparable to that for unidentified beaked whales in the Hawaii EEZ (0.00015/km^2; (Barlow, 2006)) and the mean predicted density estimate for the ETP *Mesoplodon* spp. (0.000296/km^2; (Ferguson et al., 2006b)).

killer whale: A few schools have been seen off the southeast coast of Honshu (off Taiji) in April, October, and November; however, none have been taken in the drive fisheries (Miyashita 1993). Without any data for the western North Pacific, best available data are from the long-term time series is the eastern tropical Pacific (Ferguson and Barlow, 2001, 2003); density estimate (0.0004/km^2) and abundance estimate (12,256). This is comparable to the density estimate in the Hawaii EEZ (0.00014/km^2; (Barlow, 2006)).

false killer whale: Miyashita (1993) estimated abundance of false killer whales from 34 sighting cruises associated with the Japanese drive fishery (16,668 (CV=0.263)). He also derived density estimates in 1° latitude by 1° longitude boxes from which an average was derived for the modeled site (0.0029/km^2). This is comparable to density estimates in the Hawaii EEZ (0.0001/km^2; (Barlow, 2006)) and to nearshore Hawaii waters (0.0017/km^2; (Mobley et al., 2000)).

pygmy killer whale: Kishiro and Kasuya (1993) reviewed the historical catches of Japanese drive fisheries. No pygmy killer whales were caught in Taiji fisheries (located on the south coast of Kii Peninsula of Japan), but Leatherwood and Reeves (1983) reported that they were seen relatively frequently in the tropical Pacific off Japan. Without data available in the western North Pacific, a density estimate (0.0021/km^2) and abundance estimate (30,214) from eastern Pacific (Ferguson and Barlow, 2003) were used. This is almost an order of magnitude larger than that observed in the Hawaii EEZ (0.00039/km^2; Barlow, 2006). None were sighted in nearshore Hawaii waters (Mobley et al., 2000).

melon-headed whale: Leatherwood and Reeves (1983) reported that melon-headed whales are not observed frequently anywhere except in the Philippine Sea, especially near Cebu Island. Abundance estimated from eastern

Pacific (36,770 animals) (Ferguson and Barlow 2001, 2003). A density estimate for the offshore region around the Hawaiian archipelago (Barlow, 2006) was used (0.0012/km^2). This value is very similar to the estimate from Mobley et al. (2000) for near the Main Hawaiian Islands: 0.0021/km^2.

short-finned pilot whale: Miyashita (1993) estimated abundance of short-finned pilot whales from 34 sighting cruises associated with the Japanese drive fishery (53,608 (CV=0.224)). He also derived density estimates in 1° latitude by 1° longitude boxes from which an average was derived for the modeled site.

Risso's dolphin: Miyashita (1993) reported an abundance estimate (83,289 (CV=0.179)) and density estimate off southern Japan/east Taiwan (0.0106/km^2). This is an order of magnitude larger than that observed in the Hawaii EEZ (0.00097/km^2; Barlow, 2006) and no Risso's dolphins were observed in nearshore Hawaii waters (Mobley et al., 2000).

common dolphin: There are no data on density or abundance estimates for this species in the western Pacific (Miyashita, 1993). Common dolphins are gregarious, and it is not unusual to find them associated with Pacific white-sided dolphins in eastern North Pacific feeding grounds. They are pelagic, offshore creatures encountered along or seaward of the 183-m (100-fm) contour, and found in waters of temperature 10-28°C (50-82.4ºF). These animals are very widely distributed, occurring in all oceans to the limits of tropical and warm temperate waters (Leatherwood and Reeves, 1983). Without any data on stock or density estimates for the western North Pacific, it is roughly estimated that the data from the eastern Pacific (Ferguson and Barlow, 2001, 2003) at the same latitudes are appropriate.

bottlenose dolphin: Miyashita (1993) reports an abundance estimate (168,791 (CV=0.261)) and density estimate off southern Japan (0.0146/km^2). This is comparable to that observed in the nearshore Hawaii waters (0.0103/km^2; (Mobley et al., 2000)) and an order of magnitude larger than that observed in the Hawaii EEZ (0.00131/km^2; Barlow, 2006).

spinner dolphin: Gilpatrick et al. (1987) did not report any sightings from the Pacific coast of Japan, and this species was not mentioned in historical Japanese whaling records (Kishiro and Kasuya, 1993). No data on density or abundance estimates are available (Miyashita, 1993). Without any data on stock or density estimates for the western North Pacific, it is roughly estimated that estimates (0.0005/km^2 and 1,015,059 animals) from the eastern tropical Pacific (Ferguson and Barlow 2001, 2003) at a similar latitude are appropriate.

pantropical spotted dolphin: Gilpatrick et al. (1987) cited a known distribution of pantropical spotted dolphins east of Taiwan and in the Philippine Sea. Miyashita (1993) abundance estimate (438,064 (CV=0.174)) and density estimate off southern Japan/east Taiwan (0.0137/km^2) were used. This is comparable to those observed in the Hawaii EEZ (0.00366/km^2; Barlow, 2006) and in nearshore Hawaii waters (0.0407/km^2; (Mobley et al., 2000)).

striped dolphin: There are two concentrations in western North Pacific, one south of 30°N and the other in the offshore waters north of 30°N. There is also the potential for three populations in the area: one south of 30°N, one inshore north of 30°N, and one offshore north of 30°N, east of 145°E. However, the boundaries between these populations have not been resolved (Miyashita 1993). Therefore, Miyashita (1993) derived a total population estimate (570,038 (CV=0.186)). The density estimate off southern Japan/east Taiwan (0.0329/km^2) was used.

rough-toothed dolphin: This species has a primarily pelagic distribution in tropical to warm temperate waters. They are seen from time to time with bottlenose dolphins and short-finned pilot whales, and are reportedly rare off Japan and in the heavily studied eastern tropical Pacific. There are no data on abundance or density estimates for the western North Pacific; therefore, a density estimate (0.0059/km^2) from eastern Pacific waters was used (Ferguson and Barlow, 2001, 2003)**.** This is comparable to those observed in the Hawaii EEZ (0.00355/km^2; Barlow, 2006) and in nearshore Hawaii waters (0.0017/km^2; (Mobley et al., 2000)).

Fraser's dolphin: Being a highly gregarious species, groups of a hundred to a thousand Fraser's dolphins have been observed. They are occasionally found mixed in herds of spotted dolphins and observed in company of false killer whales, sperm whales, striped dolphins, and spinner dolphins. Their diet consists of squid, crustaceans, and deep-sea fish (Leatherwood and Reeves, 1983). Kishiro and Kasuya (1993) reported catches off the Pacific coast of Japan in drive fisheries. Dolar et al. (2003) reported Fraser's and spinners found together in the eastern Sulu Sea, Philippines.

Comparing the feeding ecology of spinner and Fraser's dolphins, spinners feed primarily in upper 200 m (656 ft) but maybe as deep as 400 m (1312 ft), whereas Fraser's are more diverse, feeding from the surface to as deep as 600 m (1968 ft). Without any data on abundance or density estimates for the western North Pacific, it is roughly estimated that estimates (0.0040/km^2 and 220,789 animals) from the eastern tropical Pacific (Ferguson and Barlow 2001, 2003) are appropriate. This is comparable to that observed in the Hawaii EEZ (0.00417/km^2; Barlow, 2006).

