Environmental Assessment of Mitigation Alternatives for Issuance of Incidental Take Regulations to U.S. Navy for Training, Maintenance, and Research, Development, Testing, and Evaluation (RDT&E) Activities in the Hawaii Range Complex (HRC)

Office of Protected Resources
National Marine Fisheries Service
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CHAPTER 1 – PURPOSE AND NEED FOR THE ACTION

1.1 **Introduction**

The Marine Mammal Protection Act (MMPA) (16 U.S.C. 1361 et seq.) prohibits the take of marine mammals except under limited circumstances. Individuals seeking to obtain take coverage for marine mammals under the jurisdiction of the National Marine Fisheries Service (NMFS) are required to submit a request to NMFS for 5-year regulations or annual authorizations. *See* 16 U.S.C. §§ 101(a)(5)(A) & (D). In June 2007, the U.S. Navy (Navy) submitted an application to NMFS for 5-year regulations and a Letter of Authorization (LOA) for military readiness activities in the area referred to by the Navy as the "Hawaii Range Complex" (HRC). NMFS' promulgation of regulations, issuance of a 2009 LOA, and issuance of subsequent LOAs as appropriate are therefore required to authorize the Navy to take marine mammals incidental to military readiness activities in the HRC. As described in more detail below and in Section 1.2, this Mitigation Environmental Assessment (Mitigation EA) provides additional analysis of mitigation measures under consideration by NMFS as part of the MMPA rulemaking process.

Sections 101(a)(5)(A) and (D) of the MMPA direct the Secretary of Commerce (Secretary) to allow, upon request, the incidental, but not intentional taking of small numbers of marine mammals by U.S. citizens who engage in a specified activity (other than commercial fishing) within a specified geographical region during periods of not more than five consecutive years each if certain findings are made and regulations are issued or, if the taking is limited to harassment and of no more than 1 year, the Secretary shall issue a notice of proposed authorization for public review.

Authorization shall be granted if NMFS finds that the taking will have a negligible impact on the species or stock(s), will not have an unmitigable adverse impact on the availability of the species or stock(s) for subsistence uses, and if the permissible methods of taking and requirements pertaining to the mitigation, monitoring and reporting of such taking are set forth. In regard to mitigation, NMFS must set forth the means of effecting the least practicable adverse impact on the affected species or stocks and their habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance.

On June 25, 2007, NMFS received an application from the Navy requesting authorization for the take of individuals of 24 species of marine mammals incidental to upcoming Navy training activities to be conducted within the HRC, which covers 235,000 nm^2 around the Main Hawaiian Islands, over the course of 5 years. These training activities are classified as military readiness activities, which have the potential to incidentally take marine mammals present within the HRC by exposing them to sound from mid-frequency or high frequency active sonar (MFAS/HFAS) or to underwater detonations at levels that NMFS associates with the take of marine mammals. Subsequent to the initial application, Navy updated specific aspects of the request and submitted these clarifications to NMFS in February and April 2008.

The issuance of MMPA incidental take regulations and associated LOAs to the Navy is a Federal action, thereby requiring NMFS to analyze the effects of the action on the human environment pursuant to the National Environmental Policy Act (NEPA). The Navy developed an Environmental Impact Statement (EIS) that analyzed the environmental effects of conducting military training, maintenance, and research, development, testing and evaluation (RDT&E) in the HRC. NMFS participated as a cooperating agency in the development of the HRC EIS (e.g., providing information in NMFS' area of expertise and assisting in the environmental effects analysis of naval exercises on endangered species, marine mammals, and other marine resources). NMFS also participated as a cooperating agency in accordance with the NEPA regulations to ensure that the HRC EIS contained adequate information and analysis to allow NMFS to adopt the HRC EIS for the corresponding issuance of the MMPA 5-year incidental take regulations, the 2009 LOA, and future LOAs as appropriate. The HRC Final EIS was published on May 9, 2008,

Based on NMFS' preliminary determinations reached in the development of the proposed rule associated with HRC as well as our analysis of the comments received during the public comment period on the proposed rule, NMFS has determined that the Navy's EIS adequately analyzes the training activities in the HRC and NMFS has adopted the HRC Final EIS to support the proposed issuance of the MMPA incidental take regulations, the 2009 LOA, and future LOAs as appropriate. As mentioned above, NMFS must also prescribe regulations that set forth the

means of effecting the least practicable adverse impact on affected species or stocks and their habitat (i.e., mitigation measures). The Navy's EIS includes a suite of proposed mitigation measures, a discussion of mitigation measures that were considered by the Navy, but eliminated, and an indication that additional mitigation measures (not discussed in the EIS) may be required by NMFS pursuant to the MMPA process.

1.2 Purpose and Need for Action

NMFS' proposed action, as analyzed in this Mitigation EA is the additional analysis of mitigation measures (i.e., consideration of benefits to affected species or stocks and their habitat and effectiveness of such measures based on a practicability standard) and a determination of whether such measures will be included in the MMPA final rule for the HRC. In making a determination of "least practicable adverse impact", NMFS considers the needs of the affected species or stocks and their habitat, as well as the personnel safety, practicality of implementation, and the impact on the effectiveness of the military readiness activity. See 16 U.S.C. 1371(a)(5)(A)(ii). Mitigation measures need only be set forth if regulations are issued authorizing incidental take – if NMFS were to deny the Navy's request for an authorization, an analysis of mitigation would not be necessary – therefore, this Mitigation EA assumes that an authorization will be issued. NMFS has not yet made a final decision regarding the issuance of an authorization, but assumes issuance here as the basis for this analysis. As mentioned previously, NMFS adopted the HRC Final EIS in December 2008 and will rely on that document to support our decision whether or not to issue incidental take regulations, the 2009 LOA, and future LOAs as appropriate. This Mitigation EA is tiered off of the HRC Final EIS and will serve the specific purpose of providing additional analysis of a reasonable range of mitigation alternatives that may be required if an MMPA authorization is issued. If the appropriate findings under the MMPA can be made, the need for this action arises from NMFS' requirement to set forth in any associated regulations and LOAs the requirements pertaining to mitigation.

As described, mitigation is a very important component of the MMPA process and additional analysis of reasonable mitigation measures in this Mitigation EA will further support NMFS' choice of what should be required in regulations, the 2009 LOA, and subsequent LOAs as appropriate, if issued. Additionally, this Mitigation EA allows NMFS to include an analysis of any mitigation options that may have arisen during the MMPA public comment period, which occurred after the publication of the HRC Final EIS.

Many of the mitigation measures analyzed in this document are general measures that could apply to any Navy training action involving sound in the water. NMFS may reference the analysis included in this document for consideration in other Navy actions.

1.3 Description of Action and Alternatives Analyzed in the Mitigation EA

In order to issue incidental take regulations under Section 101(a)(5)(A) of the MMPA, NMFS must set forth the "permissible methods of taking pursuant to such activity, and other means of effecting the least practicable adverse impact on such species or stock and its habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance." The National Defense Authorization Act of 2004 (NDAA) (Public Law 108-136) amended the

MMPA (Section 3(18)(B)) as it relates to "military-readiness activities" and the incidental take authorization process by: removing the "small numbers" and "specified geographical region" limitations; amending the definition of "harassment"; and (most applicable here) indicating that "least practicable adverse impact" shall include consideration of personnel safety, practicality of implementation, and impact on the effectiveness of the military readiness activity.

The Navy's training activities in the HRC are considered military readiness activities. It is incumbent upon NMFS to include in the incidental take regulations, adequate means to achieve the least practicable adverse effect. This means carefully considering the Navy's proposed mitigation, as well as other potential measures, and assessing the benefit of the considered measures to the affected species or stocks of marine mammals and their habitat, while also considering personnel safety, practicality of implementation, and impact on the "military-readiness activity". If NMFS determines that the activity, as proposed (and including the Navy's proposed mitigation), does not include adequate means to achieve the least practicable adverse effect, then NMFS will identify, and discuss with the Navy, additional practicable mitigation measures to further lessen adverse effects. Any mitigation measure prescribed by NMFS should be known to accomplish, have a reasonable likelihood of accomplishing (based on current science), or contribute to the accomplishment of one or more of the general goals listed below:

a) avoidance or minimization of injury or death wherever possible (goals b,c, and d may contribute to this goal).

b) a reduction in the numbers of marine mammals (total number or number at biologically important time or location) exposed to received levels of active sonar, underwater detonations, or other activities expected to result in the take of marine mammals (this goal may contribute to a, above, or to reducing harassment takes only).

c) a reduction in the number of times (total number or number at biologically important time or location) individuals would be exposed to received levels of active sonar, underwater detonations, or other activities expected to result in the take of marine mammals (this goal may contribute to a, above, or to reducing harassment takes only).

d) a reduction in the intensity of exposures (either total number or number at biologically important time or location) to received levels of active sonar, underwater detonations, or other activities expected to result in the take of marine mammals (this goal may contribute to a, above, or to reducing the severity of harassment takes only).

e) a reduction in adverse effects to marine mammal habitat, paying special attention to the food base, activities that block or limit passage to or from biologically important areas, permanent destruction of habitat, or temporary destruction/disturbance of habitat during a biologically important time.

f) for monitoring directly related to mitigation - an increase in the probability of detecting marine mammals, thus allowing for more effective implementation of the mitigation (shut-down zone, etc.)

This document contains an assessment of the mitigation alternatives being considered by NMFS for the issuance of incidental take regulations, the 2009 LOA, and future LOAs, as appropriate, to the Navy for its training exercises in the HRC. Following are the three lternatives:

No Action Alternative: Navy Mitigation Measures – For this decision, the no action alternative consists of NMFS issuing regulations, a 2009 LOA, and future LOAs as appropriate, for the HRC that requires the mitigation measures proposed in the Navy's application for incidental take regulations and LOA with no changes or dditions.

Alternative 1 (Preferred Alternative) – NMFS and the Navy worked together to develop two additional mitigation measures (a Stranding Response Plan and a Humpback Whale Cautionary Area). Alternative 1 is the issuance of regulations, a 2009 LOA, and future LOAs as appropriate to the Navy for the HRC that requires all of the mitigation measures included in the no action alternative plus these two additional measures.

Alternative 2 – NMFS considered a variety of reasonable potential mitigation measures that have been recommended in public comments in the past or discussed internally. Alternative 2 is the issuance of regulations, a 2009 LOA, and future LOAs as appropriate, to the Navy that requires all of the mitigation measures listed in Alternative 1, but with the addition of some subset of the additional suite of mitigation measures considered in this Alternative 2. These additional mitigation measures were developed internally by NMFS, provided in the comments received on the MMPA Notice of receipt or proposed rule, or considered and analyzed by the Navy in the HRC EIS but not proposed as part of the Navy's preferred alternative.

In order to analyze the mitigation alternatives it is necessary to understand the underlying training activities for which incidental take would be authorized. As noted, the HRC Final EIS contains a complete description of these activities. NMFS has adopted the HRC Final EIS prior to reaching a finding on this Mitigation EA and this EA is tiered off of the HRC Final EIS. Additionally, and more specifically, NMFS' proposed rule establishing the framework upon which incidental take authorizations may be issued to the Navy for its HRC training activities contain: a description of the Navy activities; a description of the marine mammals that will likely be taken by the Navy activities; an analysis of the permissible methods of take and their impacts to marine mammals; and a finding of negligible impact. These provisions, as appropriately updated via the MMPA process, are a required part of any final rule issued for this action. Applicable portions of the proposed rule are incorporated by reference herein and may be viewed at: http://www.nmfs.noaa.gov/pr/permits/incidental.htm#applications. A summary of the major components of NMFS' proposed authorization is included in the next section.

1.4 Background - Summary of NMFS' Proposed Authorization for HRC

As noted above, in order to analyze the mitigation alternatives it is necessary to briefly describe the underlying training activities for which incidental take would be authorized (additional information is available in the HRC Final EIS).

1.4.1 Specified Activities Covered by the Proposed Authorization

NMFS has proposed regulations to authorize the take of marine mammals incidental to a subset of the Navy's military readiness training activities in the HRC that include the use of mid-frequency active sonar (MFAS), high frequency active sonar (HFAS), and underwater explosive detonations. Following are summaries of the specified activities.

1.4.1.1 *Activities Utilizing Active Sonar Sources*

For the HRC, the training activities that utilize active tactical sonar sources fall into the category of Anti-submarine Warfare (ASW) exercises. During training and testing in the HRC, tactical military sonars are used to detect submarines and other underwater contacts. This task requires the use of the sonar mid-frequency range (1 kilohertz [kHz] to 10 kHz) predominantly, as well as one source in the high frequency range (above 10 kHz) that operates at a source level high enough to be considered in the modeling of take estimates. The high frequency source will contribute a comparatively very small amount to the total amount of active sonar that marine mammals will be exposed to during the Navy's proposed activities; however, for this document we will refer to the collective high and mid-frequency sonar sources as MFAS/HFAS. Table 1 (below) summarizes the nominal characteristics of the acoustic sources used in the HRC EIS modeling to predict take of marine mammals.

Sonar Type	Description of Sonar	Source Depth (m)	Center Freq (kHz)	Source Level (dB)	Spacing (m)*	Vertical Directivitiy	Horizontal Directivity	Units per Hour	Total Amount per Year
MK-48	**Torpedo**	27	> 10	classified	144	Omni	Omni	one torpedo run	313 runs
AN/SQS-53	**Surface Ship**	7	3.5	235	154	Omni	240° Forward	120 pings	1284 hours
AN/SQS-56	**Surface Ship**	7	7.5	225	154	Omni	30° Forward	120 pings	383 hours
AN/SSQ-62	**Sonobuoy**	27	8	201	450	Omni	Omni	8 sonobuoys	2423 buoys
AN/AQS-22	**Helo Dipping**	27	4.1	217	15	Omni	Omni	2 dips	1010 dips
AN/BQQ-10	**Submarine**	91	classified	classified	n/a	Omni	Omni	2 pings	200 hours

Table 1. Parameters used for modeling the six sonar sources and the estimated annual operation. Many of the actual parameters and capabilities of these sonars are classified. Parameters used for modeling were derived to be as representative as possible. When, however, there were a wide range of potential modeling values, a nominal parameter likely to result in the most impact was used so that the model would err towards overestimation.

*Spacing means distance between pings at the nominal speed

As noted in the table above, the Navy requires incidental take coverage for sonar sources operated from several different platforms: surface ships, submarines, aircraft (sonobuoys may be dropped from planes or helicopters, dipping sonar is operated from a helicopter), or torpedoes. Within Navy ASW exercises in the HRC, the two types of hull-mounted (i.e., surface ship) sonar sources are of the highest power and operate for the greatest number of hours and, therefore, account for the majority of the estimated takes of marine mammals.

The ASW training in the HRC for which incidental take regulations are requested involves the use of the sound sources listed above in several different types of exercises that could occur anywhere in the HRC, although the Navy indicates that the majority of the exercises occur in areas where water depths exceed 2000m. Table 2 lists the types of ASW exercises and indicates the areas they are conducted in, the average duration of an exercise, the average number of exercises/per year, and the time of year they are conducted. Table 1, above, indicates the total number of hours for each source type anticipated for each year for each exercise type

and NMFS analyzed the potential impacts to marine mammals from the operation of these amounts +/- 10%. A brief description of the general exercise types is included below.

Training Operation	Location Where Exercise May Be Conducted	Time of Year Conducted	Number of Training Events per/year	Average Length of Exercise (hrs)
Other ASW (TRACKEX, TORPEX, etc.)	Hawaii OpArea	Any time	32	13.5
RIMPAC	Hawaii OpArea	Summer Only**	1 every other year	1 month (44 individual ASW ops from 2-24 hours long)
USWEX	Hawaii OpArea	Any time	5	3-4 days, including several 16-hr ASW ops
Multi Strike Group	Hawaii OpArea	Any time	1*	5 to 10 days including multiple 12-hr ASW ops

Table 1. Summary of locations, durations, and times of year of ASW exercises.
* If a Multiple Strike Group Exercise were planned for any given year, either other exercises (of a different type) would be cancelled or limited to ensure that the specified number of sonar hours (and, therefore, take of marine mammals) was not exceeded or the Navy would seek separate MMPA authorization.
** as noted, RIMPAC exercises are limited to the summer months, when humpback whales are not in residence (and, therfore, RIMPAC exercises are not expected to result in the take of humpback whales)
In the years without RIMPAC, the sonar hours conducted would be seasonally and spatially distributed such that no additional exposures of humpback whales to MFAS/HFAS would occur beyond those used to estimate take in the years with RIMPAC

Anti-Submarine Warfare Tracking Exercise (ASW TRACKEX) – An ASW TRACKEX trains aircraft, ship, and submarine crews in tactics, techniques, and procedures for search, detection, and tracking of submarines. No torpedoes are fired during a TRACKEX. ASW TRACKEX includes ships, fixed wing aircraft, helicopters, torpedo targets, submarines, and weapons recovery boats and/or helicopters. As a unit-level exercise, an aircraft, ship, or submarine is typically used versus one target submarine or simulated target. TRACKEXs can include the use of hull-mounted sonar, submarines, or sonobuoys. No explosive ordnance is used in TRACKEX exercises.

Anti-Submarine Warfare Torpedo Exercises (ASW TORPEX) - Anti-Submarine Warfare Torpedo Exercises (ASW TORPEX) train crews in tracking and attack of submerged targets, firing one or more Recoverable Exercise Torpedoes. TORPEX targets used in the Offshore Areas include submarines, MK-30 ASW training targets, and MK-39 Expendable Mobile ASW Training Targets. Submarines periodically conduct torpedo firing training exercises within the Hawaii Offshore OPAREA. TORPEXs can include the use of hull-mounted sonar (usually one or two per exercise), submarines, sonobuoys, or MK-48 torpedoes (inert).

Rim of the Pacific (RIMPAC) - RIMPAC is a multi-threat maritime exercise where submarines, surface ships, and aircraft from the U.S. and other countries conduct many different exercise events, including ASW against opposition submarine targets to improve coordination and interoperability of combined, bilateral and joint forces of participating nations. ASW training events are complex and highly variable. For RIMPAC, the primary event involves a

Surface Action Group (SAG), consisting of one to five surface ships equipped with sonar, with one or more helicopters, and a maritime patrol craft searching for one or more submarines. There will be approximately four to eight SAGs for a typical RIMPAC. For the purposes of this analysis, each SAG event is counted as an ASW training activity. One or more ASW events may occur simultaneously within the HRC. In addition to including potential training with all of the acoustic sources mentioned previously, RIMPAC includes training events that involve underwater detonations (described in the next section: Activities Utilizing Underwater Detonations), including Sinking Exercise, Air-to-Surface Gunnery Exercise, Surface-to-Surface Gunnery Exercise, Naval Surface Fire Support, Air-to-Surface Missile Exercise, Surface-to-Surface Missile Exercise, Bombing Exercise, Mine Neutralization Exercise, and IEER/EER Exercise. These exercises involving underwater detonations do not overlap in space and time with sonar exercises and have been included in the training events described in the next Section.

Undersea Warfare Exercise (USWEX) - Carrier Strike Groups (CSGs) and Expeditionary Strike Groups (ESGs) that deploy from the west coast of the United States will experience realistic submarine combat conditions and assess submarine warfare training capabilities postures in the HRC prior to their deployment to real world operations elsewhere. As a combined force, submarines, surface ships, and aircraft will conduct ASW against opposition submarine targets, which include real submarines, targets that simulate the operations of an actual submarine, and virtual submarines interjected into the training events by exercise controllers. USWEX training events are complex and highly variable. The primary event involves from one to five surface ships equipped with sonar, with one or more helicopters, and a maritime control craft searching for one or more submarines. In addition to the use of hull-mounted sonar (AN/SQS-53 and AN/SQS-56), submarine sonar, helicopter dipping sonar, and sonobuoys, USWEX includes training events that involve underwater detonations as described in the next section (Activities Utilizing Underwater Detonations), including Air-to-Surface Gunnery Exercise, Air-to-Surface Missile Exercise, and Bombing Exercise. These exercises utilizing underwater detonations do not overlap in space and time with sonar exercises and have been included in the training events described in the next section.

Multiple Strike Group Exercise - A Multiple Strike Group Exercise consists of events that involve Navy assets engaging in battle scenario, with U.S. forces (blue forces) pitted against a notional opposition force (red force). Participants use and build upon previously gained training skill sets to maintain and improve the proficiency needed for a mission-capable, deployment-ready unit. As described above for USWEX, as a combined force, submarines, surface ships, and aircraft will conduct ASW against opposition submarine targets.
In addition to the use of hull-mounted sonar (AN/SQS-53 and AN/SQS-56), submarine sonar, helicopter dipping sonar, and sonobuoys, the Multiple Strike Group Exercise includes training events that involve underwater detonations as described in the next Section (Activities Utilizing Underwater Detonations), including Sinking Exercise, Air-to-Surface Missile Exercise, Mine Neutralization Exercise, and EER/IEER Exercise. These exercises utilizing underwater detonations do not overlap in space and time with sonar exercises and have been included in the events described in the next Section.

1.4.1.2 *Activities Utilizing Underwater Detonations*

Exercises involving underwater detonations may utilize either live or inert ordnance of the types listed below in Table 3. Training events that involve explosives and underwater detonations occur throughout the year and are described briefly below and summarized in Table 4.

Ordnance	Net Explosive	Detonation Depth
5" Naval gunfire	9.54 lbs	1 ft
76 mm Rounds	1.6 lbs	1 ft
Maverick	78.5 lbs	2 m
Harpoon	448 lbs	2 m
MK-82	238 lbs	2 m
MK-83	574 lbs	2 m
MK-84	945 lbs	2 m
MK-48	851 lbs	50 ft
Demolition Charges	20 lbs	Bottom
EER/IEER	5 lbs	20m

Table 3. Ordnance utilized in HRC Explosive exercises

Sinking Exercise (SINKEX) - In a SINKEX, a specially prepared, deactivated vessel is deliberately sunk using multiple weapons systems. The exercise provides training to ship and submarine and aircraft crews in delivering both live and inert ordnance on a real target. These target vessels are remediated to standards set by the Environmental Protection Agency. The duration of a SINKEX is unpredictable since it ends when the target sinks, sometimes immediately after the first weapon impact and sometimes only after multiple impacts by a variety of weapons. Some or all of the following weapons may be employed in a SINKEX: three HARPOON surface-to-surface and air-to-surface missiles; two to eight air-to-surface Maverick missiles; two to four MK-82 General Purpose Bombs; two Hellfire air-to-surface missiles; one SLAM-ER air-to-surface missile; two-hundred and fifty rounds for a 5-inch gun; and one MK-48 heavyweight submarine-launched torpedo.

Surface-to-Surface Gunnery Exercise (S-S GUNEX) - Surface gunnery exercises (GUNEX) take place in the open ocean to provide gunnery practice for Navy and Coast Guard ship crews. GUNEX training events conducted in the Offshore OPAREA involve stationary targets such as a MK-42 FAST or a MK-58 marker (smoke) buoy. Typical ordnance expenditure for a single GUNEX is a minimum of 21 rounds of 5-inch or 76-mm ammunition, and approximately 150 rounds of 25-mm or .50-caliber ammunition. Both live and inert training rounds are used.

Naval Surface Fire Support Exercise - Navy surface combatants conduct fire support exercise (FIREX) training events at PMRF on a virtual range against “Fake Island”, located on Barking Sands Tactical Underwater Range (BARSTUR). Fake Island is unique in that it is a virtual landmass simulated in three dimensions. Ships conducting FIREX training against targets

on the island are given the coordinates and elevation of targets. PMRF is capable of tracking fired rounds to an accuracy of 30 feet (9.1 m).

Air-to-Surface Missile Exercise (A-S MISSILEX) - The A-S MISSILEX consists of the attacking platform releasing a forward-fired, guided weapon at the designated towed target. The exercise involves locating the target (seaborne powered targets (SEPTARs), Improved Surface Towed Targets (ISTTs), and decommissioned hulks), then designating the target, usually with a laser. From 1 to 16 aircraft carrying live or inert missiles, or flying without ordnance (dry runs), are used during the exercise. When a high-speed anti-radiation missile (HARM) is used, the exercise is called a HARMEX.

Surface-to-Surface Missile Exercise (S-S MISSILEX) - Surface-to-surface missile exercise (S-S MISSILEX) involves the attack of surface targets at sea by use of cruise missiles or other missile systems, usually by a single ship conducting training in the detection, classification, tracking and engagement of a surface target. Targets could include virtual targets or the SEPTAR or ship deployed surface target. S-S MISSILEX training is routinely conducted on individual ships with embedded training devices. A S-S MISSILEX could include four to 20 surface-to-surface missiles, SEPTARs, a weapons recovery boat, and a helicopter for environmental and photo evaluation.

Bombing Exercise (BOMBEX) - Fixed-wing aircraft conduct BOMBEX events against stationary targets (MK-42 FAST or MK-58 smoke buoy) at sea. An aircraft will clear the area, deploy a smoke buoy or other floating target, and then set up a racetrack pattern, dropping on the target with each pass. At PMRF, a range boat might be used to deploy the target for an aircraft to attack. A BOMBEX may involve either live or inert ordnance.

Mine Neutralization - Mine Neutralization events involve the detection, identification, evaluation, rendering safe, and disposal of mines and unexploded ordnance (UXO) that constitutes a threat to ships or personnel. Mine neutralization training can be conducted by a variety of air, surface and subsurface assets. Tactics for neutralization of ground or bottom mines involve a diver placing a specific amount of explosives, which when detonated underwater at a specific distance from a mine results in neutralization of the mine. Floating, or moored, mines involve the diver placing a specific amount of explosives directly on the mine. Inert dummy mines are used in the exercises. Standard practices for tethered mines in Hawaiian waters require ground mine explosive charges to be suspended 10 feet (3.0 m) below the surface of the water.

EER/IEER AN/SSQ-110A - The Extended Echo Ranging and Improved Extended Echo Ranging (EER/IEER) Systems are air-launched ASW systems used in conducting “large area” searches for submarines. These systems are made up of airborne avionics ASW acoustic processing and sonobuoy types that are deployed in pairs. The IEER System's active sonobuoy component, the AN/SSQ-110A Sonobuoy, would generate a "ping" (small detonation) and the passive AN/SSQ-101 ADAR Sonobuoy would "listen" for the return echo of the sonar ping that has been bounced off the surface of a submarine. These sonobuoys are designed to provide underwater acoustic data necessary for naval aircrews to quickly and accurately detect submerged submarines. The expendable and commandable sonobuoy pairs are dropped from a

fixed-wing aircraft into the ocean in a predetermined pattern (array) with a few buoys covering a very large area.

Training Operation	Explosive Sources	Locations Where Exercises May be Conducted	Time of Year Conducted	Number of Training Events per/year	Average Length of Exercise (hrs)	Number of Rounds per/year
Mine Neutralization	1 to 20-lb Demolition charge	Puuloa Underwater Range, Lima Landing, Naval Inactive Ship Maintenance Facility, MCBH, MCTAB, Barbers Point Range, Ewa Training Minefield	Any time	68	6	68
A-S MISSILEX	Penguin Maverick	Pacific Missile Range Facility (W-188)	Any time	50	5.5	50
S-S MISSILEX	Harpoon	Pacific Missile Range Facility (W-188)	Any time	12	5	75
BOMBEX	Mk82, Mk83, Mk84, Mk48	Hawaii OpArea	Any time	38	6	38
SINKEX	Multiple sources as described in narrative	Hawaii OpArea	Any time	6	14.5	6
S-S GUNNEX	5 inch round, 76-mm round	Warning Areas W-191, 192, 193, 194, 196, and Mela	Any time	91	3.5	3,822
Naval Surface Fire Support	5 inch round, 76-mm round	Warning Area W-188	Any time	28	8.1	644
IEER	SSQ-110A Sonobuoy	Hawaii OpArea	Any time	4	4 to 8	960

Table 3. Summary of the location, duration, time of year, and nature of the exercises involving underwater detonations

1.4.2 Marine Mammals for which Incidental Take Regulations are Proposed

Twenty-seven species of marine mammals (7 mysticetes, 18 odontocetes, and 2 pinnipeds) are known to occur in the HRC. The Navy has compiled information on the abundance, behavior, status and distribution, and vocalizations of these species from peer reviewed literature, the Navy Marine Resource Assessment, NMFS Stock Assessment Reports, and marine mammal surveys using acoustics or visual observations from aircraft or ships. This information is available in the Navy's FEIS for the HRC, which may be viewed at http://govsupport.us/navynepahawaii/FEIS.aspx. Table 5 also includes the estimated abundance, estimated group size, and estimated probability of detection (based on Barlow 2006) of the species that occur in the HRC. Seven marine mammal species listed as federally endangered under the Endangered Species Act (ESA) occur in the HRC: the humpback whale, North Pacific right whale, sei whale, fin whale, blue whale, sperm whale, and Hawaiian monk seal. The most abundant marine mammals appear to be dwarf sperm whales, striped dolphins, and Fraser's dolphins. The most abundant large whales are sperm whales. Based on their rare occurrence in the HRC, the Navy and NMFS do not anticipate any takes (as that term is defined under MMPA) of blue whales, North Pacific right whales, or Northern elephant seals. Therefore, NMFS has not proposed MMPA authorization for take of these species and mitigation measures specific to these species are not addressed further in this Mitigation EA.

1.4.2.1 *Important Reproductive Areas*

Because the consideration of areas where marine mammals are known to selectively breed or calve are important to both the negligible impact finding necessary for the issuance of

an MMPA authorization and the need for NMFS to prescribe regulations setting forth the means of effecting the least practicable adverse impact on affected species or stocks and their habitat, paying particular attention to rookeries, mating grounds, and other areas of similar significance, NMFS previously emphasized to the Navy the importance of considering reproductive areas and appropriate mitigation measures as part of the Navy's proposed action in HRC. Little is known about the breeding and calving behaviors of many of the marine mammals that occur in the HRC. Some delphinid species have calving peaks once or twice a year, but give birth throughout their ranges. The mysticete species that may occur in the HRC are generally thought to migrate from higher to lower latitudes to breed and calve in the winter. With one notable exception, no breeding or calving areas have been identified in the HRC for the species that occur there. However, the main Hawaiian Islands constitute one of the world's most important habitats for the endangered humpback whale. Nearly two-thirds of the entire North Pacific population of humpback whales migrates to Hawaii each winter to engage in breeding, calving and nursing activities important for the survival of their species. The available sighting information and the known preferred breeding habitat (shallow water) indicates that humpback whale densities are much higher (up to almost four whales/square mile) in certain areas within the HRC and that humpback mothers and calves are concentrated within the 200-m isobath. The Hawaiian Humpback Whale National Marine Sanctuary staff worked with Dr. Joe Mobley to compile a figure that generally illustrates humpback whale survey data collected between 1993 and 2003 and indicates areas of relative high and low density (Mobley 2004, Figure 1). Analysis of how this information was considered in the consideration of mitigation measures is provided in Chapter 6 of the EIS and additional analysis is provided in subsequent sections of this Mitigation EA.

Common Name	Scientific Name	Status	Occurs	Group Size*	Detection Probability[3]		Estimated Abundance in Hawaii
					Group 1-20	Group >20	
MYSTICETES (baleen whales)							
Family Balaenidae (right whales)							
North Pacific right whale	*Eubalaena japonica*	E	Rare				unknown
Family Balaenopteridae (rorquals)							
Humpback whale	*Megaptera novaeangliae*	E	Regular	1.7			4,491
Minke whale	*Balaenoptera acutorostrata*		Regular				unknown
Sei whale	*Balaenoptera borealis*	E	Rare	3.4	0.9	0.9	236
Fin whale	*Balaenoptera physalus*	E	Rare	2.6	0.9	0.9	236
Blue whale	*Balaenoptera musculus*	E	Rare				unknown
Bryde's whale	*Balaenoptera edeni/brydei*		Regular	1.5	0.9	0.9	469
ODONTOCETES (toothed whales)							
Family Physeteridae (sperm whale)							
Sperm whale	*Physeter macrocephalus*	E	Regular	7.3	0.87	0.87	6,919
Family Kogiidae (pygmy sperm whales)							
Pygmy sperm whale	*Kogia breviceps*		Regular	1	0.35	0.35	7,138
Dwarf sperm whale	*Kogia sima*		Regular	2.3	0.35	0.35	17,519
Family Ziphiidae (beaked whales)							
Cuvier's beaked whale	*Ziphius cavirostris*		Regular	2	0.23	0.23	15,242
Blainville's beaked whale	*Mesoplodon densirostris*		Regular	2.3	0.45	0.45	2,872
Longman's beaked whale	*Indopacetus pacificus*		Regular	17.8	0.76	0.96	1,007
Family Delphinidae (dolphins)							
Rough-toothed dolphin	*Steno bredanensis*		Regular	14.8	0.76	1	8,709
Bottlenose dolphin	*Tursiops truncatus*		Regular	9	0.76	1	3,215
Pantropical spotted dolphin	*Stenella attenuata*		Regular	60	0.76	1	8,978
Spinner dolphin	*Stenella longirostris*		Regular	31.7	0.76	1	3,351
Striped dolphin	*Stenella coeruleoalba*		Regular	37.3	0.76	1	13,143
Risso's dolphin	*Grampus griseus*		Regular	15.4	0.76	1	2,372
Melon-headed whale	*Peponocephala electra*		Regular	89.2	0.76	1	2,950
Fraser's dolphin	*Lagenodelphis hosei*		Rare	286.3	0.76	1	10,226
Pygmy killer whale	*Feresa attenuata*		Regular	14.4	0.76	1	956
False killer whale	*Pseudorca crassidens*		Regular	10.3	0.76	1	236
Killer whale	*Orcinus orca*		Regular	6.5	0.9	0.9	349
Short-finned pilot whale	*Globicephala macrorhynchus*		Regular	22.5	0.76	1	8,870
Total Number of Delphinids in Hawaiian Waters (from Barlow 2006)							63,354
Total Number of Beaked Whales in Hawaiian Waters (from Barlow 2006)							19,492
PINNIPEDS (seals, sea lions, walruses)							
Family Phocidae (true seals)							
Hawaiian monk seal	*Monachus schauinslandi*	E	Regular				1252****
Northern elephant seal	*Mirounga angustirostris*		Rare				

Table 5. Species of marine mammals known to occur in the HRC (E means endangered under the ESA).

Source: U.S. Department of the Navy, 2005a; Barlow, 2003; Mobley, 2004; Barlow, 2006; Carretta et al., 2006

*Mean group sizes are the geometric mean of best estimates from multiple observers and have not been corrected for bias.

**Estimated from Barlow 2006

***For analysis purposes (and in the absence of specific data), abundance and density for fin and sei whales were estimated to be the same as for false killer whales, which have similarly small numbers in the area.

****Estimated abundance in the Main Hawaiian Islands is 77 animals

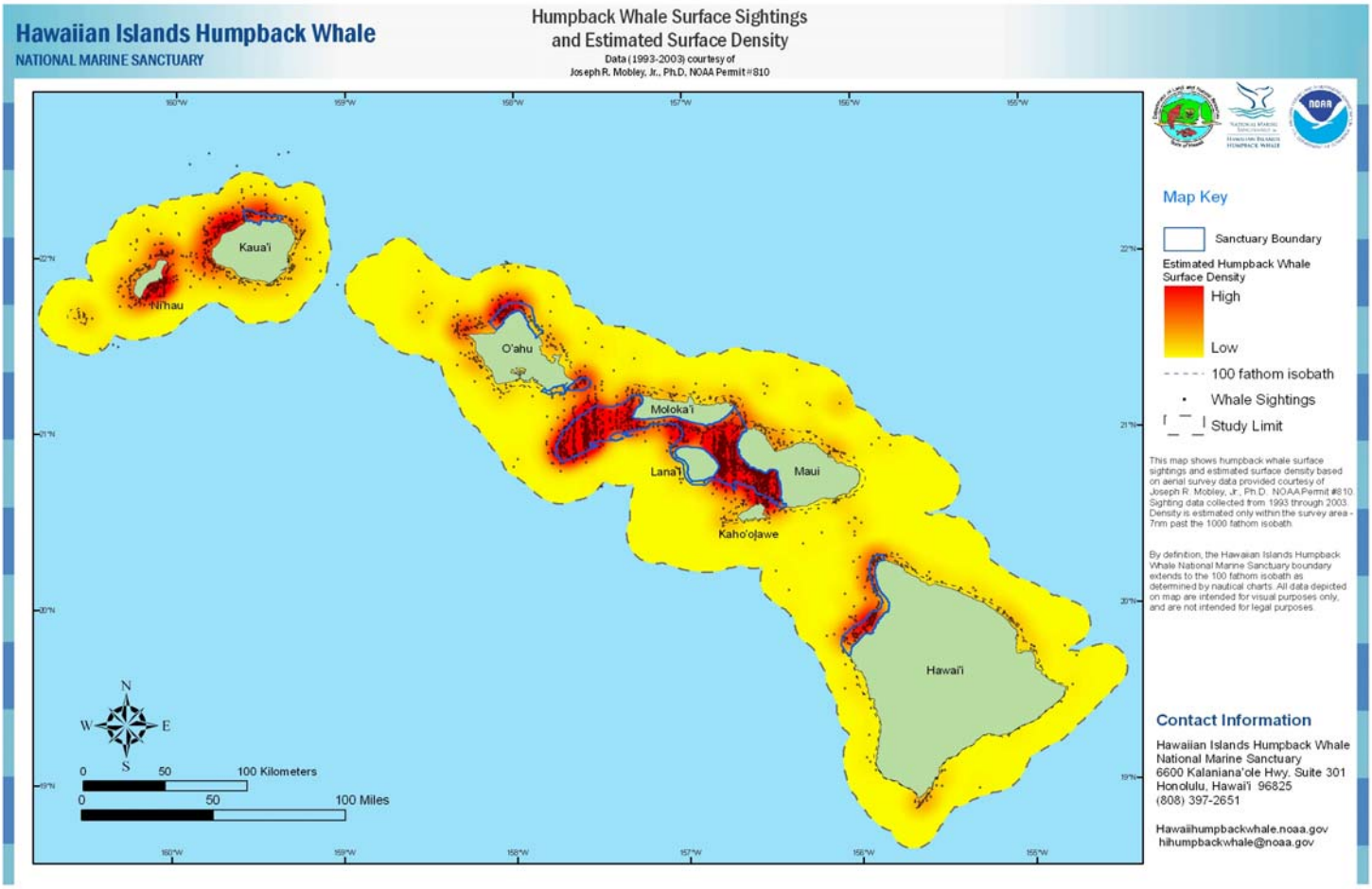

Figure 1. General illustration of areas of high humpback whale density based on survey data collected

1.4.3 Permissible Methods of Taking

In order to issue incidental take regulations, NMFS is required to set forth the permissible methods of taking. An applicant, in this case the Navy, is required to identify the type of and estimate the number of takes of marine mammals that would occur as a result of its activity. NMFS assesses the number provided by the applicant to determine whether modification is necessary, and then that number (combined with information regarding the nature of the effects) is used to inform NMFS' decisions regarding the negligible impact determination, the appropriate number of takes to authorize (and of what sort, Level A or Level B Harassment, or mortality), and the appropriate mitigation, monitoring and reporting. Based on the analysis in the HRC Final EIS and the Navy's request for authorization, this section contains a summary of the nature of the takes that are likely to result from exposure to MFAS/HFAS and explosive detonations as well as an estimate of how many marine mammal takes would occur.

1.4.3.1 *Summary of Types of Take*

With respect to military readiness activities, Section 3(18)(B) of the MMPA defines "harassment" as: (i) any act that injures or has the significant potential to injure a marine mammal or marine mammal stock in the wild [Level A Harassment]; or (ii) any act that disturbs or is likely to disturb a marine mammal or marine mammal stock in the wild by causing disruption of natural behavioral patterns, including, but not limited to, migration, surfacing,

nursing, breeding, feeding, or sheltering, to a point where such behavioral patterns are abandoned or significantly altered [Level B Harassment]. Below is a summary of the types of impacts that would be expected to result from the Navy's activities that would qualify as Level A or Level B Harassment under the MMPA. Also included is a brief discussion of mortality and strandings. A more detailed discussion is included in the Navy's FEIS.