Pacific white-sided dolphin: No data on density or abundance estimates are available in the western North Pacific (Miyashita, 1993). A gregarious species, these pelagic, offshore creatures are encountered along or seaward of the 183-m (100-fm) contour. They feed at night on the deep-scattering layer and have a primarily temperate distribution, found north of tropical waters and south of arctic waters (Leatherwood and Reeves, 1983). Recent research on genetic differentiation suggests that animals found in coastal Japanese waters and the Sea of Japan belong to a different population than animals found in offshore North Pacific waters (Hayano et al., 2004). Sighting surveys in the North Pacific were analyzed to estimate the abundance of Pacific white-sided dolphins as 931,000 individuals (Buckland et al., 1993). This estimate is over an order of magnitude larger than the abundance estimate in the eastern North Pacific (Ferguson and Barlow, 2001, 2003). Without any data on density estimates for the western North Pacific (Miyashita, 1993), it is roughly estimated that the data from the eastern tropical Pacific (Ferguson and Barlow, 2001, 2003) are appropriate. No sightings of Pacific white-sided dolphins were reported in Hawaii surveys (Barlow, 2006; Mobley et al., 2000).

Site #3 West Philippine Sea

Specific Species Information:

fin whale: Fin whales winter to about 20°N, including waters along the Pacific coast of Japan. Since fin whales migrate south from offshore waters of the northwest Pacific, density and stock estimates were derived from encounter rates of Japanese scouting boats in the northwest Pacific (Masaki 1977, Ohsumi 1977, Tillman 1977). These data are comparable to density estimates in offshore areas of the eastern tropical Pacific (Ferguson and Barlow, 2001, 2003).

Bryde's whale: Animals found around the Bonin Islands are an offshore morph of *Balaenoptera edeni*. 3 stocks are currently recognized in the western North Pacific: Solomon Islands/Southeast Asia, East China Sea, and offshore western North Pacific (Yoshida and Kato 1999). The Ohsumi (1977) density estimate was used. The IWC website is source of stock estimate for the western North Pacific stock (22,000). Ohizumi et al. (2002) conducted winter sighting surveys, observing Bryde's whales at about 20°N, which is the southern limit of their summer range. Barlow (2006) observed Bryde's whales around the Hawaiian Islands, deriving a comparable density estimate (0.00019/km^2).

minke whale: The south coast of Honshu and Shikoku were whaling grounds for the minke whale (Ohsumi 1978). Animals are migratory from the offshore western North Pacific waters. Minke whales are migratory animals, with a summer distribution extending north to the Chukchi Sea and a winter distribution extending south to near the equator (Perrin and Brownell, 2002). Two stocks of minke whales are recognized in the western North Pacific, the "O" stock in the Okhotsk Sea and off the eastern side of Japan and the "J" stock around the Korean peninsula and in the Sea of Japan (Pastene et al., 1998). Animals in this region are believed to be part of the "O" stock. Buckland et al. (1992) conducted sighting surveys in July and August in the western North Pacific and Sea of Okhotsk. Density estimates were derived from encounter rates and effective search widths for the offshore population (Standard Error (SE) = 0.17). The stock estimate is for the western North Pacific/Sea of Okhotsk stock (25,049 individuals) (Buckland et al., 1992). Ferguson and Barlow (2001; 2003) computed density estimates in offshore areas of the eastern tropical Pacific an order of a magnitude lower.

humpback whale: Humpback whales are only expected in this region during the winter, and they are typically found in water depths of less than 183 m (100 fm). Humpback wintering grounds in the western North Pacific are the Ryukyu Islands, Formosa and Bonin Islands (Evans 1987). Three populations of humpbacks are recognized in U.S. EEZ waters, the third being the (quoted from Angliss and Lodge 2002): "winter/spring population of Japan

which, based on Discovery Tag information, probably migrate to waters west of the Kodiak Archipelago (the Bering Sea and Aleutian Islands) in summer/fall (Berzin and Rovnin 1966, Nishiwaki 1966, Darling 1991) - referred to as the Western North Pacific stock. Some recent exchange between winter/spring areas has been documented (Baker et al., 1986; Darling and Cerchio, 1993; Darling and McSweeney, 1985), as well as movement between Japan and British Columbia, and Japan and the Kodiak Archipelago (Calambokidis et al., 1997; Darling et al., 1996)." The best abundance estimate for the western North Pacific stock is 394 (CV=0.084) (Angliss and Lodge, 2002).

sperm whale: Three stocks are recognized in U.S. EEZ waters, a North Pacific stock that migrates between Alaska and the western North Pacific, a central North Pacific stock around Hawaii, and a California/Oregon/Washington stock off the U.S. west coast (Angliss and Lodge, 2002). Preliminary data indicate that the best abundance estimate for the western North Pacific is 102,112 individuals (CV=0.155) (Angliss and Lodge, 2002). Sightings collected by Kasuya and Miyashita (1988) suggest that that there are two stocks of sperm whales in the western North Pacific, a northwestern stock with females that summer off the Kuril Islands (~50°N) and winter off Hokkaido and Sanriku (~40°N), and the southwestern North Pacific stock with females that summer off Hokkaido and Sanriku (~40°N) and winter around the Bonin Islands (~25°N). The males of these two stocks are found north of the range of the corresponding females, i.e., in the Bering Sea (~55°N) and off Hokkaido and Sanriku (~40°N), respectively, during the summer. As such, the density estimate is considered comparable to 0.00282/km^2 calculated from the summer/fall survey off Hawaii in 2002 (Barlow, 2006) and the density estimate (0.00123/km^2) calculated from the winter/spring survey around Guam and Mariana Islands (Department of the Navy, 2007) and to Mobley's estimate (0.0010 animals/km^2) where sperm whales were generally seen in the outer 5% of survey effort (Mobley et al., 2000) during the spring, summer and fall.

Kogia: Evans (1987) reported records of *Kogia* spp. off the Japanese coast with primarily an oceanic distribution that are not believed to be concentrated anywhere specific. Summing the abundances of *Kogia breviceps, Kogia simus, and Kogia* spp. in the geographic strata defined by Ferguson and Barlow (2001), an overall abundance of 350,553 animals was computed in the eastern tropical Pacific. At this latitude, expect *Kogia breviceps* and *Kogia simus*. Reviewing density estimates calculated in the eastern Pacific Ocean at about 20°N (Ferguson and Barlow, 2003), a density estimate of 0.0017/km^2 was modeled. This is comparable to the density estimates for pygmy sperm whale (0.00291/km^2 (CV=1.12) and dwarf sperm whale (0.00714/km^2 (CV=0.74) observed within the Hawaii EEZ (Barlow, 2006).

Cuvier's beaked whale: No data are available for Cuvier's beaked whales in this region. Considering habitat preferences (e.g., water temperature, bathymetry), it was determined that best data available are a density estimate (0.0003/km^2) and an abundance estimate of 90,725 animals from the same latitudes in the eastern Pacific (Ferguson and Barlow, 2003). This is comparable to that estimated for the Hawaii EEZ (0.00621/km^2; (Barlow, 2006)) and the mean predicted density estimate for the ETP (0.00455/km^2; (Ferguson et al., 2006b)).