1.4.3.1.1 Level B Harassment

Following are the types of anticipated effects from the Navy's action (MFAS/HFAS operation and underwater explosive detonations) that fall into the MMPA Level B Harassment category:

Behavioral Disturbance - Behavioral disturbance that rises to the level described in the definition above is considered Level B Harassment. Behavioral responses to sound are highly variable and context-specific. Following are some examples of the sorts of responses that could be classified as Level B harassment and that could potentially result from the Navy's activities: prolonged vocal modifications or cessation; cessation of feeding; cessation of social interaction; prolonged alteration of movement or diving behavior; habitat abandonment (temporary or permanent); brief cessation of reproductive behaviors, or, in severe cases, panic, flight, or stampede (Southall et al., 2007).

Many different variables can influence an animal's perception of and response to (nature and magnitude) an acoustic event, such as: an animal's prior experience with a sound type; the perceived nearness of the sound; the bearing of the sound (approaching vs. retreating); the similarity of a sound to biologically relevant sounds in the animal's environment (i.e., calls of predators, prey, or conspecifics); the characteristics of the individual (age, gender, reproductive status, etc.); the activity the individual is currently engaged in; or the presence of other factors, such as a nearby boat.

There are few empirical studies of avoidance responses of free-living cetaceans to mid-frequency sonar. Relatively more information is available on the avoidance responses of free-living cetaceans to other acoustic sources, like seismic airguns and low frequency sonar, than mid-frequency active sonar. Richardson et al., (1995) noted that avoidance reactions are the most obvious manifestations of disturbance from anthropogenic sounds in marine mammals.

When Level B Harassment is predicted based on estimated behavioral responses, those takes may have a stress-related (or distress) physiological component as well. When an animal does not have sufficient energy reserves to satisfy the energetic costs of a stress response, energy resources must be diverted from other biotic functions, which could impair those functions that experience the diversion and could potentially pose a risk to the animal's welfare.

In the Navy's Hawaii Range Complex, behavioral disturbance can result either from exposure to MFAS/HFAS or underwater detonation of explosives, though it is more likely to result from MFAS because the duration of sound transmission is much longer and therefore the potential for exposure of marine mammals to sound levels that may result in Level B harassment is higher.

As mentioned above, there are few empirical studies of the direct responses of cetaceans to MFAS. In 2008 (after the HRC FEIS was finalized), results were made available from a series of behavioral response studies (BRSs) conducted by NMFS and other scientists, which showed one individual beaked whale (Mesoplodon densirostris) responding to an MFAS playback. The BRS-07 Cruise report indicates that the MFAS playback began when the tagged beaked whale was vocalizing at depth, following a previous control dive with no sound exposure. The whale appeared to stop clicking significantly earlier than usual when exposed to mid-frequency signals in the 130-140 dB (rms) range. After a few more minutes of the playback, when the received level reached a maximum of 140-150 dB, the whale ascended on the slow side of normal ascent rates with a longer than normal ascent, at which point the exposure was terminated. The BRS-07 Cruise report notes that the results are from a single experiment and that a greater sample size is needed before robust and definitive conclusions can be drawn.

Acoustic Masking and Communication Impairment – Masking, or auditory interference, generally occurs when sounds in the environment are louder than and of a similar frequency to, auditory signals an animal is trying to receive. Masking is a phenomenon that affects animals that are trying to receive acoustic information about their environment, including sounds from other members of their species, predators, prey, and sounds that allow them to orient in their environment. Similarly, in addition to making it more difficult for animals to perceive acoustic cues in their environment, anthropogenic sound presents separate challenges for animals that are vocalizing. Acoustic masking and communication impairment are considered Level B Harassment as it can disrupt natural behavioral patterns of individuals or groups by interrupting or limiting the marine mammal's receipt or transmittal of important information or environmental cues.

Masking and communication impairment can result either from exposure to MFAS/HFAS or underwater explosives, though the effect is different for each: MFAS/HFAS as proposed in HRC is a narrower frequency and shorter signal, but for many uses may be repeated every 30 seconds or so over a multi-hour period, while an explosive signal would be longer (still relatively short) and broadband, but planned to occur far fewer times.

Temporary Threshold Shift (TTS) – When animals exhibit reduced hearing sensitivity (i.e., certain sounds must be louder for an animal to recognize them) following exposure to a sufficiently intense sound, it is referred to as a noise-induced threshold shift (TS). An animal can experience temporary threshold shift (TTS) or permanent threshold shift (PTS). TTS results from fatigue of the cochlear hair cells and supporting structures and can last from minutes or hours to days. A marine mammal that experiences TTS is able to recover its hearing sensitivity. TTS occurs in specific frequency ranges (i.e., an animal might only have a temporary loss of hearing sensitivity between the frequencies of 1 and 10 kHz)) and can be of varying amounts (for example, an animals hearing sensitivity might be reduced by only 6 dB or reduced by 30 dB). The type and degree of TTS that is incurred is primarily based on the type (frequency and other characteristics) and intensity of the sound the animal is exposed to, as well as the duration of the exposure. TTS can effect how an animal behaves in response to the environment, including conspecifics, predators, and prey.

TTS can result either from exposure to MFAS/HFAS or underwater explosives. With explosives, TTS can result from exposure to the pressure wave, in addition to the acoustic energy, and will likely desensitize the animal over a broader frequency bandwidth.

1.4.3.1.2 Level A Harassment

Following are the types of potential effects that fall into the MMPA Level A Harassment category, however, the probability of these effects occurring incidental to the HRC activities is very low when the implementation of mitigation is considered (from any of the three alternatives):

Permanent Threshold Shift (PTS) – A threshold shift that an animal does not recover from is called permanent threshold shift and is considered an injury. PTS results from exposure to intense sounds that cause a permanent loss of inner or outer cochlear hair cells or exceed the elastic limits of certain tissues and membranes in the middle and inner ears and result in changes in the chemical composition of the inner ear fluids. PTS can effect how an animal behaves in response to the environment, including conspecifics, predators, and prey. PTS can result either from exposure to MFAS/HFAS or underwater explosives. With explosives, PTS can result from exposure to the pressure wave, in addition to the acoustic energy, and will likely desensitize the animal over a broader frequency bandwidth.

Acoustically Mediated Bubble Growth – A few theories suggest ways in which gas bubbles become enlarged through exposure to intense sounds (MFAS) to the point where tissue damage results. In rectified diffusion, exposure to a sound field would cause bubbles to increase in size. Alternately, bubbles could be destabilized by high-level sound exposures such that bubble growth then occurs through static diffusion of gas out of the tissues. Tissue damage from either of these processes would be considered an injury. These effects are hypothesized to occur as a result of exposure to MFAS (not explosives).

Behaviorally Mediated Bubble Growth – Several authors suggest mechanisms in which marine mammals could behaviorally respond to exposure to MFAS/HFAS by altering their dive patterns in a manner (unusually rapid ascent, unusually long series of surface dives, etc.) that might result in unusual bubble formation or growth ultimately resulting in tissue damage (emboli, etc.). These effects are hypothesized to occur as a result of exposure to MFAS/HFAS (not explosives).

Physical Disruption of Tissues Resulting from Explosive Shock Wave – Physical damage of tissues resulting from a shock wave (from an explosive detonation, not MFAS/HFAS) is classified as an injury. Blast effects are greatest at the gas-liquid interface (Landsberg, 2000) and gas-containing organs, particularly the lungs and gastrointestinal tract, are especially susceptible (Goertner, 1982; Hill 1978; Yelverton et al., 1973). Nasal sacs, larynx, pharynx, trachea, and lungs may be damaged by compression/expansion caused by the oscillations of the blast gas bubble (Reidenberg and Laitman, 2003). Severe damage (from the shock wave) to the ears can include tympanic membrane rupture, fracture of the ossicles, damage to the cochlea, hemorrhage, and cerebrospinal fluid leakage into the middle ear.

1.4.3.1.3 Serious Injury and Mortality

Over the past 12 years, there have been five stranding events (in which cetaceans were seriously injured or died) coincident with military mid-frequency sonar use that are believed to most likely have been caused by exposure to the sonar: Greece (1996); the Bahamas (2000); Madeira (2000); Canary Islands (2002); and Spain (2006). Cuvier's beaked whales comprise approximately 80% of the animals involved in these strandings. Other beaked whale species make up the majority of the remaining species.

Several theories that have been suggested for the exact causes of the sonar-associated strandings – but none of these theories have been proven. Though an exact causal link between the stranding events and naval exercises has not been determined, certain conditions may have existed in several of the exercises that, in their aggregate, may have contributed to the marine mammal strandings (Freitas, 2004): Exercises were conducted in areas of at least 547 fathoms (1000 m) depth near a shoreline where there is a rapid change in bathymetry on the order of 547 to 3,281 fathoms (1000 – 6000 m) occurring across a relatively short horizontal distance; multiple ships were operating MFAS in the same area over extended periods of time in close proximity; and exercises took place in an area surrounded by landmasses, or in an embayment. Exercises involving multiple ships employing MFA sonar near land may have produced sound directed towards a channel or embayment that may have cut off the lines of egress for the affected marine mammals (Freitas, 2004). The HRC Final EIS evaluates the strandings in more depth, and provides information on a 2004 stranding event in Hanalei Bay, Kaua'i. The potential for Navy's activities in HRC to contribute to marine mammal strandings was considered carefully in the HRC Final EIS, with input from NMFS, and is discussed further in section 1.4.3.2.

1.4.3.2 *Take Estimates*

1.4.3.2.1 Thresholds

NMFS utilizes various thresholds to indicate at what received levels marine mammals are likely to experience Level A and Level B Harassment incidental to exposure to different types of sound sources. These thresholds allow for estimates of the numbers of animals that may be harassed and inform NMFS' decisions regarding appropriate and practicable mitigation measures. The Navy's HRC FEIS discussed in detail the justification for the various thresholds. The thresholds used for modeling estimated takes (as defined under MMPA) incidental to MFAS/HFAS and underwater explosive detonations are summarized below.

PTS, which is considered a conservative surrogate for the onset of all acoustic injury (Level A Harassment), is predicted to occur whenever an animal is exposed to the following levels of MFAS/HFAS or above (these metrics are called sound energy level (SEL) and incorporate duration):

- Cetaceans - 215 dB re 1 μPa^2-s
- Pinnipeds (monk seals, which are closely related to elephant seals) – 224 dB re 1 μPa^2-s

- (note that for harbor seals and closely related species the threshold is 203 dB re 1 μPa^2-s and for California sea lions and closely related species the threshold is 226 dB re 1 μPa^2-s – however, of the two species of pinnipeds that may occur in the HRC, only monk seals are expected to be present in sufficient numbers such that exposure to Navy sound sources may occur , therefore only the 224 dB threshold is applicable fro pinnipeds in the HRC.)

TTS, which is a subset of Level B Harassment and, is predicted to occur whenever an animal is exposed to the following levels of MFAS/HFAS or above:

- Cetaceans - 195 dB re 1 μPa^2-s
- Pinnipeds (monk seals) – 204 dB re 1 μPa^2-s
- (note that for harbor seals and closely related species the threshold is 183 dB re 1 μPa^2-s and for California sea lions and closely related species the threshold is 206 dB re 1 μPa^2-s – however, of the two species of pinnipeds that may occur in the HRC, only monk seals are expected to be present in sufficient numbers such that exposure to Navy sound sources may occur, therefore only the 224 dB threshold is applicable fror pinnipeds in the HRC.)

The following risk functions are used to predict what percentage of marine mammals exposed to the given level of MFAS/HFAS will respond in a manner NMFS considers Level B Harassment. As received level increases, a larger percentage of the exposed animals are predicted to be harassed.

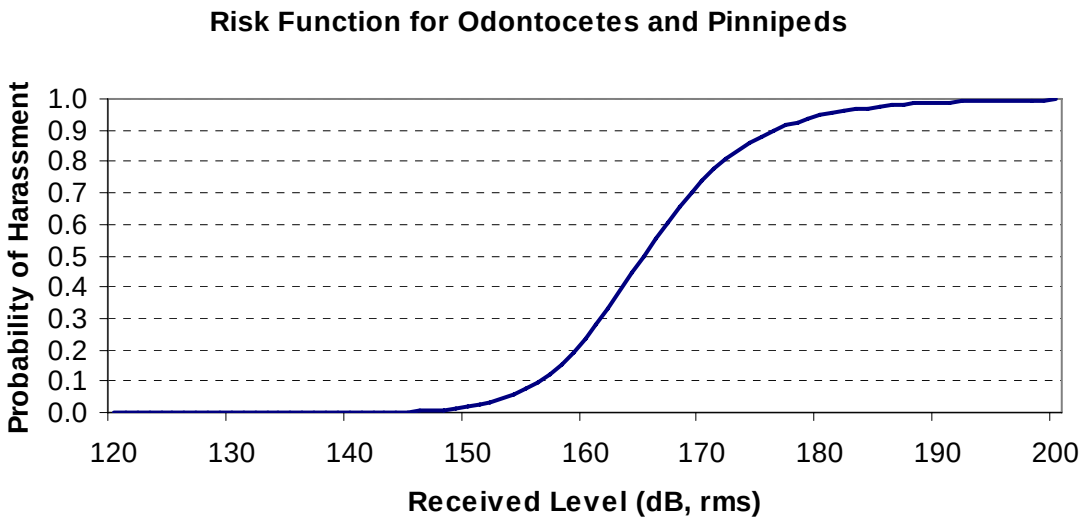

Figure 2a. Risk function for odontocetes and pinnipeds. B=120 dB, K=45 dB, A=10

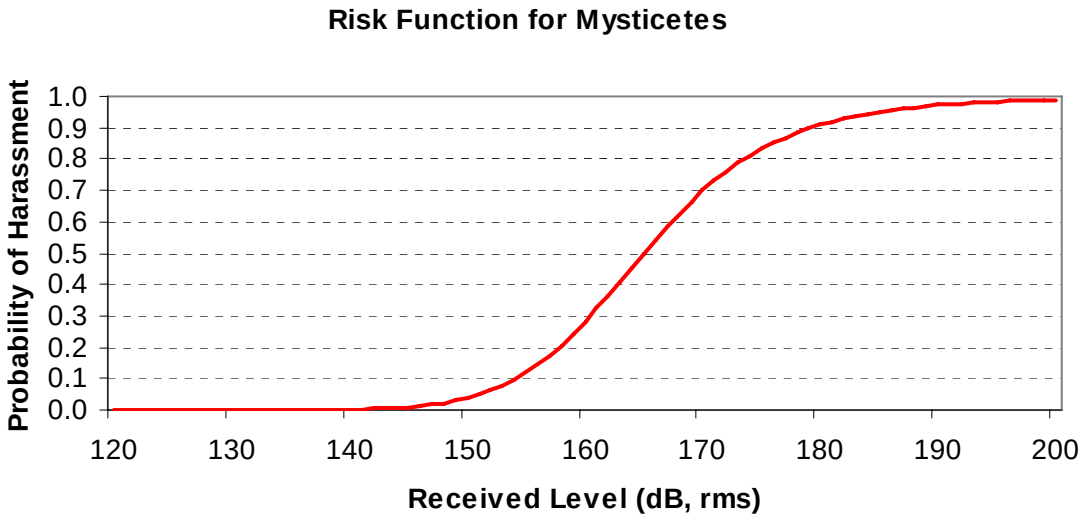

Figure 2b. Risk function for mysticetes. B=120 dB, K=45 dB, A=8.

Table 6, below, summarizes the thresholds for underwater detonations.

Criterion	Criterion Definition	Threshold
Mortality	onset of severe lung injury (1% probability of mortality)	31 psi-ms (positive impulse)
Level A Harassment (Injury)	Slight lung injury; or	13 psi-ms (positive impulse)
	50% of animals exposed would experience ear drum rupture; and 30% exposed sustain PTS	205 dB re 1 microPa^2-s (full spectrum energy)
Level B Harassment	TTS (dual criteria); or	23 psi (peak pressure) (explosives < 2,000 lbs.); or
		182 dB re 1 microPa^2-s (peak 1/3 octve band)
	Sub-TTS behavioral disruption (for multiple detonations only, not applicable for single detonations)	177 dB re 1 microPa^2-s, (1/3 octave band)

Table 6. Summary of Criteria for Explosive Detonations

1.4.3.2.2 Navy Modeling

As described in the EIS, the Navy uses several different models to perform the calculations necessary to estimate take, and NMFS may make modifications to the Navy's estimates if appropriate. Following is an outline of the steps followed in the HRC EIS to estimate take:

(1) In order to quantify the types of take described in previous sections that are predicted to result from the Navy's specified activities, the Navy first uses a sound propagation model that predicts the number of animals that will be exposed to a range of levels of pressure and energy (of the metrics used in the criteria) from MFAS/HFAS and explosive detonations based on several important pieces of information, including:

- Characteristics of the sound sources (source level, source depth, center frequency, source directivity, and ping spacing for MFAS/HFAS; the weight of an explosive, the type of explosive, the detonation depth, number of successive explosions).
- Transmission loss (in 20 representative environmental provinces across 8 sonar modeling areas) based on: water depth; sound speed variability throughout the water column (including presumption that surface duct is present in HRC); bottom geo-acoustic properties (bathymetry); and wind speed.
- The density of each marine mammal species in the HRC, horizontally distributed uniformly and vertically distributed according to dive profiles based on field data.

(2) Next, the thresholds discussed in the previous section are applied to the estimated exposures to predict the number of exposures that exceed the criteria, i.e., the number of takes by Level B Harassment, Level A Harassment, and mortality.

(3) During the development of the HRC EIS, NMFS and the Navy determined that the output of the model could be made more realistic by applying post-modeling corrections to account for several factors, such as the subtraction of land from the calculated water volume, subtraction of overlapping sonar footprints, and the maximum number of individuals of a species that could potentially be exposed to sonar within the course of 1 day or a discreet continuous sonar event if less than 24 hours.

(4) For potential Level A Harassment, specific mitigation measures are taken into consideration. For example, in some cases the raw modeled numbers of exposures to levels predicted to result in Level A Harassment from exposure to MFAS might indicate that individual marine mammals (e.g., one fin whale) could be exposed to levels of sonar anticipated to result in PTS. However, an individual marine mammal would need to be within approximately 10 m of the source vessel in order to be exposed to these levels. In this example, because of the mitigation measures (watchstanders and shutdown zone), size of fin whales, and nature of fin whale behavior, it is highly unlikely that a fin whale would be exposed to those levels, and therefore the Navy has not requested, nor does NMFS propose to authorize, Level A Harassment of that one fin whale.

(5) Last, the Navy's specified activities have been described based on best estimates of the number of MFAS/HFAS hours and underwater explosive detonations that the Navy proposes to conduct. The exact number of active sonar hours may vary from year to year, but will not exceed the 5-year total (which may be calculated by multiplying the yearly estimate indicated in Table 3 by 5) by more than 10 percent. NMFS estimates that a 10-percent increase in sonar hours would result in approximately a 10 percent increase in the number of takes, and this possibility is considered in NMFS' MMPA analysis.

Table 8 below indicates the Level B and Level A Harassment takes that NMFS proposes to authorize. Neither NMFS, nor the Navy anticipates that marine mammal strandings or mortality will result from the operation of mid-frequency sonar during Navy exercises within the HRC. However, to allow for scientific uncertainty regarding the contributing causes of beaked whale strandings and the exact behavioral or physiological mechanisms that have lead to the stranding and/or death of marine mammals coincident with sonar in other geographic areas and in different circumstances, NMFS has, through its MMPA authority, proposed to authorize take, by serious injury or mortality, of 10 individuals of each of the following species over the course of the five-year rule: bottlenose dolphin, Kogia spp., melon-headed whale, pantropical spotted dolphin, pygmy killer whale, short-finned pilot whale, striped dolphin, Cuvier's, Longman's, and Blainville's beaked whales.

Of note, NMFS (the Endangered Species Division) will also issue Biological Opinions and associated incidental take statements (ITSs) to NMFS (the Permits, Conservation, and Recreation Division) to exempt the take (under the ESA) that NMFS authorizes in the LOAs under the MMPA. Because of the difference between the statutes, it is possible that ESA analysis of the applicant's action could produce a take estimate that is different than the takes requested by the applicant (and analyzed for authorization by NMFS under the MMPA process), despite the fact that the same proposed action (i.e. number of sonar hours and explosive detonations) was being analyzed under each statute. When this occurs, NMFS staff coordinate to ensure that that the most conservative (lowest) number of takes are authorized. For the Navy's proposed training in the HRC, coordination with the Endangered Species Division indicates that they will likely allow for a lower level of take of ESA-listed marine mammals than were requested by the applicant (because their analysis indicates that fewer will be taken than estimated by the applicant). Therefore, the number of authorized takes in NMFS' LOA(s) will reflect the lower take numbers from the ESA consultation, though the specified activities (i.e., number of sonar hours, etc.) will remain the same. Alternately, table 8 reflects the regulations, which indicate the maximum number of takes that may be authorized under the MMPA.

	Total Estimated Exposures to Indicated Levels of Energy/Pressure from Explosive Detonations				Total Estimated Exposures to Indicated Levels of Sound from MFAS/HFAS					
	Level B Harassment		Level A Harassment	Mortality	Level B Harassment		Level A Harassment			
	177 dB re 1 μPa^2-s	23 psi or 182 dB re 1 μPa^2-s	13 psi-ms / 205 dB re 1 μPa^2-s	31 psi-ms	Risk Function	195 dB re 1 μPa^2-s	215 dB re 1 μPa^2-s	Annual Take Authorized by these Regulations		
Species	Behavioral Harassment	TTS (mitigation considered)	Slight Lung / TM Injury	Onset Massive Lung Injury	Behavioral Harassment	TTS (mitigation considered)	PTS	Level B Harassment	Level A Harassment	Mortality
Bryde's whale	0	0	0	0	64	0	0	64	0	
Fin whale	0	0	0	0	46	0	0	46		
Sei whale	0	0	0	0	46	0	0	46		
Minke whale	0	0	0	0	64	0	0	64		
Humpback whale	5	12 (4)***	1 (0)	0	9,677	199 (0)*	0	9894		
Sperm whale	9	5 (4)***	0	0	758	9 (0)*	0	781		
Dwarf sperm whale	13	13	0	0	2,061	35	0	2122	10 over 5 years	
Pygmy sperm whale	4	5	0	0	842	14	0	865	10 over 5 years	
Cuvier's beaked whale	16	8	0	0	1,121	5	0	1150	10 over 5 years	
Longman's beaked whale	0	0	0	0	104	1	0	105	10 over 5 years	
Blainville's beaked whale	2	2	0	0	347	6	0	357	10 over 5 years	
Unidentified beaked whale	0	0	0	0	36	0	0	36		
Bottlenose dolphin	0	1 (0)***	0	0	716	17 (9)*	0	734	10 over 5 years	
False killer whale	0	0	0	0	46	0	0	46		
Killer whale	0	0	0	0	46	0	0	46		
Pygmy killer whale	0	0	0	0	192	4 (0)*	0	196	10 over 5 years	
Short-finned pilot whale	2	5 (1)***	0	0	1,751	40 (0)*	0	1798	10 over 5 years	
Risso's dolphin	0	1 (0)***	0	0	486	10 (5)**	0	497		
Melon-headed whale	0	1 (0)***	0	0	583	13 (0)*	0	597	10 over 5 years	
Rough-toothed dolphin	2	4 (2)***	0	0	1,053	18 (9)**	0	1077		
Fraser's dolphin	6	6 (3)***	0	0	1,216	19 (10)**	0	1247		
Pantropical spotted dolphin	0	5 (0)***	1 (0)	0	2,144	49 (25)**	0	2199	10 over 5 years	
Spinner dolphin	2	2 (1)***	0	0	410	7 (4)**	0	421		
Striped dolphin	2	7 (2)***	1 (0)	0	3,126	73 (37)**	0	3209	10 over 5 years	
Monk seal	0	3 (0)***	0	0	104	3 (0)*	0	110		
Total	62	80 (45)	0	0	27,039	522 (160)	0	27707		

Table 8. Estimated exposures of marine mammals to indicated criteria and authorized take. Parenthetical numbers indicate estimated number when mitigation is taken into consideration.

*Due to the animal size, average group size, or behavior of these species, watchstanders will very likely detect these animals and cease MFAS/HFAS operations before they are within the distance of the source that would put them at risk of TTS (120 m)

**Individuals of these species travel in group sizes that will allow for detection and shutdown prior to TTS exposure, however, they may also bow-ride and MFAS/HFAS sonar may operate if vessel attempted to change course but the animals stayed with the vessel, therefore, some TTS could occur

***As mentioned above, these animals are likely to be seen by watchstanders, and mitigation implemented, however the exclusion zone for the two largest explosive charges is not large enough to avoid all TTS, so estimated TTS takes potentially associated with those charges remain

NOTE: if calculated TTS takes are assumed not to occur because of mitigation, they are still included as a Level B behavioral harassment

1.4.4 Negligible Impact Finding

As mentioned above, NMFS may only issue incidental take regulations if it determines that the total taking over the 5-year period will have a negligible impact on the species or stock(s). NMFS has made this determination in the HRC proposed rule (for the preferred alternative). The Analysis and Negligible Impact Determination section of NMFS' proposed rule for the HRC is incorporated herein by reference.

1.4.5 Monitoring and Reporting

When issuing incidental take regulations pursuant to section 101(a)(5)(A) of the MMPA, NMFS is required to prescribe regulations setting forth requirements pertaining to the monitoring and reporting of the authorized take.

1.4.5.1 *Monitoring Requirements*

The Navy's Monitoring Plan for the HRC may be viewed at NMFS' website: http://www.nmfs.noaa.gov/pr/permits/incidental.htm. The draft Monitoring Plan for the HRC has been designed as a collection of focused "studies" (described fully in the HRC Monitoring Plan) to gather data that will support assessment of the following questions:

(a) Are marine mammals exposed to mid-frequency active sonar (MFAS), especially at levels associated with adverse effects (i.e., based on NMFS'criteria for behavioral harassment, TTS, or PTS)? If so, at what levels are they exposed?

(b) If marine mammals are exposed to MFAS in the HRC, do they redistribute geographically as a result of continued exposure? If so, how long does the redistribution last?

(c) If marine mammals are exposed to MFAS, what are their behavioral responses to various levels?

(d) What are the behavioral responses of marine mammals that are exposed to explosives at specific levels?

(e) Is the Navy's suite of mitigation measures for MFAS and explosives (e.g., PMAP, major exercise measures agreed to by the Navy through permitting) effective at avoiding TTS, injury, and mortality of marine mammals?

Data gathered in these studies will be collected by qualified, professional marine mammal biologists that are experts in their field. They will use a combination of the following methods to collect data:

- Contracted vessel and aerial surveys
- Tagging
- Passive acoustics
- Marine mammal observers on Navy ships

In the five proposed study designs (all of which cover multiple years), the above methods will be used separately or in combination to monitor marine mammals in different combinations before, during, and after training activities utilizing MFAS/HFAS or explosive detonations.

Included in the Navy's Monitoring Plan is an Integrated Comprehensive Monitoring Plan (ICMP), which will provide the overarching coordination that will support compilation of data from range-specific monitoring plans (e.g., HRC Range Complex plan) as well as Navy funded research and development (R&D) studies. The ICMP will be used both as: 1) a planning tool to focus Navy monitoring priorities (pursuant to ESA/MMPA requirements) across Navy Range Complexes and Exercises; and 2) an adaptive management tool, through the consolidation and analysis of the Navy's monitoring and watchstander data, as well as new information from other Navy programs (e.g., R&D), and other appropriate newly published information.

1.4.5.2 *Reporting Requirements*

NMFS also worked with the Navy to establish new, more specific (since those included in the proposed rule for the HRC), reporting requirements that will allow for consistent data collection across different Navy actions and also for the comparison of Navy data with the marine mammal data collected by others. These reporting requirements are designed to verify

the extent of the Navy's specified activity and the implementation of the mitigation measures, as well as document any observations of marine mammal occurrence or responses made during the required monitoring period. These reporting requirements include specifications of data gathering for both Navy lookouts involved in training, as well as MMOs implementing the Monitoring Plan. Both annual and 5-yr comprehensive reports from the HRC are required and the Navy is also required to compare the MFAS data collected in other Range Complexes.

1.4.6 Adaptive Management

As presented in the MMPA proposed rule for the HRC, any final regulations governing the take of marine mammals incidental to Navy training exercises in the HRC will contain an adaptive management component. NMFS' understanding of the effects of MFAS/HFAS and explosives on marine mammals is still in its relative infancy, and the science in this field continues to improve. These circumstances make the inclusion of an adaptive management component both valuable and necessary within the context of 5-year regulations for activities that have been associated with marine mammal mortality in certain circumstances and locations (though not the HRC). The use of adaptive management will give NMFS the ability to consider new data from different sources to determine (in coordination with the Navy) on an annual basis if mitigation or monitoring measures should be modified or added (or deleted) if new data suggests that such modifications are appropriate (or are not appropriate) for subsequent annual LOAs. Following are some of the possible sources of applicable data:

- Results from the Navy's monitoring from the previous year (either from the HRC or other locations)
- Findings of the Workshop that the Navy will convene in 2011 to analyze monitoring results to date, review current science, and recommend modifications, as appropriate to the monitoring protocols to increase monitoring effectiveness
- Compiled results of Navy funded research and development (R&D) studies (presented pursuant to the ICMP, which is discussed elsewhere in this document)
- Results from specific stranding investigations (either from the HRC or other locations, and involving coincident MFAS/HFAS of explosives training or not involving coincident use)
- Results from the Long Term Prospective Study described below
- Results from general marine mammal and sound research (funded by the Navy (described below) or otherwise)

Mitigation measures could be modified or added (or deleted) if new data suggests that such modifications would have (or do not have) a reasonable likelihood of accomplishing the goals of any mitigation laid out in the HRC final rule and if the measures are practicable. NMFS would also coordinate with the Navy to modify or add to (or delete) the existing monitoring requirements if the new data suggest that the addition or deletion of a particular measure would more effectively accomplish the goals of monitoring laid out in the final rule. The reporting requirements associated with the final rule would be designed to provide NMFS with monitoring data from the previous year to allow NMFS to consider the data and issue annual LOAs. NMFS and the Navy propose to meet annually to discuss the monitoring reports, Navy R&D

developments, and current science and whether mitigation or monitoring modifications are appropriate.

CHAPTER 2 – ALTERNATIVES INCLUDING THE PROPOSED ACTION

2.1 **No Action Alternative: Navy Mitigation Measures**

The No Action Alternative consists of NMFS issuing regulations, a 2009 LOA, and future LOAs as appropriate, that require the Navy to implement the mitigation measures proposed in the Navy's application for incidental take regulations and an LOA with no changes or additions. Note that the No Action alternative for purposes of this EA is distinct from the No Action alternative considered by NMFS in adopting the HRC Final EIS. Under that No Action alternative, should NMFS be unable to reach required findings under the MMPA, regulations and an LOA would not be issued. As described earlier, this Mitigation EA assumes the MMPA findings can be made and that regulations and an LOA will be issued, requiring that NMFS set forth the means of effecting the least practicable adverse impact (i.e., mitigation measures).

The Navy's standard protective measures associated with each of the specified activities described earlier in this Mitigation EA are listed below:

2.1.1 Mitigation Measures for MFAS/HFAS Use

(a) All lookouts onboard platforms involved in ASW training events shall review the NMFS-approved Marine Species Awareness Training (MSAT) material prior to use of mid-frequency active sonar.

(b) All Commanding Officers, Executive Officers, and officers standing watch on the Bridge shall have reviewed the MSAT material prior to a training event employing the use of mid-frequency active sonar.

(c) Navy lookouts shall undertake extensive training in order to qualify as a watchstander in accordance with the Lookout Training Handbook (NAVEDTRA, 12968-D).

(d) Lookout training shall include on-the-job instruction under the supervision of a qualified, experienced watchstander. Following successful completion of this supervised training period, Lookouts shall complete the Personal Qualification Standard program, certifying that they have demonstrated the necessary skills (such as detection and reporting of partially submerged objects).

(e) Lookouts shall be trained in the most effective means to ensure quick and effective communication within the command structure in order to facilitate implementation of mitigation measures if marine species are spotted.

(f) On the bridge of surface ships, there shall be at least three people on watch whose duties include observing the water surface around the vessel.

(g) All surface ships participating in ASW exercises shall, in addition to the three personnel on watch noted previously, have at all times during the exercise at least two additional personnel on watch as lookouts.

(h) Personnel on lookout and officers on watch on the bridge shall have at least one set of binoculars available for each person to aid in the detection of marine mammals.

(i) On surface vessels equipped with mid-frequency active sonar, pedestal mounted “Big Eye” (20x110) binoculars shall be present and in good working order.

(j) Personnel on lookout shall employ visual search procedures employing a scanning methodology in accordance with the Lookout Training Handbook (NAVEDTRA 12968-D).

(k) After sunset and prior to sunrise, lookouts shall employ Night Lookouts Techniques in accordance with the Lookout Training Handbook.

(l) Personnel on lookout shall be responsible for reporting all objects or anomalies sighted in the water (regardless of the distance from the vessel) to the Officer of the Deck.

(m) CPF shall distribute the final mitigation measures contained in the LOA and Biological Opinion to the Fleet.

(n) Commanding Officers shall make use of marine species detection cues and information to limit interaction with marine species to the maximum extent possible consistent with safety of the ship.

(o) All personnel engaged in passive acoustic sonar operation (including aircraft, surface ships, or submarines) shall monitor for marine mammal vocalizations and report the detection of any marine mammal to the appropriate watch station for dissemination and appropriate action.

(p) During mid-frequency active sonar training activities, personnel shall utilize all available sensor and optical systems (such as Night Vision Goggles) to aid in the detection of marine mammals.

(q) Navy aircraft participating in exercises at sea shall conduct and maintain, when operationally feasible and safe, surveillance for marine mammals as long as it does not violate safety constraints or interfere with the accomplishment of primary operational duties.

(r) Aircraft with deployed sonobuoys shall use only the passive capability of sonobuoys when marine mammals are detected within 200 yards (182 m) of the sonobuoy.

(s) Marine mammal detections shall be reported immediately to assigned Aircraft Control Unit for further dissemination to ships in the vicinity of the marine species as appropriate where it is reasonable to conclude that the course of the ship will likely result in a closing of the distance to the detected marine mammal.

(t) Safety Zones - When marine mammals are detected by any means (aircraft, shipboard lookout, or acoustically) the Navy shall ensure that MFAS transmission levels are limited to at least 6 dB below normal operating levels if any detected marine mammals are within 1000 yards (914 m) of the sonar dome (the bow).

(i) Ships and submarines shall continue to limit maximum MFAS transmission levels by this 6-dB factor until the marine mammal has been seen to leave the area, has not been detected for 30 minutes, or the vessel has transited more than 2,000 yards (1828 m) beyond the location of the last detection.

(ii) The Navy shall ensure that MFAS transmissions will be limited to at least 10 dB below the equipment's normal operating level if any detected animals are within 500 yards (457 m) of the sonar dome. Ships and submarines shall continue to limit maximum ping levels by this 10-dB factor until the marine mammal has been seen to leave the area, has not been detected for 30 minutes, or the vessel has transited more than 2000 yards (1828 m) beyond the location of the last detection.

(iii) The Navy shall ensure that MFAS transmissions are ceased if any detected marine mammals are within 200 yards of the sonar dome. MFAS transmissions will not resume until the marine mammal has been seen to leave the area, has not been detected for 30 minutes, or the vessel has transited more than 2,000 yards beyond the location of the last detection.

(iv) Special conditions applicable for dolphins and porpoises only: If, after conducting an initial maneuver to avoid close quarters with dolphins or porpoises, the Officer of the Deck concludes that dolphins or porpoises are deliberately closing to ride the vessel's bow wave, no further mitigation actions are necessary while the dolphins or porpoises continue to exhibit bow wave riding behavior.

(v) If the need for power-down should arise as detailed in “Safety Zones” above, Navy shall follow the requirements as though they were operating at 235 dB – the normal operating level (i.e., the first power-down will be to 229 dB, regardless of at what level above 235 dB sonar was being operated).

(u) Prior to start up or restart of active sonar, operators shall check that the Safety Zone radius around the sound source is clear of marine mammals.

(v) Sonar levels (generally) - Navy shall operate sonar at the lowest practicable level, not to exceed 235 dB, except as required to meet tactical training objectives.

(w) Helicopters shall observe/survey the vicinity of an ASW Exercise for 10 minutes before the first deployment of active (dipping) sonar in the water.

(x) Helicopters shall not dip their sonar within 200 yards (183 m) of a marine mammal and shall cease pinging if a marine mammal closes within 200 yards (183 m) after pinging has begun.

(y) Submarine sonar operators shall review detection indicators of close-aboard marine mammals prior to the commencement of ASW training activities involving active mid-frequency sonar.

(z) Night vision goggles shall be available to all ships and air crews, for use as appropriate.

2.1.2 Mitigation Measures for Underwater Detonations

2.1.2.1 *Mitigation Measures for IEER*

(a) Crews shall conduct aerial visual reconnaissance of the drop area prior to laying their intended sonobuoy pattern. This search should be conducted below 500 yards (457 m) at a slow speed, if operationally feasible and weather conditions permit. In dual aircraft training activities, crews are allowed to conduct coordinated area clearances.

(b) Crews shall conduct a minimum of 30 minutes of visual and acoustic monitoring of the search area prior to commanding the first post detonation. This 30-minute observation period may include pattern deployment time.

(c) For any part of the briefed pattern where a post (source/receiver sonobuoy pair) will be deployed within 1,000 yards (914 m) of observed marine mammal activity, the Navy shall deploy the receiver ONLY and monitor while conducting a visual search. When marine mammals are no longer detected within 1,000 yards (914 m) of the intended post position, co-locate the explosive source sonobuoy (AN/SSQ-110A) (source) with the receiver.

(d) When able, crews will conduct continuous visual and aural monitoring of marine mammal activity. This is to include monitoring of own-aircraft sensors from first sensor placement to checking off station and out of communication range of these sensors.

(e) Aural Detection: If the presence of marine mammals is detected aurally, then that shall cue the aircrew to increase the diligence of their visual surveillance. Subsequently, if no marine mammals are visually detected, then the crew may continue multi-static active search.

(f) Visual Detection:

(i) If marine mammals are visually detected within 1,000 yards (914 m) of the explosive source sonobuoy (AN/SSQ-110A) intended for use, then that payload shall not be detonated. Aircrews may utilize this post once the marine mammals have not been re-sighted for 30 minutes, or are observed to have moved outside the 1,000 yards (914 m) safety buffer.

(ii) Aircrews may shift their multi-static active search to another post, where marine mammals are outside the 1,000 yards (914 m) safety buffer.

(g) Aircrews shall make every attempt to manually detonate the unexploded charges at each post in the pattern prior to departing the operations area by using the "Payload 1 Release" command followed by the "Payload 2 Release" command. Aircrews shall refrain from using the "Scuttle" command when two payloads remain at a given post. Aircrews will ensure that a 1,000 yard (914 m) safety buffer, visually clear of marine mammals, is maintained around each post as is done during active search operations.

(h) Aircrews shall only leave posts with unexploded charges in the event of a sonobuoy malfunction, an aircraft system malfunction, or when an aircraft must immediately depart the area due to issues such as fuel constraints, inclement weather, and in-flight emergencies. In these cases, the sonobuoy will self-scuttle using the secondary or tertiary method.

(i) The Navy shall ensure all payloads are accounted for. Explosive source sonobuoys (AN/SSQ-110A) that cannot be scuttled shall be reported as unexploded ordnance via voice communications while airborne, then upon landing via naval message.

(j) Marine mammal monitoring shall continue until out of own-aircraft sensor range.

2.1.2.2 *Mitigation for Demolitions (DEMOs) and Mine Countermeasure (MCM) Training (Up to 20 lb)*

(a) Exclusion Zones – Explosive charges shall not be detonated if a marine mammal is detected within 700 yards (640 m) of the detonation site.

(b) Pre-Exercise Surveys - For MCM training activities, the Navy shall conduct a pre-exercise survey within 30 minutes prior to the commencement of the scheduled explosive event. The survey may be conducted from the surface, by divers, and/or from the air. If a marine mammal is detected within the survey area, the exercise shall be suspended until the animal voluntarily leaves the area.

(c) Post-Exercise Surveys - Surveys within the same radius shall also be conducted within 30 minutes after the completion of the explosive event.

(d) Reporting - Any evidence of a marine mammal that may have been injured or killed by the action shall be reported immediately to NMFS.