Blainville's beaked whale: Miyazaki et al. (1987) reported 2 strandings on Taiwan and one stranding on the southern Ryukyu Archipelago. Without any data on stock or density estimates for the western North Pacific, it is roughly estimated that the data from the eastern tropical Pacific (Ferguson and Barlow 2001, 2003) are appropriate. The *Mesoplodon densirostris* abundance estimate added to one-fifth of the *Mesoplodon* spp. abundance estimate is 8,032. This density estimate is comparable to that for Blainville's beaked whales in the Hawaii EEZ (0.00117/km^2; (Barlow, 2006)), in the main Hawaiian Islands (0.0012/km^2; Mobley et al., 2001), and the mean predicted density estimate for the ETP *Mesoplodon* spp. (0.000296/km^2; (Ferguson et al., 2006b)).

ginkgo-toothed beaked whale: Miyazaki et al. (1987) reported 2 strandings of *M. ginkgodens* from the east coast of Taiwan. Of the 15 known *M. ginkgodens* strandings, Palacios (1996) reported 8 off Taiwan and Japan. Leatherwood and Reeves (1983) stated that some hunting of this species apparently takes place in Taiwan. Since no data on density or stock estimates are available for this species, it was roughly estimated that the density and abundance estimates for *Mesoplodon* spp. at the same latitudes in the eastern Pacific (Ferguson and Barlow 2001, 2003) are approximate. This density estimate is comparable to that for unidentified beaked whales in the Hawaii EEZ (0.00015/km^2; (Barlow, 2006)) and the mean predicted density estimate for the ETP *Mesoplodon* spp. (0.000296/km^2; (Ferguson et al., 2006b)).

false killer whale: Miyashita (1993) estimated the abundance of false killer whales from 34 sighting cruises associated with the Japanese drive fishery (16,668 (CV=0.263)). He also derived density estimates in 1° latitude by

1° longitude boxes from which an average was derived for the modeled site (0.0029/km^2). This is comparable to density estimates in the Hawaii EEZ (0.0001/km^2; (Barlow, 2006)) and to nearshore Hawaii waters (0.0017/km^2; (Mobley et al., 2000)).

pygmy killer whale: Kishiro and Kasuya (1993) reviewed the historical catches of Japanese drive fisheries. No pygmy killer whales were caught in Taiji fisheries (located on the south coast of Kii Peninsula of Japan), but Leatherwood and Reeves (1983) reported that they were seen relatively frequently in the tropical Pacific off Japan. Without data available in the western North Pacific, a density estimate (0.0021/km^2) and abundance estimate (30,214) from eastern Pacific (Ferguson and Barlow, 2003) was used. This is almost an order of magnitude larger than that observed in the Hawaii EEZ (0.00039/km^2; Barlow, 2006). None were sighted in nearshore Hawaii waters (Mobley et al., 2000).

melon-headed whale: Leatherwood and Reeves (1983) reported that melon-headed whales are not observed frequently anywhere except in the Philippine Sea, especially near Cebu Island. Abundance estimated from eastern Pacific (36,770 animals) (Ferguson and Barlow 2001, 2003). A density estimate for the offshore region around the Hawaiian archipelago (Barlow, 2006) was used (0.0012/km^2). This value is very similar to the estimate from Mobley et al. (2000) for near the Main Hawaiian Islands: 0.0021/km^2.

short-finned pilot whale: Miyashita (1993) estimated abundance of short-finned pilot whales from 34 sighting cruises associated with the Japanese drive fishery (53,608 (CV=0.224)). He also derived density estimates in 1° latitude by 1° longitude boxes. There was limited coverage of the Philippine Sea, but Kishiro and Kasuya (1993) reported a southern limit to the short-finned pilot whale range of approximately 20°N; therefore, a density estimate was derived as one-half the density estimate of the area south of Japan. Kasuya et al. (1988) suggest that there might be more than one stock of short-finned pilot whales off the Pacific coast of Japan and Taiwan, since there is a southern form found south of the Kuroshio Current front (south of 35°N) and a northern form found between the Kuroshio Current front and the Oyashio Current front (from approximately 35-43°N). However, the northern form has not been harvested by Japanese drive fisheries (Kishiro and Kasuya 1993), and it was therefore not included in the above analyses (Miyashita 1993).

Risso's dolphin: Miyashita (1993) abundance estimate (83,289 (CV=0.179)) and density estimate off southern Japan/east Taiwan (0.0106/km^2) were used. This is an order of magnitude larger than that observed in the Hawaii EEZ (0.00097/km^2; Barlow, 2006) and no Risso's dolphins were observed in nearshore Hawaii waters (Mobley et al., 2000).

common dolphin: There are no data on density or stock estimates for this gregarious species (Miyashita 1993). It is not unusual to find common dolphins associated with Pacific white-sided dolphins in eastern North Pacific feeding grounds. These pelagic, offshore creatures are encountered along or seaward of the 100-fm contour and are found in waters of temperature 10-28°C (50-82.4°F). They are very widely distributed, occurring in all oceans to the limits of tropical and warm temperate waters (Leatherwood and Reeves 1983). Without any data on stock or density estimates for the western North Pacific, it is roughly estimated that the data from the eastern tropical Pacific (Ferguson and Barlow 2001, 2003) are appropriate.

bottlenose dolphin: Miyashita (1993) abundance estimate (168,791 (CV=0.261)) and density estimate off southern Japan (0.0146/km^2) were used. This is comparable to that observed in the nearshore Hawaii waters (0.0103/km^2; (Mobley et al., 2000)) and an order of magnitude larger than that observed in the Hawaii EEZ (0.00131/km^2; Barlow, 2006).

spinner dolphin: Gilpatrick et al. (1987) reported a high density of sightings in the Korea Strait, but none were reported from the Philippine Sea. Spinners are also not mentioned in historical Japanese whaling records (Kishiro and Kasuya 1993), and no data on density or abundance estimates are available (Miyashita 1993). Without any data on stock or density estimates for the western North Pacific, it is roughly estimated that estimates (0.0005/km^2 and 1,015,059 animals) from the eastern tropical Pacific (Ferguson and Barlow 2001, 2003) at similar latitude are appropriate.

pantropical spotted dolphin: Gilpatrick et al. (1987) cited a known distribution of pantropical spotted dolphins east of Taiwan and in the Philippine Sea. The Miyashita (1993) abundance estimate (438,064 (CV=0.174)) and density

estimate off southern Japan/east Taiwan (0.0137/km^2) were used. This is comparable to those observed in the Hawaii EEZ (0.00366/km^2; Barlow, 2006) and in nearshore Hawaii waters (0.0407/km^2; (Mobley et al., 2000)).

striped dolphin: Two concentrations exist in the western North Pacific, one south of 30°N and the other in the offshore waters north of 30°N. However, there is the potential for only one population in the area: one south of 30°N, though the boundaries between these populations have not been resolved (Miyashita 1993). Therefore, Miyashita (1993) derived a total population estimate (570,038 (CV=0.186)). One-half the density estimate from off southern Japan/east Taiwan for this site (0.0164/km^2) was used.

rough-toothed dolphin: Their distribution is primarily pelagic, in tropical to warm temperate waters. Rough-toothed dolphins are seen from time to time with bottlenose dolphins and short-finned pilot whales, and are reportedly rare off Japan and in the heavily studied eastern tropical Pacific. No data on stock or density estimates for the western North Pacific are available; therefore, a density estimate (0.0059/km^2) and an abundance estimate from the ETP (145,729) were used (Ferguson and Barlow 2001, 2003)**.** This is comparable to those observed in the Hawaii EEZ (0.00355/km^2; Barlow, 2006) and in nearshore Hawaii waters (0.0017/km^2; (Mobley et al., 2000)).

Fraser's dolphin: Kishiro and Kasuya (1993) reported takes of Fraser's dolphin off the Pacific coast of Japan in the Japanese drive fisheries. Dolar et al. (2003) reported Fraser's and spinners found together in the eastern Sulu Sea, Philippines. Amano et al. (1996) also stated that Fraser's dolphins are common in Philippine waters. A highly gregarious species, groups of a hundred to a thousand have been observed, are occasionally found mixed in herds of spotted dolphins, and observed in the company of false killer whales, sperm whales, striped dolphins, and spinner dolphins. Their diet consists of squid, crustaceans, and deep-sea fish (Leatherwood and Reeves 1983). A comparison of the feeding ecology of spinner and Fraser's dolphins indicates that spinners feed primarily in upper 200 m (656 ft), but maybe as deep as 400 m (1312 ft), whereas Fraser's dolphins are more diverse, feeding from the surface to as deep as 600 m (1968 ft). Without any data on stock or density estimates for the western North Pacific, it is roughly estimated that the estimates (0.0040/km^2 and 220,789 animals) from the eastern tropical Pacific (Ferguson and Barlow 2001, 2003) are appropriate. This is comparable to that observed in the Hawaii EEZ (0.00417/km^2; Barlow, 2006).

Pacific white-sided dolphin: There are no data on density or stock estimates available for this species (Miyashita 1993). These pelagic, offshore animals are encountered along or seaward of the 100-fm contour, and feed at night on the deep-scattering layer. Pacific white-sided dolphins have a primarily temperate distribution, found north of tropical waters and south of arctic waters (Leatherwood and Reeves 1983). Recent research on genetic differentiation suggests that animals found in coastal Japanese waters and the Sea of Japan belong to a different population than animals found in offshore North Pacific waters (Hayano et al., 2004). Sighting surveys in the North Pacific were analyzed to estimate the abundance of Pacific white-sided dolphins as 931,000 individuals (Buckland et al., 1993). This estimate is over an order of magnitude larger than the abundance estimate in the eastern North Pacific (Ferguson and Barlow, 2001, 2003). Without any data on density estimates for the western North Pacific (Miyashita, 1993), it is roughly estimated that the data from the eastern tropical Pacific (Ferguson and Barlow, 2001, 2003) are appropriate. No sightings of Pacific white-sided dolphins were reported in Hawaii surveys (Barlow, 2006; Mobley et al., 2000).

Site #7 South China Sea

Specific Species Information:

fin whale: De Boer (2000) conducted a research cruise in the Indian Ocean Sanctuary and the South China Sea from 29 March to 17 April, 1999. Sightings of fin whales and a sperm whale west of the Balabac Strait suggest a possible migration route of these species between the South China Sea and the Sulu Sea. De Boer's cruise is the first record of fin whales in the South China Sea. The East China Sea population is thought to be resident and may represent a distinct population (Evans, 1987). Without any data on stock or density estimates for the South China Sea, it is roughly estimated that the data from the western North Pacific are appropriate. Density and stock estimates were derived from encounter rates of Japanese scouting boats in the northwest Pacific (Masaki 1977, Ohsumi 1977,

Tillman 1977). These data are comparable to density estimates in other areas of the eastern tropical Pacific (Ferguson and Barlow, 2001, 2003) and around Hawaii (Barlow, 2006).

Bryde's whale: Yoshida and Kato (1999) identified 3 stocks of Bryde's whales in the western North Pacific: Solomon Islands/Southeast Asia stock (mainly Philippine waters and the Gulf of Thailand), East China Sea, and offshore western North Pacific. Animals found in this area are considered part of the southeast Asia stock of Bryde's whales, which includes waters of the Philippine Sea and Gulf of Thailand (Yoshida and Kato, 1999) and which is separate from both the East China Sea and western North Pacific populations. Animals in this region are the offshore form of *Balaenoptera edeni*. De Boer (2000) sighted Bryde's whales during his cruise. No data specific to this stock were reported. The Ohsumi (1977) western North Pacific density estimate is most appropriate; comparable to Department of the Navy (2007) (0.00041/km^2), Barlow (2006) (0.00019/km^2) and Ferguson and Barlow (2001, 2003) (in South Gulf of CA d=0.0011/km^2; area 85 d = 0.0006/km^2; 0.0003-0.0009/km^2 in eastern North Pacific). The IWC website is source of stock estimate for western North Pacific stock (22,000).

minke whale: As a cosmopolitan species, minke whales are expected to be present in the South China Sea, though De Boer (2000) did not observe them during his recent cruise through the area and Smith et al. (1997) did not document them during their cruises or from historical "whale temples." Whaling data from the East China Sea suggest that animals do not migrate through the Taiwan Strait, though other studies (Butterworth et al., 1996; Gong, 1988) indicate that individuals might be from the J-stock, migrating into the region in the winter. In either case, there are limited data on density and stock estimates. Therefore, estimated encounter rates and stock estimate similar to the favored whaling grounds of the western North Pacific were used (Buckland et al., 1992). These estimates are an order of magnitude higher than any calculated in the eastern North Pacific (Ferguson and Barlow, 2001, 2003).

gray whale: Gray whales would only be expected to be in this area during the winter season. Exact wintering grounds of this species are not known, though believed to winter in the South China Sea, in the vicinity of Korea and China (Evans 1987, Omura 1988). Presumably they maintain a shallow water/nearshore affinity throughout the southern portion of their range. The exact migration route is not known, but they are believed to migrate directly across the East China Sea, which is one of the few times that they leave their shallow, nearshore habitat (Omura 1988). During this time, they may be found up to 400 nm (741 km) offshore (Weller et al. 2002). Weller et al. (1999) conducted photo-id studies in the Sakhalin region to begin to characterize this population; additional work cited by Meier et al. (2007): N=123. It is believed that the total population size is less than 100 individuals. Considering the few number of animals in the population and the lack of data on the species in this region, a density estimate characteristic of a "very low-level species" is proposed for the winter.

North Pacific right whale: There has been a limited search effort in the South China Sea, but no observations of right whales have ever been reported in the area (Clapham et al., 2004). In addition, right whales migrate further north during the spring, summer, and fall, and are not expected in the area at this time of year. The only possibility of a right whale encounter would be during the winter season.

sperm whale: De Boer (2000) sighted sperm whales in the South China Sea (Mar-Apr), and suggested that animals seen west of the Balabac Strait might be migrating between the South China Sea and the Sulu Sea. Miyashita et al. (1996) also observed sperm whales in the winter (Jan-Mar) in the South China Sea, very close to the Philippines. No data on density estimates or stock estimates were provided in either study. Because this region is found in the lower latitudes, it is most probable that females and juveniles would be in the area. The best available density estimate (0.00123/km^2) is from a recent survey around Guam and the Mariana Islands (Department of the Navy, 2007). This is comparable to Mobley's estimate (0.0010 animals/km^2) where sperm whales were generally seen in the outer 5% of his survey effort (Mobley et al., 2000) and is also comparable to the density estimate (0.0029 animals/km^2) calculated from the summer/fall survey off Hawaii in 2002 (Barlow, 2006). Abundance estimate is for the North Pacific stock that migrates between Alaska and the western North Pacific (Angliss and Lodge, 2002).