(e) Mine Laying Training – Though mine laying training operations involve aerial drops of inert training shapes on floating targets, measures 1, 2, and 3 for Demolitions and Mine countermeasures (above) will apply to mine laying training. To the maximum extent feasible, the Navy shall retrieve inert mine shapes dropped during Mine Laying Training.

2.1.2.3 *Mitigation for SINKEX, GUNEX, MISSILEX, and BOMBEX*

(a) All weapons firing shall be conducted during the period 1 hour after official sunrise to 30 minutes before official sunset.

(b) Extensive range clearance operations shall be conducted in the hours prior to commencement of the exercise.

(c) An exclusion zone with a radius of 1.0 nm (1.85 km) shall be established around each target. An additional buffer of 0.5 nm (0.93 km) shall be added to account for errors, target drift, and animal movements. Additionally, a safety zone, which extends out an additional 0.5 nm (0.93 km), shall be surveyed. Together, the zones extend out 2 nm (3.7 km) from the target.

(d) A series of surveillance over-flights shall be conducted within the exclusion and the safety zones, prior to and during the exercise, when feasible. Survey protocol would be as follows:

(i) Overflights within the exclusion zone shall be conducted in a manner that optimizes the surface area of the water observed. This may be accomplished through the use of the Navy's Search and Rescue (SAR) Tactical Aid (TACAID).

(ii) All visual surveillance activities shall be conducted by Navy personnel trained in visual surveillance. At least one member of the mitigation team shall have completed the Navy's marine mammal training program for lookouts.

(iii) In addition to the overflights, the exclusion zone shall be monitored by passive acoustic means, when assets are available. This passive acoustic monitoring shall be maintained throughout the exercise. Potential assets include sonobuoys, which can be utilized to detect any vocalizing marine mammals in the vicinity of the exercise. The sonobuoys shall be re-seeded as necessary throughout the exercise. Additionally, passive sonar onboard submarines may be utilized to detect any vocalizing marine mammals in the area. The Officer Conducting the Exercise (OCE) shall be informed of any aural detection of marine mammals and would include this information in the determination of when it is safe to commence the exercise.

(iv) On each day of the exercise, aerial surveillance of the exclusion and safety zones shall commence two hours prior to the first firing.

(v) The results of all visual, aerial, and acoustic searches shall be reported immediately to the OCE. No weapons launches or firing would commence until the OCE declares the safety and exclusion zones free of marine mammals.

(vi) If a marine mammal observed within the exclusion zone is diving, firing shall be delayed until the animal is re-sighted outside the exclusion zone, or 30 minutes has elapsed.

(vii) During breaks in the exercise of 30 minutes or more, the exclusion zone shall again be surveyed for any marine mammals. If marine mammals are sighted within the exclusion zone, the OCE would be notified, and the procedure described above would be followed.

(e) Upon sinking of the vessel, a final surveillance of the exclusion zone shall be monitored for two hours, or until sunset, to verify that no marine mammals were harmed.

(f) Aerial surveillance would be conducted using helicopters or other aircraft based on necessity and availability. These aircraft shall be capable of (and shall, to the extent practicable) flying at the slow safe speeds necessary to enable viewing of marine mammals with unobstructed, or minimally obstructed, downward and outward visibility. The Navy may cancel the exclusion and safety zone surveys in the event that a mechanical problem, emergency search and rescue, or other similar and unexpected event preempts the use of one of the aircraft onsite for the exercise.

(g) Where practicable, the Navy shall conduct the exercise in sea states that are ideal for marine mammal sighting, i.e., Beaufort Sea State 3 or less. In the event of a Beaufort Sea State of 4 or above, the Navy shall utilize additional aircraft (conducting tight search patterns), if available, to increase survey efforts within the zones.

(h) The exercise shall not be conducted unless the exclusion zone can be adequately monitored visually.

(i) In the unlikely event that any marine mammals are observed to be harmed in the area, a detailed description of the animal shall be documented, the location noted, and if possible, photos taken. This information would be provided to NMFS.

2.2 **Alternative 1 (Preferred Alternative)**

Alternative 1 is the issuance of regulations, a 2009 LOA, and subsequent LOAs as appropriate, to the Navy requiring the Navy to implement all of the mitigation measures included in Section 2.1 - No Action Alternative plus the two additional measures indicated below that NMFS and the Navy developed (a Stranding Response Plan and a Humpback Whale Cautionary Area). This is NMFS' preferred alternative. The additional measures that would be specified in a final rule under this alternative are presented in subsection 2.2.1 and 2.2.2.

Note that the HRC Stranding Response Plan discussed below is a stand-alone document that is currently available on the NMFS website: http://www.nmfs.noaa.gov/pr/permits/incidental.htm#applications, and is hereby incorporated by reference. Under this alternative, NMFS' final rule, 2009 LOA, and associated LOAs as appropriate, would indicate that the Navy is required to abide by the HRC Stranding Response Plan (see 2.2.1). Additionally, the primary requirements of the HRC Stranding Response Plan would be summarized in the final rule and subsequent LOA(s), as indicated below.

2.2.1 HRC Stranding Response Plan

The Navy shall abide by the letter of the "Stranding Response Plan for Major Navy Training Exercises in the HRC" to include the following measures:

(a) Shutdown Procedures– When an Uncommon Stranding Event (USE – defined below) occurs during a Major Training Exercise (MTE, including RIMPAC, USWEX, or Multi-Strike Group Exercise) in the HRC, the Navy shall implement the procedures described below (i-iv).

(i) The Navy shall implement a Shutdown (as defined) when advised by a NMFS Office of Protected Resources Headquarters Senior Official designated in the HRC Stranding Communication Protocol that a USE involving live animals has been identified and that at least one live animal is located in the water. NMFS and Navy will maintain a dialogue, as needed, regarding the identification of the USE and the potential need to implement shutdown procedures.

(ii) Any shutdown in a given area shall remain in effect in that area until NMFS advises the Navy that the subject(s) of the USE at that area die or are euthanized, or that all live animals involved in the USE at that area have left the area (either of their own volition or herded).

(iii) If the Navy finds an injured or dead animal floating at sea during a MTE, the Navy shall notify NMFS immediately or as soon as operational security considerations allow. The Navy shall provide NMFS with species or description of the animal(s), the condition of the animal(s) including carcass condition if the animal(s) is/are dead), location, time of first discovery, observed behavior (if alive), and photo or video (if available). Based on the information provided, NMFS will determine if, and advise the Navy whether a modified shutdown is appropriate on a case-by-case basis.

(iv) In the event, following an USE that: a) qualified individuals are attempting to herd animals back out to the open ocean and animals are not willing to leave, or b) animals are seen repeatedly heading for the open ocean but turning back to shore, NMFS and the Navy shall coordinate (including an investigation of other potential anthropogenic stressors in the area) to determine if the proximity of MFAS training activities or explosive detonations, though farther than 14 nm from the distressed animal(s), is likely contributing to the animals' refusal to return to the open water. If so, NMFS and the Navy will further coordinate to determine what measures are necessary to improve the probability that the animals will return to open water and implement those measures as appropriate.

(b) Within 72 hours of NMFS notifying the Navy of the presence of a USE, the Navy shall provide available information to NMFS (per the HRC Communication Protocol) regarding the location, number and types of acoustic/explosive sources, direction and speed of units using MFAS, and marine mammal sightings information associated with training activities occurring within 80 nm (148 km) and 72 hours prior to the USE event. Information not initially available regarding the 80 nm (148 km), 72 hour period prior to the event will be provided as soon as it becomes available. The Navy will provide NMFS investigative teams with additional relevant unclassified information as requested, if available.

(c) Memorandum of Agreement (MOA) – The Navy and NMFS shall develop an MOA, or other mechanism consistent with federal fiscal law requirements (and all other applicable laws), that will establish a framework whereby the Navy can (and provide the Navy examples of how they can best) assist NMFS with stranding investigations in certain circumstances. This MOA shall be completed in 2009.

Uncommon Stranding Event (USE) – A stranding event that takes place during an MTE and involves any one of the following:

- Two or more individuals of any cetacean species (not including mother/calf pairs, unless of species of concern listed in next bullet) found dead or live on shore within a two day period and occurring on same shore lines or facing shorelines of different islands.
- A single individual or mother/calf pair of any of the following marine mammals of concern: beaked whale of any species, kogia sp., risso's dolphin, melon-headed whale, pilot whales, humpback whales, sperm whales, blue whales, fin whales, sei whales, or monk seal.
- A group of 2 or more cetaceans of any species exhibiting indicators of distress.

Exhibiting Indicators of Distress – Animals exhibiting an uncommon combination of behavioral and physiological indicators typically associated with distressed or stranded animals. This situation would be identified by a qualified individual and typically includes some combination of the following characteristics:

- Marine mammals continually circling or moving haphazardly in a tightly packed group – with a member occasionally breaking away and swimming towards the beach.
- Abnormal respirations including increased or decreased rate or volume of breathing, abnormal content or odor
- Presence of an individual of a species that has not historically been seen in a particular habitat, for example a pelagic species in a shallow bay when historic records indicate that it is a rare event.
- Abnormal behavior for that species, such as abnormal surfacing or swimming pattern, listing, and abnormal appearance

2.2.2 Humpback Whale Cautionary Area

The Humpback Whale Cautionary Area is defined as an area extending 5km (2.7 nm) from a line drawn from Kaunakakai on the island of Molokai to Kaena Point on the Island of Lanai; and an area extending 5 km (2.7 nm) from a line drawn from Kaunolu on the Island of Lanai to the most Northeastern point on the Island of Kahoolawe; and within a line drawn from Kanapou Bay on the Island of Kahoolawe to Kanahena Point on the Island of Maui and a line drawn from Cape Halawa on the Island of Molokai to Lipo Point on the Island of Maui, excluding the existing submarine operating area (see Figure 1). Following are the required mitigation measures for the Humpback Whale Cautionary Area:

(a) Should national security needs require MFAS training and testing in the cautionary area between 15 December and 15 April, it must be personally authorized by the Commander, U.S. Pacific Fleet based on his determination that training and testing in that specific area is required for national security purposes. This authorization shall be documented by the CPF in advance of transiting and training in the cautionary area, and the determination shall be based on the unique characteristics of the area from a military readiness perspective, taking into account the importance of the area for humpback whales and the need to minimize adverse impacts on humpback whales from MFAS whenever practicable. Further, Commander, U.S. Pacific Fleet will provide specific direction on required mitigation measures prior to operational units transiting to and training in the cautionary area.

(b) The Navy shall provide advance notification to NMFS of any such activities (listed in

(a), above).

(c) The Navy shall include in its periodic reports for compliance with the MMPA whether or not activities occurred in the Humpback Whale Cautionary Area above and any observed effects on humpback whales due to the conduct of these activities.

2.3 **Alternative 2**

NMFS considered a variety of reasonable potential mitigation measures that have been recommended in past public comments on activities involving sound in the water, submitted during the comment period on the HRC proposed rule, discussed within NMFS as part of the proposed rulemaking for HRC, or considered by the Navy in the HRC EIS but not included as preferred measures in the Navy's proposed action. Alternative 2 is the issuance of regulations, a 2009 LOA, and subsequent LOAs as appropriate to the Navy that requires all of the mitigation measures identified in Alternative 1, but with the addition of a subset of the additional suite of mitigation measures considered herein. Below is a description of the reasonable mitigation measures that NMFS considered in Alternative 2. These measures are broadly grouped into general mitigation measures, with lists of more specific measures that have been recommended by the public. Note that the term 'public comment' as used here includes comments received from other federal and state agencies during public comment periods.

Many of the mitigation measures considered by NMFS for the HRC are measures that could apply broadly to other Navy actions and the material included in this document may be used to assist in the analysis of mitigation options for other Navy actions. NMFS will note when a measure is HRC-specific. Also note that several of the measures are specific to MFAS (versus HFAS), as MFAS sources are responsible for the majority of the estimated takes presented in Table 8.

2.3.1 Seasonal and/or Geographic Limitations

A seasonal or geographic limitation is a requirement that an authorized entity limit or avoid conducting the specified activity in specific areas where marine mammals are *known* to be concentrated, either regularly or to perform a specifically important biological function (such as breeding, calving, or feeding), either all of the time or during specific times of the year (or day). Following are the general types of seasonal and geographic limitations analyzed by NMFS in this Mitigation EA. Note the focus here is on MFAS, as those sources are responsible for the majority of estimated takes presented for MFAS/HFAS in Table 8.

- Disallow any use of MFAS in all areas where specific marine mammal species (such as humpback whales) are known to be conducting specifically important behaviors (in the case of humpback whales in Hawaii, reproductive behaviors including breeding, calving and nursing) during all of the time period that the marine mammals are conducting the behavior. Or, the following sub-categories of mitigation could be utilized:

    - Disallow use of MFAS in a subset of the areas described above
    - Disallow use of MFAS for a subset of the time described above

- Disallow use of MFAS in a subset of the areas and times described above

- Limit use (i.e., require reduced use, either in the planning stages or at the scene) of MFAS in all areas where specific marine mammal species are known to be conducting specifically important behaviors during all of the time period that the marine mammals are conducting the behavior. Or, the following sub-categories of mitigation could be used:

  - Limit use of MFAS in a subset of the areas described above
  - Limit use of MFAS for a subset of the time described above
  - Limit use of MFAS in a subset of the areas and times described above

Following are some specific examples of seasonal or geographic restrictions that NMFS considers in the HRC:

- Disallowing or limiting use of sonar in the areas where humpback whales are concentrated within the HRC (which are also considered humpback whale calving grounds), such as:
  - within the area delineated in the map that Dr. Mobley compiled that summarizes humpback whale presence from 4 datasets over 10 years (see figure 2), during the times that they are present
  - Within the Hawaiian Islands Humpback Whale National Marine Sanctuary

- Disallowing or limiting MFAS use in coastal areas (within 200-m isobath, 12 nm, 13.5 nm, or 25 nm from shore)

- Disallowing or limiting MFAS use when the factors that have been associated with marine mammal strandings and sonar (such as the presence of more than 3 ships operating in the same area for an extended amount of time, constricted channels or embayments, steep bathymetry, and the presence of significant surface ducts) or other scenarios potentially associated with potential danger to marine mammals (embayments) are present in their aggregate or separately.

- Disallowing or limiting MFAS use in the vicinity of physical or environmental features likely to (or that could potentially) be associated with higher concentrations of marine mammals (or specific marine mammal occurrences themselves), such as:
  - seamounts for beaked whales
  - cyclonic eddies
  - Transition Zone Chlorophyll Front to the north of the islands
  - Aggregations of beaked whales or mysticetes

- Disallowing or limiting MFAS use in areas of known higher marine mammal density or where models estimate higher marine mammal takes.

2.3.2 Additional Detection Methods to Implement Mitigation (Shutdown Zones)

Visual observations of marine mammals by Navy lookouts stationed on the decks of surface vessels are currently the primary means of marine mammal detection for use in mitigation implementation. Aircraft and passive acoustic tools involved in training exercises also provide additional detection capabilities, when operationally feasible. A suite of other possible marine mammal detection tools are considered here by NMFS for regular use in the implementation of mitigation (shutdowns):

- Active Sonar (HFM3 or other)
- Additional Passive Sonar (sonobuoys, SQQ89, nodes, instrumented ranges, bottom-mounted sensors, or other)
- Radar
- Infrared technologies
- Additional platforms specifically for detection (aircraft, UAVs, Gliders)

These methods could be used either as dedicated equipment for the detection of marine mammals, or in conjunction with other uses as part of the ongoing Navy training.

In addition to being used all of the time for the detection of marine mammals for mitigation implementation, these additional types of detection methods could be used in different ways or for more specific circumstances, such as at night or in low visibility.

2.3.3 Use of Independent Marine Mammal Observers (MMOs) to Implement Mitigation

These measures include the use of independent marine mammal observers that are not participating in the Navy exercises to detect marine mammals for the purpose of implementing the mitigation measures (including powerdowns and shutdowns). Considerations include the use of these MMOs either all of the time or during particular times of heightened concern. Related measures would require that the Navy conduct a study to compare the effectiveness of Navy lookouts to experienced MMOs and requiring that the Navy use standardized datasheets during Navy exercises to ensure consistency of data collection and comparability across observations.

2.3.4 Enlargement or Modification of Powerdown/Shutdown Zones of Hull-mounted Sonar

Currently, the Navy implements the following powerdowns and shutdowns: powerdown 6 dB (marine mammal closing to or within 1000 yds of source); powerdown additional 4 dB to 10 dB total (marine mammal closing to or within 500 yds of source); shutdown (marine mammal closing to or within 200 yds). There are multiple ways that powerdown or shutdown zones could be modified and following are some examples that NMFS has specifically considered under this alternative for potential use in the HRC:

- Enlarged shutdown and powerdown zones for use at all times with MFAS (for example, the public comments cite 4000 m shutdown employed by the Australian Navy)
- Enlarged shutdown and powerdown zones for use when specific marine mammals are detected, such as:
    - Humpback whale calves

- Beaked whales
- Feeding aggregations of large whales

- Use of a prolonged powerdown (i.e., MFAS operated at lower power) in certain circumstances, such as:
  - The presence of a strong surface duct
  - Nighttime or low visibility

2.3.5 Ramp Up of Sonar Source Prior to Full Power Operation

One method of potentially reducing impacts to marine mammals is requiring the Navy to "ramp up" the sonar source, which means that the source is turned on at a lower level and then slowly turned up until it is operating at the level needed to conduct the training exercise. This measure is based on the supposition that many marine mammals avoid sonar sources and that they will gradually move farther away from the source as it is gradually turned up and thereby be exposed to lower levels than if it were turned immediately on to the full level required during a particular activity.

2.3.6 Halting of MFAS Use in the Event of a Marine Mammal Stranding until Cause is Determined

This measure would require the Navy to cease all MFAS use in the event of a stranding until the definitive cause of the stranding was determined.

2.3.7 Suspension of MFAS Training at Night, or During Low Visibility or Surface Duct

This measure would require the suspension of MFAS use at night, during periods of low visibility (including fog, high Beaufort Sea State, or dusk and dawn), or when a strong surface duct is present.

2.3.8 Avoidance of the Papahanaumokuakea Marine National Monument and Hawaiian Island Humpback Whale National Marine Sanctuary

This measure would disallow or restrict the use of MFAS sonar in the Papahanaumokuakea Marine National Monument and the Hawaiian Island Humpback Whale National Marine Sanctuary (see above). Although specific additional state marine protected areas are not analyzed in this EA, this EA does include the approach to analysis that is followed in considering site-specific avoidance.

2.3.9 Delayed Restart of MFAS after Shutdown or Powerdown

Under this measures, NMFS would require the Navy to delay resumption of full operational sonar use following a power-down or shutdown for 30 minutes if the sighted animal can be identified to the species level and the species is not deep diving and 60 minutes if it cannot be identified or is known to be a member of a deep-diving species such as sperm and beaked whales.

2.3.10 Expansion of Exclusion Area Delineated for Use with Explosive Detonations

Currently, the Navy uses certain exclusion zones for different explosive types, which means that an area of a certain size around an explosive must be clear of marine mammals for a certain amount of time prior to the detonation of that explosive. For a few of the larger charges (MK-84s and MK-48s), the distance to the isopleth within which NMFS expects TTS would likely occur is larger than the distance that the Navy must ensure is clear prior to the initiation of some of the exercise types that utilize those larger charges (i.e., an animal could be within the distance from a source where TTS may occur, but outside of the distance that the Navy is required to 'clear' prior to detonation. NMFS considered requiring an enlarged exclusion zone for use with these larger charges.

2.3.11 Monitoring of Explosive Exclusion Area During Exercises

For some explosive detonations, the Navy's current mitigation requires clearance of an area prior to the initiation of an explosive exercise, but does not require continued monitoring of the area throughout the exercise (see 2.1.2). Under this measure, NMFS considered a requirement for Navy to continue monitoring the exclusion zone throughout the exercise and to take appropriate mitigation measures during the exercise should a marine mammals be spotted within that zone.

2.4 **Alternatives Considered but Eliminated**

Several additional potential "mitigation measures" were identified by NMFS or raised during the public comment period on the proposed HRC rule. These measures were analyzed in the HRC Final EIS. However, for the reasons described below, these alternative measures were not appropriate for consideration as mitigation, and therefore were not included in Alternatives 1 or 2 of this mitigation EA. The rationale for eliminating them is presented below.