Kogia: Smith et al. (1997) reported that *Kogia* were found in "whale temples" in nations surrounding the South China Sea. No density or abundance estimates are available. No sightings of *Kogia* spp. were made by De Boer (2000). Summing the abundances of *Kogia* spp. in the geographic strata defined by Ferguson and Barlow (2001), an overall abundance of 350,553 animals is computed in the eastern tropical Pacific. At this latitude, expect *Kogia breviceps* and *Kogia simus*. Reviewing density estimates calculated in the eastern Pacific Ocean at about 20°N (Ferguson and Barlow, 2003), a density estimate of 0.0017/km^2 was modeled. This is comparable to the density

estimates for pygmy sperm whale (0.00291/km^2 (CV=1.12) and dwarf sperm whale (0.00714/km^2 (CV=0.74) observed within the Hawaii EEZ (Barlow, 2006).

Cuvier's beaked whale: De Boer (2000) sighted Cuvier's beaked whales during his cruise through the South China Sea. No density or stock estimate data are available for this region. Considering habitat preferences (e.g., water temperature, bathymetry), it was determined that best data available are a density estimate (0.0003/km^2) and an abundance estimate of 90,725 animals from the same latitude in the eastern Pacific (Ferguson and Barlow, 2003). This is comparable to that estimated for the Hawaii EEZ (0.00621/km^2; (Barlow, 2006)) and the mean predicted density estimate for the ETP (0.00455/km^2; (Ferguson et al., 2006b)).

Blainville's beaked whale: Miyazaki et al. (1987) did not report any strandings of *M. densirostris* from the South China Sea. De Boer (2000) and Miyashita et al. (1996) did not observe any *M. densirostris* during their research cruises. Without any data on stock or density estimates for the western North Pacific, it is roughly estimated that the data from the eastern tropical Pacific (Ferguson and Barlow 2001, 2003) are appropriate. The *Mesoplodon densirostris* estimate added to one-fifth of the *Mesoplodon* spp. abundance estimate is 8,032. This density estimate is comparable to that for Blainville's beaked whales in the Hawaii EEZ (0.00117/km^2; (Barlow, 2006)), in the main Hawaiian Islands (0.0012/km^2; Mobley et al., 2001), and the mean predicted density estimate for the ETP *Mesoplodon* spp. (0.000296/km^2; (Ferguson et al., 2006b)).

ginkgo-toothed beaked whale: Miyazaki et al. (1987) report no strandings of *M. ginkgodens* from the South China Sea, and De Boer (2000) and Miyashita et al. (1996) did not observe *M. ginkgodens* during their research cruises. Since no data on density or stock estimates are available for this species, it was roughly estimated that the density (0.0005/km^2) and abundance estimates (22,799 animals) for *Mesoplodon* spp. at the same latitude in the eastern Pacific (Ferguson and Barlow 2001, 2003) are approximate. This density estimate is comparable to that for unidentified beaked whales in the Hawaii EEZ (0.00015/km^2; (Barlow, 2006)) and the mean predicted density estimate for the ETP *Mesoplodon* spp. (0.000296/km^2; (Ferguson et al., 2006b)).

false killer whale: Miyashita (1993) suggests that animals summering in the Sea of Japan are probably from a different stock, by analogy of Pacific white-sided dolphins. Animals in the East and South China seas are probably part of this inshore Archipelago stock. Kishiro and Kasuya (1993) cited Miyashita (1986) as estimating the population wintering in the East China Sea at 3,259. Since these data represent only about one-third of the habitat of false killer whales in the South China Sea, the population estimate is multiplied by 3 for the inshore Archipelago stock estimate (9777). False killer whales are sighted infrequently in the South China Sea (De Boer, 2000; Miyashita et al., 1996; Smith et al., 1997). There are no data on density estimates for the South China Sea. The best available density estimate (0.00111/km^2) is calculated from the winter/spring survey around Guam and the Mariana Islands (Department of the Navy, 2007). This is an order of magnitude larger than the density estimate (0.0001/km^2) calculated from the summer/fall survey in the Hawaii EEZ (Barlow, 2006) and comparable to nearshore Hawaii waters (0.0017 animals/km^2) during the spring, summer and fall (Mobley et al., 2000).

pygmy killer whale: Leatherwood and Reeves (1983) stated that this species is not abundant in any particular area, but is widely distributed in tropical waters. Pygmy killer whales are seen relatively frequently in the ETP, especially near Hawaii. Pygmy killer whales were seen by De Boer (2000) during his research cruise through the South China Sea, known from historical "whale temples" (Smith et al. 1997), but not seen by Miyashita et al. (1996). No mention of these animals exists in Japanese whaling records (Kishiro and Kasuya 1993). There are no data on density or stock estimates off Japan or Taiwan (Miyashita 1993), or nearshore Hawaii (Mobley et al. 2000). The best available density estimate (0.00014/km^2) is calculated from the winter/spring survey around Guam and the Mariana Islands (Department of the Navy, 2007). This is comparable to the density estimate (0.00039/km^2) calculated from the summer/fall survey in the Hawaii EEZ (Barlow, 2006). An abundance estimate (30,214) from the eastern Pacific (Ferguson and Barlow, 2003) was used.

melon-headed whale: Leatherwood and Reeves (1983) stated that melon-headed whales are rare except in the Philippine Sea. Distributed in tropical and subtropical waters, preferring equatorial water masses, they have been observed in the South China Sea (De Boer, 2000) and in "whale temples" on islands surrounding the South China Sea (Smith et al. 1997). However, they were not observed by Miyashita et al. (1996). The best available density estimate (0.00428/km^2) is calculated from the winter/spring survey around Guam and the Mariana Islands (Department of the Navy, 2007). This is comparable to the density estimate (0.0012/km^2) calculated from the

summer/fall survey in the Hawaii EEZ (Barlow, 2006) and in nearshore Hawaii waters (0.0021 animals/km^2) during the spring, summer and fall (Mobley et al., 2000). An abundance estimate in the eastern North Pacific (36,770) (Ferguson and Barlow 2003) was used.

short-finned pilot whale: Smith et al. (1997) reported that short-finned pilot whales are found in "whale temples" on islands surrounding the South China Sea. De Boer (2000) did not observe pilot whales during his research cruise, but Miyashita et al. (1996) did observe them in the western North Pacific. With limited data for this particular region, data from the Pacific coast of Japan were used. Miyashita (1993) estimated abundance of short-finned pilot whales from 34 sighting cruises associated with the Japanese drive fishery (53,608 (CV=0.224)). He also derived density estimates in 1° latitude by 1° longitude boxes. Kishiro and Kasuya (1993) reported a southern limit to the short-finned pilot whale range of approximately 20°N; therefore, a density estimate was derived as one-half the density estimate of the area south of Japan. Kasuya et al. (1988) suggest that there might be more than one stock of short-finned pilot whales off the Pacific coast of Japan and Taiwan, since there is a southern form found south of the Kuroshio Current front (south of 35°N) and a northern form found between the Kuroshio Current front and the Oyashio Current front (from approximately 35-43°N). However, the northern form has not been harvested by Japanese drive fisheries (Kishiro and Kasuya 1993), and therefore, it was not included in the above analyses (Miyashita 1993). The best available density estimate (0.00159/km^2) is calculated from the winter/spring survey around Guam and the Mariana Islands (Department of the Navy, 2007). This is comparable to the density estimate (0.0036/km^2) calculated from the summer/fall survey in the Hawaii EEZ (Barlow, 2006) and an order of magnitude less than in nearshore Hawaii waters (0.0237 animals/km^2) during the spring, summer and fall (Mobley et al., 2000).

Risso's dolphin: Smith et al. (1997) reported that Risso's dolphin were found in "whale temples" in nations on the South China Sea, but not seen by Miyashita et al. (1996) or De Boer (2000) during their research cruises. Miyashita (1993) suggests by analogy to bottlenose dolphins and Pacific white-sided dolphins that animals summering in Sea of Japan are a separate stock from the western North Pacific. There have been no separate data reported for the Sea of Japan, East China Sea, or South China Sea, though. Therefore, the western North Pacific stock estimate (83,289 (CV=0.179)) and the density estimate derived for southeast Pacific coast of Japan/east of Taiwan (Miyashita 1993) were used. This is within the range of densities estimated in the eastern North Pacific (Ferguson and Barlow, 2001, 2003) and higher than those around Hawaii (not observed by Mobley et al. (2000) or Department of the Navy (2007); 0.0010/km^2 (Barlow, 2006)).

common dolphin: Common dolphin has been found in "whale temples" in nations along the South China Sea (Smith et al. 1997). There are no data on density or stock estimates (Miyashita 1993). This is a gregarious species, not unusual to find associated with Pacific white-sided dolphins in eastern North Pacific feeding grounds. These dolphins are pelagic, offshore creatures encountered along or seaward of the 183-m (100-fm) contour, and found in waters of temperature 10-28°C (50-82.4°F). They are very widely distributed, occurring in all oceans to the limits of tropical and warm temperate waters (Leatherwood and Reeves 1983). Without any data on stock or density estimates for the western North Pacific, it is roughly estimated that the data from the eastern tropical Pacific (Ferguson and Barlow 2001, 2003) are appropriate. Common dolphins were not sighted around Hawaii in recent surveys (Barlow, 2006; Mobley et al., 2000) or around Guam or the Mariana Islands (Department of the Navy, 2007).

bottlenose dolphin: Smith et al. (1997) reported that bottlenose dolphins are found in "whale temples" in South China Sea nations. Miyashita (1993) reports that reproductive differences suggest that animals from the Pacific and East China Sea are different stocks. Kishiro and Kasuya (1993) cite Miyashita (1986) as estimating the abundance of the stock in the East China Sea as 35,046. Since these data represent only about one-third of the habitat of bottlenose dolphins in the East China Sea, the population estimate is multiplied by 3 for the inshore Archipelago stock estimate (105,138). It is assumed that animals found in the Sea of Japan and South China Sea are of the same stock. No density estimates are available for this stock; therefore, a density estimate was derived from the southeast Pacific coast of Japan/east of Taiwan (Miyashita 1993)(0.0146/km^2). This is within the range of densities estimated in the eastern North Pacific (Ferguson and Barlow, 2001, 2003) and higher than those around Hawaii (0.0103/km^2 Mobley et al. (2000); 0.0013/km^2 (Barlow, 2006)) and around Guam and the Mariana Islands (0.00021/km^2) (Department of the Navy, 2007).

spinner dolphin: Gilpatrick et al. (1987) reported a high density of sightings in the Korea Strait and adjacent waters to the north, but none were reported from the South China Sea or Philippine Sea. Spinner dolphins are not mentioned in historical Japanese whaling records (Kishiro and Kasuya 1993), reported during the De Boer (2000)

research cruise, or encountered in historical "whale temples" (Smith et al. 1997). There are no data on density or stock estimates available (Miyashita 1993). The best available density estimate (0.00314/km^2) is calculated from the winter/spring survey around Guam and the Mariana Islands (Department of the Navy, 2007). This is comparable to that observed in the Hawaii EEZ (0.00137/km^2; Barlow, 2006) and an order of magnitude less than that observed in nearshore waters of Hawaii (0.0443/km^2) (Mobley et al., 2000). The best data available abundance estimate is for whitebelly spinner dolphins (1,015,059) from the eastern tropical Pacific (Ferguson and Barlow 2003)**.**

pantropical spotted dolphin: These animals have been reported during the De Boer (2000) research cruise, observed in winter (Jan-Feb) in South China Sea (Miyashita et al., 1996), and reported from historical "whale temples" (Smith et al. 1997). Gilpatrick et al. (1987) summarized one report from west of Taiwan in the northern portion of the South China Sea. Miyashita (1993) summarized data from 34 sighting cruises conducted as part of the Japanese drive fishery. There is no discontinuity in sightings to suggest different stocks, though based on data from the ETP, it is possible that multiple populations exist in the western North Pacific (Miyashita 1993). In the western North Pacific, total population size was 438,064 (CV=0.174); density estimate was 0.0137/km^2. It was estimated that the population in South China Sea was one-half the abundance of the western North Pacific stock (219,032) with the same density estimate of 0.0137/km^2. This is comparable to those observed in the Hawaii EEZ (0.00366/km^2; Barlow, 2006) and in nearshore Hawaii waters (0.0407/km^2; (Mobley et al., 2000)).

striped dolphin: These animals were not reported during the De Boer (2000) research cruise in March-April, but seen by Miyashita et al. (1996) in the South China Sea are Jan-Feb cruise. No data on density or abundance estimates for the South China Sea is available. Two concentrations of striped dolphin are recognized in the western North Pacific: one south of 30°N and the other in the offshore waters north of 30°N. There is the potential for three populations in the area: one south of 30°N, one inshore north of 30°N, one offshore north of 30°N, east of 145°E though the boundaries between these populations have not been resolved (Miyashita 1993). Therefore, Miyashita (1993) derived a total population estimate (570,038 (CV=0.186)). One-half of the density estimate off southern Japan/east Taiwan for this site (0.0164/km^2) was used. This is an order of magnitude greater than the density estimates from the Hawaii EEZ (0.00536/km^2; Barlow, 2006), from nearshore Hawaii (0.0016/km^2; Mobley et al., 2000), and from Guam and the Mariana Islands (0.00616/km^2; Department of the Navy, 2007).

rough-toothed dolphin: Rough-toothed dolphins have a primarily pelagic distribution in tropical to warm temperate waters. They are seen from time to time with bottlenose dolphins and short-finned pilot whales, and are reportedly rare off Japan and in the heavily studied eastern tropical Pacific. These animals have been found in "whale temples" in South China Sea nations (Smith et al. 1997). The best available data are a density (0.0040/km^2) and abundance estimate (145,729) from eastern Pacific (Ferguson and Barlow, 2001, 2003) was used. This is comparable to those observed in the Hawaii EEZ (0.00355/km^2; Barlow, 2006) and in nearshore Hawaii waters (0.0017/km^2; (Mobley et al., 2000)) and an order of magnitude larger than that observed around Guam and the Mariana Islands (0.00029/km^2; Department of the Navy, 2007).