2.4.1 Scaling Back of Training Exercises or Use of Simulated Exercises in Lieu of Real-time Exercises

NMFS considered the recommendations of some members of the public that the Navy scale back the amount of training they will conduct, or use simulated electronic exercises instead of the real exercises described in the Navy's specified activities pursuant to their request for incidental take regulations and an LOA. However, NMFS did not carry this analysis further because the MMPA requires that NMFS make its findings based on the "specified activity" identified in an applicant's request, and reducing the overall amount of the activity specified by the applicant or replacing part of the specified activity with a completely different activity (training simulations) inherently changes the applicant's specified activity. The Navy's HRC Final EIS contains a section that addresses reduced training effort or use of simulated electronic exercises (see Chapter 6 of the HRC FEIS).

2.4.2 Requirement that Foreign Navies Abide by U.S. Mitigation Measures in HRC

As described in the HRC Final EIS, pursuant to the Navy's 2000 Policy for Environmental Compliance at Sea, the commander or officer in charge of a major exercise provides participating foreign units with a description of the measures to protect the environment required of similar U.S. units as early as reasonable in the exercise planning process and encourages them to comply. Chapter 6 of the HRC Final EIS notes that it is not within the power of the U.S. Navy to compel foreign sovereign immune vessels to adopt the U.S. mitigation measures and, therefore, NMFS did not consider this measure further. However, the Navy has indicated to NMFS that they strongly encourage foreign navies to abide by the same measures employed by the U.S. Navy.

2.4.3 Required Research and Development of Technology to Reduce MFAS Impacts

NMFS considered requiring the Navy to research and develop new technologies to better detect marine mammals and reduce impacts to marine mammals during MFAS use. However, the MMPA does not require that individuals who have applied for an incidental take regulations conduct research and develop new technologies prior to receiving an authorization and, therefore NMFS has not carried this proposed measure forward for analysis as part of an action alternative in this Mitigation EA.

However, NMFS has incorporated an adaptive management component into the HRC rule which would allow for yearly review of Navy monitoring and current science that could influence (allow for the potential modification of) monitoring and mitigation measures in subsequent LOAs, if appropriate.

NMFS recognizes the importance of research, and notes that the Navy specifically addressed research in the HRC Final EIS, and that the Navy's Record of Decision notes that Navy will continue to fund research efforts to develop associated data. NMFS encourages research on new or improved methods of marine mammal detection and on understanding the effects of Navy activities on marine mammals. The Navy continues to commit resources to marine mammal and related research efforts. A summary of the Navy's research plans is included in the FEIS and in NMFS' proposed rule, but these robust programs are not detailed here as the MMPA does not specifically require the conduct of research by applicants.

CHAPTER 3 – AFFECTED ENVIRONMENT

The affected environment for NMFS' decision consists of the marine mammals and their habitats potentially taken by the Navy's specified activity in the Hawaii Range Complex. This Mitigation EA tiers from the analysis presented in the HRC Final EIS; Section 3.1 of that EIS specifically presents the "Open Ocean" affected environment that is relevant to NMFS' proposed action.

CHAPTER 4 – ENVIRONMENTAL CONSEQUENCES

This chapter includes an analysis of the environmental consequences associated with each of the three alternatives presented in Chapter 2. The environmental consequences of the underlying Navy action for the marine resources relevant to NMFS' authorization are presented in Chapter 4.1 of the HRC Final EIS, and those consequences (e.g., number of estimated takes) are not reassessed here. Chapter 6 of the HRC Final EIS presents an analysis of the majority of the mitigation alternatives assessed in this Mitigation EA. Therefore, this tiered Mitigation EA provides additional analyses that build upon the information presented in Chapter 6 of the FEIS, as well as the consequences associated with a few additional measures (specifically, 2 measures for underwater explosive detonations that were raised during the comment period and the HRC Stranding Response Plan, which was in development when the FEIS was finalized) that were not analyzed in the HRC Final EIS.

NMFS has expanded the analysis of the potential benefit or lack of benefit of proposed marine mammal mitigation measures. The approach to this assessment is founded on the purposes of mitigation described in items a) through f) of Section 1.3, above. Where a benefit to marine mammals is identified in the assessment, NMFS has evaluated the practicability of the measure in greater detail. Note that practicability is not described in additional detail herein if the benefit of a measure to marine mammals is not clear, as NMFS would not seek to require measures with no identified benefit to the affected marine mammal species or their habitats; in these cases the practicability of the measure is as presented in Chapter 6 of the Final EIS. .

4.1 **No Action Alternative: Navy Mitigation Measures**

As described in Chapter 2 of this Mitigation EA, personnel training and monitoring for the presence of marine mammals for the implementation of the powerdown and shutdown zones are a large part of the Navy's standard protective measures. Section 2.1 presents the suite of specific mitigation measures that would be required by NMFS as part of the MMPA rulemaking under the No Action alternative. This section does not analyze each specific mitigation measure described in Alternative 2.1. Rather, NMFS considers the mitigation measures as they act together to effect the least practicable adverse impact. For example, the series of personnel training mitigations are analyzed below, followed by NMFS assessment of the effectiveness of this training operating in concert with the various requirements to survey areas for marine mammal presence and the subsequent requirement to implement appropriate mitigation (e.g., shut down) when marine mammals are sighted with certain distances from sound sources. NMFS' resulting analyses of the suite of measures considered under the No Action alternative are provided below.

Marine mammal mitigation training for specific participants in the active sonar activities is a key element of implementing the mitigation measures summarized above. The goal of this training is twofold: (1) that active sonar operators understand the details of the mitigation measures and be competent to carry out the mitigation measures, and (2) that key personnel onboard Navy platforms exercising in the various OPAREAS understand the mitigation measures and be competent to carry them out.

Navy personnel (i.e., lookouts/watchstanders, bridge personnel, active sonar operators, aviation units) on ships, submarines, and aircraft involved in ASW exercises receive a variety of professional training, including the marine species awareness training (MSAT) and the NAVEDTRA 12968-D (as applicable to their workstation) to increase their understanding of the visual cues, physical and behavioral characteristics of marine mammals. Lookout training includes precise scanning procedures for marine species (i.e., detect visual cues indicating the presence of marine mammals and their behavior). Other tools such as a Navy-developed whale identification wheel are provided to aid Navy crews in their identification of marine mammal species. Sonar operators are taught to distinguish biological contacts from other acoustic contacts and to notify lookouts of potential marine mammal detections so that lookouts can confirm the object sited.

Navy shipboard lookout(s) are highly qualified and experienced observers. The information presented here is a summary of input provided by Navy in response to inquiries from NMFS requesting more detail on the lookouts' qualifications and experience:

- Effective visual searching does not come naturally; Navy lookouts learn specialized scanning procedures, undergo extensive training and certification, and have more hours practicing these skills than many non-Navy marine mammal observers. For example, in the daytime, the average person must stop on an object in order to see it but Navy lookouts are skilled at scanning while moving their eyes across the water rapidly from point to point.
- At all times, the shipboard lookouts are required to sight and report all objects (e.g., trash, periscope) or disturbances (e.g., surface disturbance, discoloration) found in the water. Because the safety of the ship is dependent on the eyes of these lookouts, the chances are greater that a lookout will spot something: a faint wisp of smoke on the horizon may be the first indication of an approaching enemy surface unit or a single flash of sunlight on a wingtip may be the only notice of approaching enemy aircraft that can attack at a speed of 500 yards per second. Failure to see and report a mere pinpoint of light on the horizon jeopardizes the safety of the crew and means disciplinary action if they do not report everything they see or hear.
- Lookouts operate stations, scan for, and report all marine sightings prior to activating MFAS. Lookout watches established on ships survey the waters surface to the horizon. Their assigned areas have a 10-degree overlap, so no area will go unsearched. (Figure 3 Lookout/Watchstander Sectors Assigned). A special watch, called the low visibility lookout, is stationed as far forward in the ship as possible during fog or other conditions of poor visibility. The low visibility lookout watch consists of two people. One person wears sound powered (S/P) phones for communication with the bridge and the other looks and listens. Sounds at night are often heard without seeing their source and it might be possible to determine the bearing of the sound and, sometimes, an estimate of its distance. Conversely, when in a fog, sound sources are difficult to determine because the sound may seem to come from several different directions.

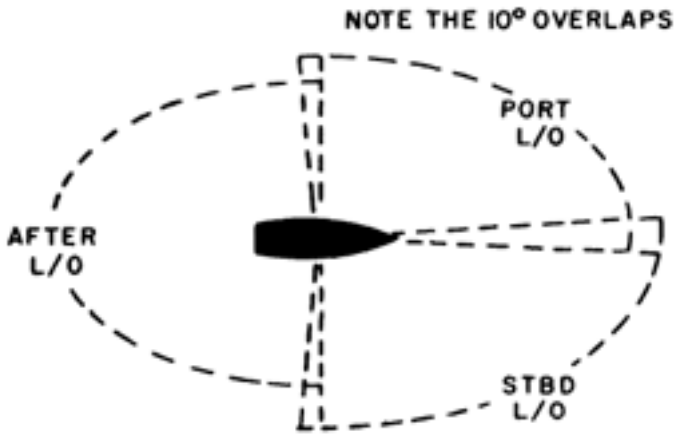

Figure 3 Lookout/Watchstander Sectors Assigned

The normal peacetime watch organization has three people in each watch section whose duties include observing the water surface around the vessel,with two specifically dedicated during ASW training observing the water for marine mammals. Personnel located on the bridge or atop the pilothouse whose duties include observing water also aid in marine mammal detection. In addition to surface ship lookouts, a majority of training exercises involve at least one aerial asset with crews specifically training to hone their detection of objects in the water. Surface and aerial platforms provide good survey capabilities using the Navy's existing exercise assets/personnel because they are faster and more efficient at scanning for and detecting objects in the water than inexperienced non-navy individuals. Sonar operators, lookouts, and the bridge team ensure quick and effective communication within the command structure resulting in facilitated implementation of mitigation measures if marine mammals are spotted.

4.1.1 Benefit to Marine Mammals / Effectiveness of Measure

The range clearance procedures and shutdown/safety zone/exclusion zone measures the Navy has proposed will enable the Navy to avoid injuring or killing any marine mammals and will enable them to minimize the numbers of marine mammals exposed to levels associated with TTS. As described in Section 1.3, this would accomplish purpose (a) and, also, purposes (b), (c), and (d) as they relate to TTS takes. The following subsections provide the rationale for NMFS assessment that these measures will benefit marine mammals and be practicable for the Navy to implement.

4.1.1.1 *MFAS/HFAS*

The Navy's standard protective measures indicate that they will ensure powerdown of MFAS/HFAS by 6 dB when a marine mammal is detected within 1000 yd (914 km), powerdown by 4 more dB (or 10 dB total) when a marine mammal is detected within 500 yd (457 km), and cease MFAS/HFAS transmissions when a marine mammal is detected within 200 yd (183 km).

PTS/Injury – NMFS' assessment indicates that the Navy's standard mitigation measures will allow the Navy to avoid exposing marine mammals to received levels of MFAS/HFAS sound that would result in injury for the following reasons:

- The estimated distance from the source at which an animal would receive a level of 215 dB SEL (threshold for PTS/injury/Level A Harassment) is approximately 10 m (10.9 yd) (this is for the SQS-53 sonar, the sonar with the highest source level. For the remaining sources, the distance to 215 dB SEL is at most half that distance.)
- The likelihood that a marine mammal would approach within 10 m (10.9 yd) of the sonar dome (to the sides or below) is unlikely for both of the following reasons:
    - Avoidance – As described previously, many marine mammals deliberately avoid vessels and/or other sound sources at varying distances
    - Even if marine mammals choose to approach, the likelihood of doing so without being seen by the watchstanders (who would activate a shutdown if the animal was within 200 yd (183 m) is very low
- The modeling presented in the HRC Final EIS and the Navy's authorization request did not predict any marine mammals would be exposed to a 215 dB SEL of MFAS/HFAS, and

TTS – NMFS' assessment indicates that the Navy's standard mitigation measures will allow the Navy to minimize exposure of marine mammals to received levels of MFAS/HFAS sound associated with TTS for the following reasons:

- The estimated range of distances from the source at which a marine mammal would receive 195 dB SEL (the TTS threshold) is from 110-165 m (120 -180 yd) from the source.
- Most marine mammals would likely avoid approaching the sound source within that distance.
- Based on the size of the animals, average group size, behavior, and average dive time, NMFS has determined that the probability that Navy watchstanders will visually detect mysticetes or sperm whales, dolphins, and social pelagic species (pilot whales, melon-headed whales, etc.) at some point within the 1000 yd (914 km) safety zone before they are exposed to the TTS threshold levels is high, which means that the Navy would be able to shutdown or powerdown to avoid exposing these species to levels associated with TTS.
- However, more cryptic, deep-diving species (beaked whales and Kogia sp.) are less likely to be visually detected and could potentially be exposed to levels of MFAS/HFAS expected to cause TTS (see the Threshold Shift section of the HRC proposed rule - TTS can have effects on marine mammals ranging from discountable to serious, however, serious effects would be expected in conjunction with TTS of a longer duration and larger amount, which is not expected to occur because of the 2 sets of bullets above). Additionally, the Navy's bow-riding mitigation exception for dolphins may sometimes allow dolphins to be exposed to levels of MFAS/HFAS likely to result in TTS as they approach the ship to bow-ride or swim away after bow-riding.

4.1.1.2 Underwater Explosives

The Navy utilizes exclusion zones (wherein explosive detonation will not begin/continue if animals are within the zone) for explosive exercises. Table 8 indicates the various explosives, the estimated distance at which animals will receive levels associated with take (see Section 1.4.3.2), and the exclusion zone associated with the explosive types.

Mortality and Injury – NMFS' assessment indicates that the Navy's standard mitigation measures will allow the Navy to avoid exposing marine mammals to underwater detonations that would result in injury or mortality for the following reasons:

- Surveillance for large charges (which includes aerial and passive acoustic detection methods, when available, to ensure clearance) begins two hours before the exercise and extends to 2 nm (3704 m) from the source.
- Marine mammals would need to be within less than 1023 m (1118 yd) (maximum distance for large explosives) or 305 m (334 yd) (maximum distance for smaller charges) from the source to be exposed to the injury threshold, and within less than 639 m (maximum distance for large explosives) or 148 m (maximum distance for smaller charges) from the source to be exposed to the mortality threshold.
- Unlike for sonar, an animal would need to be present at the exact moment of the explosion(s) (except for the short series of gunfire example in GUNEX) to be taken from a single explosion.
- The model predicted only 3 animals would be exposed to levels associated with injury and 0 animals exposed to levels associated with mortality (though, for the reasons listed in the above 3 bullets, NMFS does not expect that marine mammals will be exposed to those levels).
- When the implementation of the exclusion zones (i.e., not starting or not continuing to detonate explosives if an animal is detected within the exclusion zone) is combined with the above considerations, NMFS' assessment indicates that the Navy's standard mitigation measures will be effective in preventing injury and mortality to marine mammals from explosives.

TTS – NMFS' assessment indicates that the Navy's standard mitigation measures will allow the Navy to minimize the exposure of marine mammals to underwater detonations that would result in TTS for the following reasons:

- Very few animals were predicted to be exposed to explosive levels that would result in TTS. For the reasons noted above (i.e., implementation of mitigation measures such as pre-detonation surveillance), NMFS has determined that most modeled TTS takes can be avoided, especially dolphins, mysticetes and sperm whales, and social pelagic species.
- However, more cryptic, deep-diving species (beaked whales and Kogia sp.) are less likely to be visually detected and could potentially be exposed to explosive levels expected to cause TTS (see the Threshold Shift section of the HRC proposed rule - TTS can have effects on marine mammals ranging from discountable to serious, however, serious effects would be expected in conjunction with TTS of a longer duration and larger amount, which is not expected to occur because of the 2 sets of bullets above).
- Additionally, for two of the explosive types (MK-84 and MK-48), though the distance to the pressure threshold is within the exclusion zone, the distance at which an animal

would be expected to receive SEL levels associated with TTS (182 dB SEL) is larger than the exclusion zone, which means that for those two explosive types, any species could potentially be exposed to levels associated with TTS if it was detected in the limited area outside of the exclusion zone, but inside the distance to 182 dB SEL (see Table 8).

		TTS		Injury		Mortality	Exclusion
	lbs	182 SEL	23 psi	205 SEL	13 psi-ms	31 psi-ms	Zone Used
5" Naval gunfire	9.5	249	254	12	91	18	1852 m (1 nm)
76mm rounds	1.6	74	114	8	17	13	1852 m (1 nm)
Maverick	78.5	652	532	18	550	268	1852 m (1 nm)
Harpoon	448	1020	785	39	852	472	1852 m (1 nm)
MK-82	238	982	759	65	824	452	1852 m (1 nm)
MK-83	574	1322	992	113	1023	639	1852 m (1 nm)
MK-84	945	3834	1236	234	723	384	1852 m (1 nm)
MK-48	851	3495	1178	228	759	442	1852 m (1 nm)
Demolition Charges	20 (max)	643 (703 yd)	532	115	305	148	700 yd
EER/IEER	5	460	270	17	154	75	1000 yd

Table 8. Estimated maximum distances to indicated Criteria from source (meters unless otherwise noted)

4.1.2 Practicability of the Measures

The Navy currently utilizes the measures described in the No Action Alternative and has indicated that they are practicable. Therefore, NMFS has determined that these measures are practicable.

4.2 **Alternative 1 (NMFS Preferred Alternative)**

Alternative 1 includes the measures described and analyzed for the No Action alternative, plus the HRC Stranding Response Plan and Humpback Whale Cautionary Area. The environmental consequences of Alternative 1, with the exception of the measures discussed below, were described in section 4.1 and are equally applicable to this alternative.

4.2.1 HRC Stranding Response Plan

4.2.1.1 *Benefit to Marine Mammals / Effectiveness of Measure*

When marine mammals are in a situation that can be defined as a *stranding* (see glossary in Stranding Response Plan), they are experiencing physiological stress. When animals are stranded, and alive, exposing these compromised animals to additional known stressors would likely exacerbate the animal's distress and could potentially cause its death. Regardless of the factor(s) that may have initially contributed to the stranding, it is NMFS' goal to avoid exposing these animals to further stressors. Therefore, when live stranded cetaceans are in the water and engaged in what is classified as an *Uncommon Stranding Event* (USE) (see Stranding Response Plan glossary), the shutdown component (within 14 nm of the animal) of this plan will minimize the exposure of those animals to MFAS/HFAS and explosive detonations, regardless of whether or not these activities may have initially played a role in the event. This measure will contribute to goals (a) and (d) of the mitigation as described in Section 1.3 of this Mitigation EA.

The Stranding Response includes components more relevant to monitoring measures, but which also provide information that can be used to further benefit marine mammals. The plan will enhance the understanding of how MFAS or explosive detonations (as well as other environmental conditions) may, or may not, be associated with marine mammal injury or strandings. Information gained from the investigations associated with the Stranding Response Plan may be used in the adaptive management of mitigation or monitoring measures in subsequent LOAs, if appropriate. Finally, the information gathered pursuant to this protocol will inform NMFS' decisions regarding the Navy's compliance with Sections 101(a) (5) (B and C) of the MMPA.

4.2.1.2 *Practicability of the Measure*

The Navy has indicated that the measures contained in the Stranding Response Plan are practicable, and they have been utilizing a subset of these measures (those included in the No Action Alternative) for 2 years. Therefore, NMFS has determined that these measures are practicable.

4.2.2 Humpback Whale Cautionary Area

4.2.2.1 *Benefit to Marine Mammals / Effectiveness of Measure*

This measure will increase awareness of humpback whale presence and may potentially reduce impacts to humpback whales (through mitigation goals (b-d) described in Section 1.3 of this Mitigation EA) if MFAS use that would otherwise have occurred in this area does not because of the Humpback Whale Cautionary Area. However, the benefits will be likely be limited because the Navy has already indicated that the total hours of sonar training will be relatively low in the overall dense humpback area (red areas in Mobley Area, Figure 1), which includes the Humpback Whale Cautionary Area:

- SPORTS data (an internal Navy system used for tracking active sonar use) from 2007 indicates that the Navy operated sonar for a total of approximately 30 hours in the Mobley Area (i.e., the red areas in figure 2), which includes the Humpback Cautionary Area.
- Though SPORTS was not operative prior to mid-2006, the Navy indicated that sonar use in the Mobley Area prior to 2007 was similarly limited.
- The Navy generally asserts that the majority of the exercises are in water of depths of 2000-4000 km. This means that the exercises are 2–15 km (1–8 nm), or farther, from the densest areas of humpbacks, which would suggest, based on propagation information provided by the Navy, that the majority of behavioral takes of humpbacks would occur at received levels less than 150–160 dB. This further suggests that the overall potential severity of the effects is likely less than one would anticipate if humpbacks were not selectively using the shallower, inshore areas and the Navy was not conducting the majority of their exercises in deeper areas.