Fraser's dolphin: Highly gregarious groups of a hundred to a thousand dolphins have been observed, and occasionally have been found mixed in herds of spotted dolphins. Fraser's dolphins have also been observed in the company of false killer whales, sperm whales, striped dolphins, and spinner dolphins. Their diet consists of squid, crustaceans, and deep-sea fish (Leatherwood and Reeves 1983). Comparing the feeding ecology of spinner and Fraser's dolphins, spinner dolphins feed primarily in upper 200 m (656 ft), but maybe as deep as 400 m (1312 ft), whereas Fraser's are more diverse, feeding from the surface to as deep as 600 m (1968 ft). Kishiro and Kasuya (1993) report catches off the Pacific coast of Japan in drive fisheries. Dolar et al. (2003) report Fraser's and spinners found together in the eastern Sulu Sea, Philippines. Without any data on stock or density estimates for the western North Pacific, it is roughly estimated that the estimates (0.0040/km^2 and 220,789 animals) from the eastern tropical Pacific (Ferguson and Barlow 2001, 2003) are appropriate. This is comparable to that observed in the Hawaii EEZ (0.00417/km^2; Barlow, 2006).

Hawaii-South/Summer

General Area Information:

The waters around the Main Hawaiian Islands (MHI) have been systematically surveyed as part of the Acoustic Thermometry of Ocean Climate Marine Mammal Research Program (ATOC MMRP) during the peak humpback season (mid-Feb through mid-April) (Mobley, 2006). The aerial surveys were designed to assess the distribution and abundance of marine mammals and sea turtles within approximately 25 nautical miles (nm) of the MHI, in order to assess the potential effects of the ATOC transmissions. The first systematic shipboard survey of the Hawaii EEZ was conducted from August to November, 2002 (Barlow, 2006). Because of the spatial and temporal characteristics of these surveys, the knowledge of marine mammals around the Hawaiian Islands is growing, but still relatively limited, particularly for mysticete whales which migrate seasonally to offshore waters. Much more extensive survey work has been conducted in the eastern tropical Pacific (Ferguson and Barlow, 2001, 2003; Ferguson et al., 2006a; Ferguson et al., 2006b), but it is not known whether these animals are part of the same population that occurs around the Hawaiian Islands.

Specific Species Information:

Blue whale: A western North Pacific stock of blue whale is recognized for U.S. management purposes, though they are extremely rare in the area (Carretta et al., 2007). It is hypothesized that blue whales that feed along the Aleutian Island chain in the summer winter north of Hawaii, though only one visual sighting of blue whales has been recorded (Carretta et al., 2007). Further evidence of their occurrence in the area exists in acoustic recordings. Stafford et al. (2001) show that recordings made near Kaneohe, Hawaii from August 1992 through April 1993 consisted of approximately 30% of the northwest Pacific blue whale call type and 70% of northeast Pacific call type, with western North Pacific calls dominating during the winter and eastern North Pacific calls dominating during the summer. Other papers on acoustic censusing of blue whales in eastern North Pacific are Moore et al. (1997) and Stafford et al. (1999). Because of the limited data available for the blue whales around Hawaii and the current uncertainty in blue whale stock delineation in the North Pacific (IWC recognizes only one stock in North Pacific; NOAA Fisheries delineates two stocks in U.S. EEZ waters, though up to five populations are believed to exist in the entire North Pacific basin (Reeves et al., 1998); and acoustic data suggest two populations), density estimate ($0.0002/km^2$) (Ferguson and Barlow, 2001, 2003) and stock abundance (1548 (CV=0.16)) (Barlow and Forney, 2007) were derived from data on the eastern North Pacific stock. There have been no recent sightings of blue whales around Hawaii in recent years (Barlow, 2006; Mobley, 2006)

Fin whale: Hawaii stock is recognized (Carretta et al., 2007). There has been acoustic evidence for presence in fall and winter (Moore et al., 1998; Thompson and Friedl, 1982) and one sighting in nearshore waters (February) (Mobley et al., 1996). From the five sightings reported during the 2002 summer/fall survey (Barlow, 2006), an abundance estimate of 174 (CV=0.72) was calculated for the Hawaii stock (Carretta et al., 2007). However, because the summer/fall 2002 survey did not occur during the peak period of their abundance in Hawaii waters, Barlow (2006) did not recommend deriving an abundance estimate. Because of this, density estimate ($0.0007/km^2$) (Ferguson and Barlow, 2001, 2003) and stock abundance (2099 (CV=0.18)) (Barlow and Forney, 2007) were derived from data in the eastern North Pacific. These estimates are conservative because McDonald and Fox (1999) derived an average calling whale density estimate of 0.027 animals per 1000 km^2 ($0.000027/km^2$) based on recordings made north of Oahu, Hawaii – a value an order of magnitude less than what was modeled. The seasonal maximum calling whale density was about three times the average, or 0.081 animals/1000 km^2 (McDonald and Fox, 1999), still considerably less than the modeled density.

The following table from McDonald and Fox (1999) gives a sense of the variability in the derivation of call density estimates. Based on the chosen methodology and parameters, the call density ranged from 0.011/1000 km^2 to 0.106/1000 km^2.

TABLE I. Relation of average call density estimate to time constant and range (From McDonald and Fox, 1999)

SNR	Range (km)	Number of Detections		Call Density/1000 km^2	
		TC=4h	TC=8h	TC=4h	TC=8h
1.0–1.5	16.0–24.0	143	85	0.042	0.025
1.5–2.5	9.6–16.0	54	36	0.031	0.020
2.5–5.0	4.75–9.6	15	10	0.016	0.011
5.0–10	2.25–4.75	11	8	0.038	0.027
>10	0–2.25	9	7	0.106	0.083
Average Call Density/1000 km^2 Weighted by number of detections				0.040	0.027

Bryde's whale: Hawaii stock is recognized (Carretta et al., 2007)**.** The best available density estimate (0.00019/km^2) and abundance estimate (469, CV=0.45) are calculated from the summer/fall survey in the Hawaii EEZ (Barlow, 2006).

Humpback whale: They are not expected in the area during summer. Central North Pacific stock identified as individuals that migrate from summer/fall feeding grounds of northern British Columbia and southeast Alaska (Prince William Sound west to Kodiak), to winter/spring breeding and calving grounds of the Hawaiian Islands (Carretta et al., 2007)**.** Some exchange between winter/spring areas has been documented, as well as movement between Japan and British Columbia, and Japan and the Kodiak Archipelago (Calambokidis et al., 1997). Recent acoustic surveys (Norris et al., 1999) suggest a northbound migration heading of approximately magnetic north (10° true), with a "migration corridor" of 150-160°W. Animals are cycling through the breeding grounds with an average residency of approximately 30-45 days. The abundance estimate for the entire central North Pacific stock is 4005 (CV=0.095) (Angliss and Outlaw, 2007). Mobley et al. (2001) conducted aerial surveys throughout the main Hawaiian Islands during 1993, 1995, 1998, and 2000. Abundances during these surveys were 2,754 (95% CI: 2,044-3,468), 3,776 (95% CI: 2,925-4,627), 4,358 (95% CI: 3,261-5,454), and 4,491 (95%) CI: 3,146-5,836, respectively. Mobley et al.'s (1999) aerial surveys observed that 64% of humpback whales were found in waters of depths less than 183 m (100 fm). Density estimate for waters greater than 183 m (100 fm) derived from eastern North Pacific survey results (Barlow and Forney, 2007) in which the density of animals migrating through the region was calculated (0.0008/km^2). This is comparable to other density estimates in the eastern North Pacific (Ferguson and Barlow, 2001, 2003).