So, though the requirement for the Humpback Cautionary Area may not add a significant value, retention of the area and associated requirements could potentially reduce the take of

humpback whales if an exercise were not conducted there during the times that humpback whales are present as a result of implementation of the Humpback Whale Cautionary Area measure. Generally, NMFS assessment finds that the hull-mounted MFAS impacts to humpback whales are already expected to be less numerous and severe than if MFAS use were spread evenly throughout the deep and shallow water; the addition of the Humpback Cautionary Area may further reduce the potential for take of this ESA-listed species.

4.2.1.2 *Practicability of the Measure*

The Navy has indicated that the Humpback Whale Cautionary Area measure and the Stranding Response Plan proposed in Alternative 1 are practicable. Therefore, NMFS has determined that this measure is practicable.

4.3 **Alternative 2**

Alternative 2 includes the measures described and analyzed for Alternative 1, plus all or some subset of the measures analyzed below. The environmental consequences of Alternative 1, with the exception of the measures discussed below, were described in section 4.2 and are equally applicable to this alternative**.**

4.3.1 Seasonal and/or Geographic Limitations

4.3.1.1 *Benefit to Marine Mammals / Effectiveness of Measure*

Seasonal or Geographic Limitations are one of the most direct and effective means of reducing adverse impacts to marine mammals. By reducing the overlap in time and space of the known concentrations of marine mammals and the acoustic footprint associated with the thresholds for the different types of take (either at all times and places where animals are concentrated, or times and places where they are concentrated for specifically important behaviors (such as reproduction or feeding)), the amount of take can be reduced. Variations of these types of measures can meet mitigation goals (a-d).

It is important, however, that these measures are used carefully at times and places where their effects are relatively well known. For example, if there is credible evidence that concentrations of marine mammals are known to be high at a specific place or during a specific time of the year (such as the high densities of humpback whales delineated on the Mobley map in the HRC, or North Atlantic right whale critical habitat on the east coast), then these types of blanket seasonal or geographic exclusions or limitations may be appropriate. However, if marine mammals are known to *prefer* certain *types* of areas (as opposed to specific areas) for certain functions (such as beaked whales use of seamounts or marine mammal use of productive areas like cyclonic eddies), which means that they may or may not be present at any specific time, it is less effective to require avoidance or limited use of the area all of the time.

Of note (because this measure is often recommended by the public), the Navy analyzed the physical factors that were present in the Bahamas (2000), Madeiras (2000), Canaries (2002), and Spain (2006) strandings, which were associated with MFAS use. They used these factors to

develop a protective measure for use when this combination of factors was broadly in place. Note that the factors described below do not exist in their aggregate in the HRC. The measure indicates that the Navy should avoid planning major ASW training exercises with mid-frequency active sonar in areas where they will encounter conditions which, in their aggregate, may contribute to a marine mammal stranding event.

The conditions to be considered during exercise planning (which do not exist in their aggregate in HRC) include:

(i) Areas of at least 1000 m depth near a shoreline where there is a rapid change in bathymetry on the order of 1000-6000 meters occurring across a relatively short horizontal distance (e.g., 5 nm).

(ii) Cases for which multiple ships or submarines ($\geq$ 3) operating mid-frequency active sonar in the same area over extended periods of time ($\geq$ 6 hours) in close proximity ($\leq$ 10 nm apart).

(iii) An area surrounded by land masses, separated by less than 35 nm and at least 10 nm in length, or an embayment, wherein operations involving multiple ships/subs ($\geq$ 3) employing mid-frequency active sonar near land may produce sound directed toward the channel or embayment that may cut off the lines of egress for marine mammals.

(iv) Though not as dominant a condition as bathymetric features, the historical presence of a significant surface duct (i.e. a mixed layer of constant water temperature extending from the sea surface to 100 or more feet).

For purposes of completeness, this Mitigation EA addressed the steps Navy would follow if the above conditions were found to exist in their aggregate for a particular event. Since the aggregate conditions are not expected in the HRC, implementation of these measures is not required and is not intended by Navy for HRC exercises. However, if the Major Exercise must occur in an area where the above conditions exist in their aggregate, these conditions must be fully analyzed in environmental planning documentation. In such cases, the Navy would increase vigilance by undertaking the following additional mitigation measure:

- A dedicated aircraft (Navy asset or contracted aircraft) will undertake reconnaissance of the embayment or channel ahead of the exercise participants to detect marine mammals that may be in the area exposed to active sonar. Where practical, advance survey should occur within about two hours prior to mid-frequency active sonar use, and periodic surveillance should continue for the duration of the exercise. Any unusual conditions (e.g., presence of sensitive species, groups of species milling out of habitat, any stranded animals) shall be reported to the Office in Tactical Command (OTC), who should give consideration to delaying, suspending or altering the exercise.
- The post-exercise report must include specific reference to any event conducted in areas where the above conditions exist, with exact location and time/duration of the event, and noting results of surveys conducted.

4.3.1.2 *Practicability of the Measure*

Generally speaking, the Navy has informed NMFS that they need to have the flexibility to operate at any time or place to meet their training needs pursuant to Title 10. The Navy needs to be able to train in the largest variety of physical (bathymetry, etc.), environmental, and

operational (within vicinity of different assets, such as airfields, instrumented ranges, homeports, etc.) parameters in order to be properly prepared. Additionally, Navy training, planning and implementation needs to be adaptable in order to accommodate the need of the Navy to respond to world events and the ever-changing strategic focus of the U.S. In some cases, the Navy has been able to commit to considering certain areas that are important to marine mammals in their planning process, or limiting MFAS use in certain ways in certain areas, but has always expressed a need to maintain the flexibility to train in an area if necessary for national security, and any measures imposed by NMFS need to account for this reality. The Humpback Whale Cautionary Area addressed above is an example of one of the ways the Navy has been able to be protective in a specific area and a specific time of year.

Aside from the general reasons of impracticability cited above, below are some of the specific reasons that certain specific types of seasonal and geographic restrictions or limitations are impracticable for the Navy.

Coastal restrictions - Littoral waterspace is where the enemy will operate. The littoral waterspace is also the most challenging area to operate due to a diverse acoustic environment. It is not realistic to refrain from training in the areas that are the most challenging and operationally important. Also, coastal restrictions would decouple ASW training and Amphibious training, which are critically important (together) due to the high risk to forces during actual Amphibious operations.

Sea Mounts - Submarine tracking is a long and complicated tactical procedure. The training value of these procedures would be lost if operations were terminated when nearing sea mounts prior to reaching the training objectives. Sea mounts impact the way sound travels in water as well as the Navy's ability to search and track submarines. If the Navy does not train near sea mounts and understand how sea mounts affect their ability to search and track a submarine, they will unable to do so when faced with an actual threat. Submarine search planning is a detailed process that requires flexibility and large operating areas. If the Navy avoided searching or tracking submarines near sea mounts, ASW operators would be severely limited in their ability to execute effective plans. Additionally, there are over 300 sea mounts in the HRC and many of them are present in training locations where training is currently planned. The necessity to plan training in these areas is driven by the need to avoid the presence of commercial air traffic.

Cyclonic eddies – NMFS has determined that the impracticability to the Navy of avoiding these features outweighs the potential conservation gain. Though many species may congregate near cyclonic eddies, cyclonic eddies are very large, and, so restricting access to the full extent of these features to avoid animals that may congregate in a small subset of the total areas is not practicable. Additionally, limiting sonar use in the vicinity of these types of features would disrupt training for the reasons described above for sea mounts.

4.3.2 Use of Additional Detection Methods to Implement Mitigation (Shutdown Zones)

4.3.2.1 *Benefit to Marine Mammals / Effectiveness of Measure*

Lookouts stationed on surface vessels are currently the primary component of the Navy's marine mammal detection capabilities, with some opportunistic assistance from aerial or passive acoustic platforms when such assets are participating in a given exercise. NMFS recognizes the weaknesses inherent in using vessel-based visual observers to detect marine mammals (especially cryptic and deep-diving species like beaked whales, which are not at the surface often and are difficult to see when they are) (Barlow et al., 2002). The use of additional detection methods, such as those listed in chapter 2, for the implementation of mitigation would further minimize the take of marine mammals (through mitigation goal (e), Section 1.3). Specifically, passive and active acoustic methods could detect animals that were below the surface (for passive acoustic detection, the animals would have to be vocalizing to be detected, but for active acoustic detection they would not – the HFM3 system utilized by LFA sonar vessels effectively detects marine mammals to within 1 km of the sonar source). Additionally, the use of more specialized passive acoustic detection methods could increase the practicability of species-specific measures (such as powering or shutting down when beaked whale aggregations are nearby). Some benefits of specific methods are included in the section below.

In order for additional marine mammal detection methods to assist in the implementation of mitigation (shutdown and powerdown), they must be able to localize, or identify where the marine mammal is in relation to the sound source of concern (since shutdown and powerdown mitigation is triggered by the distance from the sound source), and transmit the applicable data to the commanding officer in real time (i.e., quickly so that the sonar source can be turned down or shut off right away or the explosive detonation can be further delayed). Techniques based on the realtime participation of additional observers (such as additional aerial platforms) can achieve this, while many passive acoustic methods cannot. The section below contains information provided by the Navy that speaks both to the practicality of implementation of some methods as well as the effectiveness.

4.3.2.2 *Practicability of the Measure*

The assessments below are based largely on additional information provided by the Navy in response to inquiries from NMFS regarding practicability, which, under the MMPA is to be determined by NMFS after consultation with the Navy.

Radars - While Navy radars are used to detect objects at or near the water surface, radars are not specifically designed to search for and identify marine mammals. For example, when an object is detected by radar, the operators cannot definitively discern that it is a whale. During a demonstration project at Pacific Missile Range Facility (PMRF), radar systems were only capable of detecting whales under very controlled circumstances and when these whales were already visually spotted by lookouts/watchstanders. Enhancing radar systems to detect marine mammals requires additional resources to schedule, plan and execute Navy limited objective experiments (LOEs) and Research, Development, Test & Evaluation (RDTE) events. The Navy is currently reviewing opportunities to pursue enhancing radar systems and other developmental

methods such as laser detection and ranging technology as potential mitigation for detecting marine mammals. Until funding resources and the data are available to develop enhanced systems, it is not technically feasible to implement radar as an additional detection method.

Additional Platforms (aerial, UAV, Gliders, and Other**)** - The number of aerial and unmanned aerial vehicle (UAV) systems currently integrated into fleet training is extremely low and their availability for use in most training events is rare; therefore, shifting their use and focus from hunting submarines to locating marine mammals would be costly and negatively impact the training objectives related to these systems. If additional platforms are civilian, scheduling civilian vessels or aircraft to coincide with training events would affect training effectiveness since exercise events or timetables are not fixed and are based on a free flow development of tactical situations. Waiting for civilian aircraft or vessels to complete surveys, refuel, or be on station would slow the required progress of the training exercise. In addition, the precise location data and exercise plans provided to non-Navy assets poses logistical challenges and classification or security issues. While the Navy is currently reviewing options for additional detection methods, these additional platforms proved to be impracticable for the following reasons:

- Additional Aerial Survey Detection: Airborne assets already monitor for the presence of marine mammals with no reported incidents where marine mammals were overlooked during an exercise or where aerial assets were unable to perform their duties while watching for marine mammals; therefore, the allocation of additional airborne assets is not well justified. In addition, the presence of additional aircraft (not involved in the exercise) near naval exercises would present safety concerns for both commercial and naval observers because ASW training exercises are dynamic, can last several hours or days, and cover large areas of ocean several miles from land.
- UAV Detection: Currently and in the foreseeable five-year period of the requested authorization, these assets are extremely limited and are rarely if ever available, therefore impractical and expensive.
- Gliders Detection: Gliders are not currently capable of providing real time data, and therefore, are not an effective detection method for use in mitigation implementation.

Active Sonar - As previously noted, the Navy is actively engaged in acoustic monitoring research involving a variety of methodologies; however, none of the methodologies have been developed to the point where they could be used as a mitigation tool for MFAS. At this time, the active sonar and adjunct systems listed above proved to be impracticable for the following reasons:

- Use of multiple systems (meaning the MFAS used for the exercise plus any additional active system used for marine mammal detection) operating simultaneously increases the likelihood that a submarine may be detected under conditions where it is attempting to mask its presence before activating sonar resulting in an impact to the effectiveness of the military readiness activity. Additionally, interference may occur when certain active sonar systems (such as HFM3) are activated concurrently with MFAS.

- HFM3 is an adjunct system used by LFA because the hulls of those platforms can be modified and travel can occur at slow speeds. MFAS combatants are not equipped with HFM3 systems and it is impractical to install such a system on MFAS combatants.

The Navy will continue to coordinate acoustic monitoring and detection research specific to the proposed use of active sonar. As technology and methodologies become available, their applicability and viability will be evaluated for potential future incorporation.

Additional Passive Acoustic Monitoring - To provide a specialized localization capability (distance, direction, etc.), most of the systems mentioned in Chapter 2 (Sonobuoys, SQQ89, Bottom-Mounted Sensors) require significant modifications. The Navy is working to develop or enhance systems with distance measuring capabilities. Until these capabilities are available, exercise participants can use these systems to aid in marine mammal detection, but not solely to implement mitigation measures. Although passive contact on marine mammals only indicates the presence, not the range (distance and direction), the information on any passive acoustic detections is disseminated real time to allow lookouts to focus their visual search for marine mammals.

The Navy is improving the capabilities to use range instrumentation to aid in the passive acoustic detection of marine mammals. For example, though range capabilities at the PMRF range in Hawaii are more limited, at the SCORE Range in California, development of effective passive acoustic detection as part of the instrumented range is progressing fairly rapidly. Passive acoustic monitoring has the potential to significantly improve the ability to detect marine mammal presence within SCORE. The N45/ONR sponsored Marine Mammal Monitoring on Navy Ranges (M3R) program has developed hardware and software that leverages the SOAR sensors to detect and localize marine mammal vocalizations. Localization is possible when the same signal is detected, precisely time-tagged, and associated on at least three sensors. Prototype M3R systems have been installed on both the AUTEC (Bahamas) and SCORE ranges.

The M3R system is capable of monitoring all the range hydrophones in real-time. The Navy is refining the M3R system by developing tools to display detected transient signals including marine mammal vocalizations and localizations. The tools operate in real-time and are being used in a series of tests to document marine mammal species, their vocalizations, and their distribution on the SOAR range. In addition, they are being used to collect and analyze opportunistic data at AUTEC, and as part of the on-going Behavioral Response Study (BRS) there.

Reliable automated methods are needed for detection and classification of marine mammal calls to allow range hydrophones to be used for routine marine mammal monitoring in SCORE. The performance of these hydrophones must be quantified. The calls of many baleen whale species are stereotyped and well known. Identification of stereotyped mysticete calls within SCORE has been accomplished using automatic detectors. However, the full range of mysticete call types that are expected within SCORE are not known (e.g. sei whales). Odontocete call identification is more difficult owing to their call complexity. Calls of some odontocetes, such as sperm whales, killer whales, and porpoises, are easily distinguishable. For most species, however, the variation in and among call types is a topic of current research.

Likewise, pinniped call types are complex and more data are needed to develop automatic detectors and classifiers to allow automated identification for pinniped species within SCORE. The Navy continues to develop this technology.

In Hawaii, PMRF range hydrophones extend from shallow (300 m) to very deep (4,000 m) over an instrumented area that covers over 1,000 $km^{2.}$ PMRF sensors are grouped into 3 adjacent range areas. The shallow water range consists of a set of multiplexed arrays with 78 working hydrophones. The sensors cover a frequency bandwidth of approximately 8-48 kHz. The BARking Sands Training Undersea Range (BARSTUR) consists of a 42 individually cabled hydrophones . 6 hydrophones have a bandwidth of 50 Hz- 50 kHz. The remaining 36 phones have a bandwidth of 8 kHz to 50 kHz. Finally, the Barking Sands Undersea Range Expansion (BSURE) provides 18 hydrophones on 2 analog multiplexed arrays in very deep water (> 3 km). The BSURE phones have with a bandwidth of 50 Hz to 19 kHz. The BSURE phones have exceeded their life expectancy and will be replaced in 2010. The replacement phones are designed with a bandwidth of 50 Hz to 40 kHz and can be used to monitor higher frequency vocalizations including those produced by Blainville's and Cuvier's beaked whales.

There is no system for the real-time detection of marine mammals at PMRF. A proposal to install a M3R system based on those installed at AUTEC and SCORE was provided in FY08 but remains unfunded. Recordings have been made using selected PMRF hydrophones (Martin et. al). These recordings have been partially analyzed. Minke whale vocalization data from these recordings are being used as part of the National Oceanic Partnership Program (NOPP) Density Estimation of Cetaceans using Acoustic Fixed Sensors (DECAF). Interface software has been completed and the recordings are being directly read directly into M3R system and a classifier for Minke whale vocalizations is being added.

Of the 3 major ranges, only AUTEC monitors the sensors in real-time for mitigation during active sonar operations. Animal densities at AUTEC are low. The dominant species is Blainville’s beaked whale. The M3R opportunistic study of these animals during active operations strongly suggests they move off range during operations. This avoidance behavior combined with low densities makes the use of the range for mitigation implementation using imprecise localization associated with passive acoustic monitoring possible without major impact to operations.

At SCORE the large number of species and high animal density combined with imprecise acoustic localization makes the efficacy of such monitoring for use for mitigation implementation during real-time operations questionable.

The species present and densities at PMRF have not been determined. At the same time the effect of passive acoustic monitoring on operations and its overall efficacy is unknown. This is complicated by the presence of humpback whales for part of the year whose low frequency vocalizations are detected on multiple hydrophones. Preliminary analyses of recordings with detected calls show animals off range near the coast of Kauai. These animals were localized by isolating calls on multiple hydrophones

by hand. The ability to automatically localize in real-time has yet to be demonstrated. Because these low frequency calls propagate long distances, localizing these animals is critical.

Prior to implementation of real-time passive acoustic monitoring for use in mitigation, the species present and their distribution should be established. A system must be implemented on range and Detection, Classification, and Localization (DCL) algorithms specific to these species must be developed and tests with visual observers must be conducted to verify their performance.

Preliminary data analysis of recoded data suggests animal densities at PMRF between that of AUTEC and SCORE. The effect of real-time monitoring on operations given PMRF site specific factors must be considered.

Infrared technology – As a complement to existing methods, use of the Infrared (IR) band for marine mammal detection and location has some obvious benefits if proved viable, including the ability to operate infrared at night, as well as the ability to establish automated detections procedures which might well reduce the factor of human fatigue that affects observer-based methods. The Navy has committed to a program of research, development, and testing of IR-based technologies for detection of marine mammals in the wild.

The Navy program will have two main thrusts. NAVAIR will continue to pursue operational tests of their airborne monitoring and mitigation program for marine species using net-centric Intelligence, Surveillance, and Reconnaissance (ISR) systems. The proposed system uses a radar detect and track cueing sensor for a turreted airborne Electro-Optic/Infrared/Multi-spectral imaging sensor. If fully funded for prototyping and demonstration, this program would evaluate the efficacy for marine mammal detection of a large, high-powered system designed, tested, and deployed for other purposes, and operates beyond the domain of research Science and Technology.

At the same time, the Office of Naval Research (ONR) will take the lead in pursuing a longer-range, research S&T program to evaluate new concepts for IR detection that may ultimately lead to an operationally viable technique(s). The focus of the ONR effort will be on comparatively small, low-power systems that might be deployable on small, robot aircraft known as Unmanned Aerial Vehicles (UAVs) as well as operating in a ship-based mode. Either option might allow the inclusion of standard video for confirmation of mammal detections during the day. The UAV option might allow for multiple passages of an area of interest at low altitude to confirm mammal detections and identification.

ONR will continue to support this effort for at least several years, with the potential for sustained support, though the future breadth of this program will depend on the outcome of early efforts. The system is not considered practicable to require for implementation at this time.