Minke whale: They are not abundant anywhere in the Pacific except in the Bering and Chukchi seas and in the Gulf of Alaska. A Hawaii stock is recognized that occurs seasonally (November-March) in Hawaiian waters, though no estimate of abundance has been calculated (Carretta et al., 2007). Minke whales were observed and acoustically detected during the 2002 summer/fall survey of the Hawaiian EEZ (Barlow, 2006). IWC identifies three Pacific stocks – one in Sea of Japan/East China Sea, one in remainder of western Pacific west of 180°, and one east of 180°. The modeled stock estimate is the IWC stock estimate for the western North Pacific stock (Approximate point estimate of 25,000; Approximate 95% confidence limits of 12,800-48,600) (IWC website http://www.iwcoffice.org/conservation/estimate.htm accessed 1 April 2008). The best density estimate (0.0002/km^2) is from the eastern North Pacific (Ferguson and Barlow, 2001, 2003).

Sperm whale: The best available density estimate (0.00282/km^2) and abundance estimate (6919, CV=0.81) are calculated from the summer/fall survey in the Hawaii EEZ (Barlow, 2006). The density estimate is comparable to nearshore Hawaiian waters (0.0010/km^2; Mobley et al., 2000).

Kogia: Hawaiian stocks of pygmy and dwarf sperm whales are recognized (Carretta et al., 2007). Mobley et al. (2000) saw 2 pods for a total of 5 individuals during his 1993-1998 survey efforts. No density or abundance estimates were derived. The best available estimates are combined pygmy and dwarf sperm whale density (0.01005/km^2) and abundance (24,657; CV=1.86), calculated from the summer/fall survey in the Hawaii EEZ (Barlow, 2006).

Cuvier's beaked whale: The best available density estimate (0.00621/km^2) and abundance estimate (15242, CV=1.43) are calculated from the summer/fall survey in the Hawaii EEZ (Barlow, 2006). The density estimate is an order of magnitude larger than the density estimate in nearshore Hawaiian waters (0.0008/km^2; Mobley et al., 2000).

Blainville's beaked whale: The best available density estimate (0.00117/km^2) and abundance estimate (2872, CV=1.25) are calculated from the summer/fall survey in the Hawaii EEZ (Barlow, 2006). The density estimate is comparable to nearshore Hawaiian waters (0.0012/km^2; Mobley et al., 2000).

Longman's beaked whale: Longman's beaked whale has only recently been identified to species (Dalebout et al., 2003; Pitman et al., 1999). It is considered one of the rarest and least known cetacean species. The best available density estimate (0.0004 animals/km^2) and abundance estimate (1,007, CV=1.26) are calculated from the summer/fall survey in the Hawaii EEZ (Barlow, 2006). No other density estimates exist for this species around Hawaii (Mobley et al., 2000).

Killer whale: Killer whales are considered rare in Hawaii waters with limited sightings being reported (Carretta et al., 2007). The best available density estimate (0.0001 animals/km^2) and abundance estimate (349, CV=0.98) are calculated from the summer/fall survey in the Hawaii EEZ (Barlow, 2006). Mobley et al. (2000) did not report any sightings in their surveys of waters within 25 nm of the Main Hawaiian Islands.

False killer whale: The best available density estimate (0.00010/km^2) and abundance estimate (236, CV=1.13) are calculated from the summer/fall survey in the Hawaii EEZ (Barlow, 2006). The density estimate is an order of magnitude less than nearshore Hawaiian waters (0.0017/km^2; Mobley et al., 2000).

Pygmy killer whale: Very little information exists about this species in the Hawaii region. Mobley et al. (2000) did not report any sightings in their surveys of waters within 25 nm of the Main Hawaiian Islands. Two sightings were reported during the summer/fall survey in the Hawaii EEZ, resulting in the best available density estimate (0.0004 animals/km^2) and abundance estimate (956, CV=0.83) (Barlow, 2006).

Melon-headed whale: The best available density estimate (0.0012/km^2) and abundance estimate (2950, CV=1.17) are calculated from the summer/fall survey in the Hawaii EEZ (Barlow, 2006). The density estimate is comparable to nearshore Hawaiian waters (0.0021/km^2; Mobley et al., 2000).

Short-finned pilot whale: The best available density estimate (0.00362/km^2) and abundance estimate (8870, CV=1.13) are calculated from the summer/fall survey in the Hawaii EEZ (Barlow, 2006). The density estimate is an order of magnitude less than nearshore Hawaiian waters (0.0237/km^2; Mobley et al., 2000).

Risso's dolphin: The best available density estimate (0.00097/km^2) and abundance estimate (2372, CV=0.65) are calculated from the summer/fall survey in the Hawaii EEZ (Barlow, 2006). There were not enough sightings to derive density or abundance estimates in nearshore waters (Mobley et al., 2000). Hawaiian stock is recognized, though they appear to be rare in the area (Carretta et al., 2007)**. "**Based on the locations of interactions with the Hawaiian longline fishery, it is likely that Risso's dolphins primarily occur in pelagic waters tens to hundreds of miles from the main Hawaiian Islands and are only occasionally found nearshore" (Carretta et al., 2007)**.**

Bottlenose dolphin: The best available density estimate (0.00131/km^2) and abundance estimate (3215, CV=0.59) are calculated from the summer/fall survey in the Hawaii EEZ (Barlow, 2006). The density estimate is an order of magnitude less than nearshore Hawaiian waters (0.0103/km^2; Mobley et al., 2000).

Spinner dolphin: The best available density estimate (0.00137/km^2) and abundance estimate (3351, CV=0.74) are calculated from the summer/fall survey in the Hawaii EEZ (Barlow, 2006). The density estimate is an order of magnitude less than nearshore Hawaiian waters (0.0443/km^2; Mobley et al., 2000).

Pantropical spotted dolphin: The best available density estimate (0.00366/km^2) and abundance estimate (8978, CV=0.48) are calculated from the summer/fall survey in the Hawaii EEZ (Barlow, 2006). The density estimate is an order of magnitude less than nearshore Hawaiian waters (0.0407/km^2; Mobley et al., 2000).

Striped dolphin: The best available density estimate (0.00536/km^2) and abundance estimate (13,143; CV=0.46) are calculated from the summer/fall survey in the Hawaii EEZ (Barlow, 2006). The density estimate is comparable to nearshore Hawaiian waters (0.0016/km^2; Mobley et al., 2000).

Rough-toothed dolphin: The best available density estimate (0.00355/km^2) and abundance estimate (8709, CV=0.45) are calculated from the summer/fall survey in the Hawaii EEZ (Barlow, 2006). The density estimate is comparable to nearshore Hawaiian waters (0.0017/km^2; Mobley et al., 2000).

Fraser's dolphin: Fraser's dolphin were first documented in Hawaii waters during a recent summer/fall survey (Barlow, 2006), resulting in the best available density estimate (0.0042 animals/km^2) and abundance estimate (10,226, CV=1.16).

Hawaiian monk seal: Mobley et al. (1999) reported only one sighting of a Hawaiian monk seal during his aerial surveys, but his surveys were not properly designed to focus on monk seal counts. Monk seals primarily occur on the Northwest Hawaiian Islands (NWHI), though a respectable population is beginning to establish itself on Niihau and Kauai, with 21 distinct individuals documented on Kauai (Farry, 2003) and a minimum of 52 individuals counted on the MHI (Carretta et al., 2007). Small amount of interaction between subpopulations, and foraging behavior suggest offshore movement patterns (Parrish et al., 2000; Parrish et al., 2002). Modeled best abundance estimate for the stock (Carretta et al., 2007) and a density estimate for a low-level species.

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