4.3.3 Use of Independent Marine Mammal Observers (MMOs) to Implement Mitigation

4.3.3.1 *Benefit to Marine Mammals / Effectiveness of Measure*

As discussed in Section 4.2 of this Mitigation EA, Navy lookouts are specifically trained to detect anything (living or inanimate) that is in the vicinity of, visible from, or approaching the vessel. The safety of the personnel on board and of the vessel depends on their performance. While they receive training that is intended to expose them to the different species of marine mammals they might see and the behaviors they might potentially observe, they would certainly not be expected to differentiate between species or identify the significance of a behavior as effectively as an independent MMO. However, identification to species and understanding of marine mammal behavior is not necessary for mitigation implementation – for that, a lookout must simply detect a marine mammal and estimate its distance (e.g., within 1000 yds, 500 yds, or 200 yds) to the vessel. Though independent MMOs are critical to implement a Monitoring Plan, lookouts would likely be no less effective at detecting marine mammals for mitigation implementation than an MMO.

However, NMFS has recommended, and the Navy has included in their Monitoring Plan a study that compares the effectiveness of Navy lookouts, versus MMOs, at detecting marine mammals to implement mitigation measures. In the meantime, there is not much protective value to be gained by utilizing independent MMOs instead of Navy lookouts to implement the mitigation measure.

4.3.3.2 *Practicability of the Measure*

Following are several reasons that the Navy presented for why using third-party observers from air or surface platforms, in addition to or instead of the existing Navy-trained lookouts is not practicable.

- The use of third-party observers could compromise security due to the requirement to provide advance notification of specific times/locations of Navy platforms.
- Reliance on the availability of third-party personnel would also impact training flexibility, thus adversely affecting training effectiveness. The presence of other aircraft in the vicinity of naval exercises would raise safety concerns for both the commercial observers and naval aircraft.
- Use of Navy observers is the most effective means to ensure quick and effective implementation of mitigation measures if marine species are spotted. A critical skill set of effective Navy training is communication. Navy lookouts are trained to act swiftly and decisively to ensure that appropriate actions are taken.
- Security clearance issues would have to be overcome to allow non-Navy observers onboard exercise platforms.
- Some training events will span one or more 24-hour period(s), with operations underway continuously in that timeframe. It is not feasible to maintain non-Navy surveillance of these operations, given the number of non-Navy observers that would be required onboard.
- Surface ships with active mid-frequency sonar have limited berthing capacity. Exercise planning includes careful consideration of this limited capacity in the placement of

exercise controllers, data collection personnel, and Afloat Training Group personnel on ships involved in the exercise. Inclusion of non-Navy observers onboard these ships would require that in some cases there would be no additional berthing space for essential Navy personnel required to fully evaluate and efficiently use the training opportunity to accomplish the exercise objectives.

- Aerial surveying during an event raises safety issues with multiple, slow civilian aircraft operating in the same airspace as military aircraft engaged in combat training activities. In addition, most of the training events take place far from land, limiting both the time available for civilian aircraft to be in the exercise area and presenting a concern should aircraft mechanical problems arise.
- Scheduling civilian vessels or aircraft to coincide with training events would impact training effectiveness, since exercise event timetables cannot be precisely fixed and are instead based on the free-flow development of tactical situations. Waiting for civilian aircraft or vessels to complete surveys, refuel, or be on station would slow the progress of the exercise and impact the effectiveness of the military readiness activity.
- Multiple events may occur simultaneously in areas at opposite ends of the HRC and continue for up to multiple days at a time. There are not enough qualified third-party personnel to accomplish the monitoring task.

4.3.4 Enlargement or Modification of Powerdown/Shutdown Zones of Hull-mounted Sonar

4.3.4.1 *Benefit to Marine Mammals / Effectiveness of Measure*

As described in section 4.2, the Navy's current mitigation measures were designed to avoid injury of marine mammals and minimize the amount of times that marine mammals are exposed to received levels of sound associated with TTS, and NMFS has determined that these measures accomplish this.

Enlargement of the powerdown or shutdown zones would primarily result in the further reduction of the maximum received level that the detected animal might be exposed to (mitigation goal (d)), which could potentially mean that an animal expected to respond in a manner NMFS would classify as level B harassment could potentially either respond in a less severe manner or maybe not respond at all. This could be more important at an important time or place or in the presence of species or age-classes of concern (such as beaked whales or humpback whale calves).

Practically, NMFS notes that review of the Navy's post-exercise reports shows that marine mammal observations in Hawaiian waters are minimal to begin with and the lookouts have not reported any observed response of marine mammals at any distance.

Because sounds propagate further in a surface duct, the purpose of enlarging the powerdown/shutdown zone during a surface duct would not be to reduce the levels that an animal is exposed to. Rather, in the case of a surface duct, the purpose of enlarged safety zones would be to ensure that injury can still be avoided and TTS minimized in the presence of a

feature that increases sound propagation, which results in and the received level of sound at the same distance being higher. However, a strong surface duct was already factored into the Navy model and the estimated distances from the source in which an animal would be exposed to received levels associated with TTS and injury already take a strong surface duct into account.

4.3.4.2 *Practicability of the Measure*

The safety range the Navy has developed is within a range sailors can realistically maintain situational awareness and achieve visually during most conditions at sea. Requirements to implement procedures when marine mammals are present well beyond 914 m (1,000 yd) require that lookouts sight marine mammals at distances that, in reality, they cannot. These increased distances also greatly increase the area that must be monitored to implement these procedures. For instance, if a power down zone increases from 914 to 3,658 m (1,000 to 4,000 yd), the area that must be monitored increases sixteen fold, which is not practicable.

4.3.5 Ramp Up of Sonar Source Prior to Full Power Operation

4.3.5.1 *Benefit to Marine Mammals / Effectiveness of Measure*

Based on the fact that some marine mammals avoid sound sources, such as vessels, seismic sources, or MFAS (Richardson et al., 1995, Southall et al., 2008, and BRS Cruise Report, 2008), animals would theoretically slowly move away from a sound source that was ramped up starting at low energy, which would result in the animals not being suddenly exposed to a more alarming, or injurious sound. NMFS requires the ramp up of seismic sources used in ocean bottom mapping used for research or oil and gas exploration. This measure could theoretically accomplish mitigation goals (b-d), but mostly (d) (see Section 1.3).

4.3.5.2 *Practicability of the Measure*

Ramp-up procedures, (slowly increasing the sound in the water to necessary levels), are not a viable alternative for Navy training exercises because the ramp-up would alert opponents to the participants' presence. This affects the realism of training in that the target submarine would be able to detect the searching unit prior to themselves being detected, enabling them to take evasive measures. This would insert a significant anomaly to the training, affecting its realism and effectiveness. Though ramp-up procedures have been used in testing, the procedure is not effective in training crews to react to tactical situations, as it provides an unrealistic advantage by alerting the target. Using these procedures would not allow the Navy to conduct realistic training, or "train as they fight," thus adversely impacting the effectiveness of the military readiness activity. Therefore, NMFS considers this measure to be impracticable.

4.3.6 Halting of MFAS Use in the Event of a Marine Mammal Injury or Death (and Stranding) until Cause is Determined

4.3.6.1 *Benefit to Marine Mammals / Effectiveness of Measure*

Only in a very small portion of incidents (such as when a ship strikes a whale and personnel realize it immediately) is the cause of marine mammal injury or death immediately known. NMFS almost always includes a measure in the MMPA authorization that requires the authorized entity to cease their action and immediately contact NMFS in cases where their activity is known to have caused the injury or death of a marine mammal. This measure is more responsive to ensuring compliance with the MMPA than to the reduction of effects to any marine mammal.

Halting MFAS use in the event of a marine mammal stranding may have an immediate benefit to marine mammals if animals have stranded and are still in the water and are within a certain distance of a Navy sound source(s) (not to imply that the Navy source would be assumed to have caused the event), i.e., it is physically possible for them to be exposed to received levels of sound that could potentially result in an additional adverse effects. In this case, cessation of sonar could alleviate additional stress to an animal that is already in a compromised physical state.

However, if stranded animals are dead or on the beach, the benefit of a cessation of sonar is less clear as neither dead nor beached animals can benefit from it. Additionally, when animals are dead or on the beach, the Stranding response plan proposed in NMFS' preferred alternative indicates that "NMFS will coordinate internally, with the Navy, and with other agencies and entities with the intent of obtaining aerial survey arrangements. If an aircraft is available, a survey will be conducted within 10 miles (on the shore and in the water) to look for additional animals that meet the USE criteria. NMFS will request that the Navy assist with aerial surveys, as resources are available," that continuing effects, not visible at the stranding site, are not continuing to occur.

4.3.6.2 *Practicability of the Measure*

Investigations into the causes of stranding events often take months or years and the most probable outcome is that a definitive determination of cause is not made. Despite the fact that the Navy has been conducting thousands of hours of sonar, each, in the HRC, southern California, and off the east coast of the U.S. for multiple years, NMFS and the Navy have concluded that only 5 strandings worldwide (and not in the areas mentioned) can be definitively associated with MFAS use. It is impracticable to halt the use of MFAS while the cause of a stranding is determined.

4.3.7 Suspension of MFAS Training at Night, or During Low Visibility or Surface Duct

4.3.7.1 *Benefit to Marine Mammals / Effectiveness of Measure*

The Navy indicates that it is capable of ***effectively monitoring*** a 1000-yd safety zone using night vision goggles and passive acoustic monitoring (infrared cameras are sometimes used as an extra tool for detection, when available, but have not been shown to show a significant enhancement of current capabilities). Night vision goggles are always available to all vessel and aircrews as needed and passive acoustic monitoring is always in use.. As mentioned previously, the estimated zone in which TTS may be incurred is within about 165 m of the sound source, and the estimated zone for injury is within 10 m of the sonar dome. The powerdown and shutdown zones are at 1000, 500, and 200 yds. The Navy is expected to be able to effectively implement the necessary mitigation measures during nighttime and times of lower visibility.

Because of the limited visibility beyond 1000 m, Navy personnel could potentially detect fewer animals early (outside of the 1000 yds), as they are approaching to within 1000 yd, which could result in a slightly delayed powerdown or shutdown as compared to when operations are conducted in full daylight. However, any such potential delays would be at the outer edge of the safety zone and would not result in an animal being exposed to received sound levels associated with TTS or injury. So, suspension of MFAS during times of lower visibility could slightly reduce the exposures of marine mammals to levels associated with behavioral harassment (goals b-d), but would not reduce the number of marine mammals exposed to sound levels associated with TTS or injury.

4.3.7.2 *Practicability of the Measure*

ASW training using MFAS is required year round in all environments, to include nighttime and low visibility conditions or conditions that realistically portray bathymetric features where adversary submarines threats (i.e., extremely quite diesel electric or nuclear powered) can hide and present significant detection challenges. Unlike an aerial dogfight, which is over in minutes or even seconds, ASW is a cat and mouse game that requires large teams of personnel working in shifts around the clock (24-hours) to complete an ASW scenario. ASW can take a significant amount of time to develop the tactical picture (i.e., understanding of the battle space such as area searched or unsearched, identifying false contacts, and water conditions). Reducing or securing power at night or in low visibility conditions would affect a Commander's ability to develop the tactical picture as well as not provide the needed training realism. If there is an artificial break in the exercise by reducing power, the flow of the exercise is lost and several hours of training will have been wasted. Both lost time and training differently than what would be needed in combat diminish training effectiveness.

MFAS training at night is vital because differences between daytime and nighttime affect the detection capabilities of MFAS systems. Ambient noise levels are higher at night because many species use the nighttime period for foraging and movement. Temperature layers, which affect sound propagation, move up and down in the water column from day to night. Consequently, personnel must train during all hours of the day to ensure they identify and respond to changing environmental conditions. An ASW team trained solely during the day cannot be sent on deployment and be expected to fight at night because they would not identify and respond to the changing conditions.

Finally, as a matter of safety and international law, Navy vessels are required to use all means available in restricted visibility, including MFAS and positioning of additional lookouts, to provide heightened vigilance to avoid collision. The *International Navigation Rules of the Road* considers periods of fog, mist, falling snow, heavy rainstorm, sandstorms, or any similar events as "restricted visibility." In restricted visibility, all mariners, including Navy vessel crews, are required to maintain proper lookout by sight and hearing as well as "by all available means appropriate in the prevailing circumstances and conditions so as to make a full appraisal of the situation and of the risk of collision." Prohibiting or limiting vessels from using sensors like MFAS during periods of restricted visibility violates international navigational rules, increases navigational risk, and jeopardizes the safety of the vessel and crew.

4.3.8 Avoidance of the Papahanaumokuakea Marine National Monument or Hawaiian Islands Humpback Whale National Marine Sanctuary

4.3.8.1 *Benefit to Marine Mammals / Effectiveness of Measure*

Pursuant to the MMPA, NMFS makes decisions regarding required mitigation based on biological information pertaining to the potential impacts of an activity on marine mammals and their habitat (and the practicability of the measure), not management designations intended for the broad protection of various other marine resources.

Both the No Action Alternative and Alternative 1 include measures intended to limit the take of marine mammals in the PMNM, the HIHWNMS, and throughout the HRC. A small portion of the PMNM overlaps with the HRC and the Navy has not indicated they would refrain from operating in the PMNM. If operations do occur in this small area, the Navy would be required to: powerdown and shutdown sonar when marine mammals are detected within ranges where the received sound level is likely to result in temporary threshold shift (TTS) or injury; use exclusion zones that avoid exposing marine mammals to levels of explosives likely to result in injury or death of marine mammals, and; implement the Stranding Response Plan for the HRC. NMFS expects that the mitigation measures employed in the PMNM and HIHWNMS would avoid injuring marine mammals in the PMNM and HIHWNMS, reduce the number of marine mammals exposed to levels of sound expected to result in TTS in these areas, and provide a framework for the protection of marine mammals and effective investigation of cause should a marine mammal stranding occur. The PMNM is an area of importance, both culturally and biologically, and the majority of the endangered Hawaiian monk seal population is found in the northwestern Hawaiian Islands. However, only the most southeastern of these islands falls within the HRC and it is at the very edge of the Range Complex. Monk seals generally forage at depths of less than 100 m, but occasionally dive to depths of over 500 m, however, the majority of the ASW training in the HRC takes place in waters 4 to 8 times deeper (than 500 m) and it is very rare for ASW training to take place in waters as shallow as 100 m. For these reasons, NMFS has determined that the likelihood of monk seal/ASW interaction in the PMNM is low and restrictions of sonar in the area would provide limited additional value to monk seals and other marine mammals.

All of the HIHWNMS is contained within the HRC. If sonar activities are conducted within the HIHWHNMS, the same measures mentioned above would be used, and the anticipated results would be the same. In addition, Alternative 1 includes the designation of a Humpback Whale Cautionary Area, which largely falls within the HIHWNMS and includes a requirement for an extra level of clearance to conduct MFAS activities. The Navy and NMFS recognize the ecological importance of the Maui Basin (the area defined as the Cautionary Area) to humpback whales and have agreed that the significance of this area should be factored into the Navy's MFAS planning. The Navy indicated to NMFS that in 2007, they operated surface vessel MFAS (the most powerful source) for a total of only approximately 30 hours in the areas of the HRC in which humpbacks are present, which largely overlaps with the HIHWNMS. MFAS use in the HIHWHNMS is relatively limited and implementation of the Humpback Whale Cautionary Area could lessen further any potential adverse impacts to humpback whales. Therefore, implementation of additional training limitations in the area will have limited value.

4.3.8.2 *Practicability of the Measure*

As discussed above, these measures would be expected to offer only limited additional benefit to marine mammals. Additionally, the impracticability of seasonal and geographic restrictions and limitations, which applies to this measure, is discussed at length in 4.1.3.2.

4.3.9 Delayed Restart of MFAS after Shutdown or Powerdown

4.3.9.1 *Benefit to Marine Mammals / Effectiveness of Measure*

NMFS' asssement indicates that expanding the delay (until sonar can be restarted after a shutdown due to a marine mammal sighting) from 30 to 60 minutes for deep-diving species adds minimal protective value for the following reasons:

- The ability of an animal to dive longer than 30 minutes does not mean that it will always do so. Therefore, the 60 minute delay would only potentially add value in instances when animals had remained under water for more than 30 minutes.
- Navy vessels typically move at 10-12 knots (5-6 m/sec) when operating active sonar and potentially much faster when not. Fish et al. (2006) measured speeds of 7 species of odontocetes and found that they ranged from 1.4–7.30 m/sec. Even if a vessel was moving at the slower typical speed associated with active sonar use, an animal would need to be swimming near sustained maximum speed for an hour in the direction of the vessel's course to stay within the safety zone of the vessel (i.e., to be in danger of being exposed to levels of sonar associated with injury or TTS).
- Additionally, the times when marine mammals are deep-diving (i.e., the times when they are under the water for longer periods of time) are the same times that a large portion of their motion is in the vertical direction, which means that they are far less likely to keep pace with a horizontally moving vessel.
- Given that, the animal would need to have stayed in the immediate vicinity of the sound source for an hour and considering the maximum area that both the vessel and the animal could cover in an hour, it is improbable that this would randomly occur. Moreover,

considering that many animals have been shown to avoid both acoustic sources and ships without acoustic sources, it is improbable that a deep-diving cetacean (as opposed to a dolphin that might bow ride) would choose to remain in the immediate vicinity of the source. It is unlikely that a single cetacean would remain in the safety zone of a Navy sound source for more than 30 minutes.

- Last, in many cases, the lookouts are not able to differentiate species to the degree that would be necessary to implement this measure. Plus, Navy operators have indicated that increasing the number of mitigation decisions that need to be made based on biological information is more difficult for the lookouts (because it is not their area of expertise).

4.3.9.2 *Practicability of the Measure*

As described in 4.3.7.2, when there is an artificial break in the exercise (such as a shutdown) the flow of the exercise is lost and several hours of training may be wasted, depending on where the Navy was in the exercise. An increase in the delay of MFAS use that occurs during an exercise will likely further negatively affect the effectiveness of the military readiness training because it will be harder to regain the flow of the exercise the longer the equipment and personnel are on hold. Moreover, lengthening a delay in training necessitates a continuation of the expenditure of resources (operation of all of the equipment and personnel), while not making progress towards the accomplishment of the mission (training completion)

4.3.10 Expansion of Exclusion Area Delineated for Use with Explosive Detonations

4.3.10.1*Benefit to Marine Mammals / Effectiveness of Measure*

As described previously, the current designated exclusion zones for the two largest explosives (MK-84 and MK-48) are not large enough to prevent TTS should the explosive detonate while the animal is at some distance outside of the exclusion zone. The exclusion zone is 1 nm (1853 m), while TTS may be incurred at 3834 and 3495 m (respectively for the above-mentioned explosives) from the explosion. If the exclusion zone were enlarged, the Navy could theoretically reduce the number of TTS takes that might occur (mitigation goals (b-d)). However, we note that only 80 total TTS takes were modeled to occur from explosives, and only a subset of them were modeled to occur from BOMBEX exercises (the only exercises that use the two largest explosives, though they also use MK—82s and MK-83s), which expend a total of 35 shells (all types combined) per year. In short, it is unlikely that many of the marine mammal TTS takes arise from this exercise type, which has a 2-hr range clearance component.

Note that the exclusion zone is more than large enough to avoid injury from the charge with the largest injury zone (1023 m).

4.3.10.2 *Practicability of the Measure*

As mentioned above, the exercises utilizing the explosives in question have a 2-hr range clearance procedure that covers a circle with a radius of 2 nm (though the exclusion zone is only 1 nm). Enlarging this circle to encompass the TTS isopleths for these explosives means doubling the radius of the exclusion zone, which means that an area 4 times the size would need to be

monitored. Generally speaking, the Navy could do this in one of two ways: they could either use the same amount of resources to monitor the area that is 4 times larger, which could potentially result in less focus on the center area that is more critical, or they could maintain the same level of coverage by increasing the resources used for monitoring by four times, which is not practicable considering the small anticipated protective value of the measure.

4.3.11 Monitoring of Explosive Exclusion Area During Exercises

4.3.11.1*Benefit to Marine Mammals / Effectiveness of Measure*

The Navy's SINKEX measures currently require that the Navy survey a safety zone 2 hours prior to an exercise, and then during the exercise when feasible. Additionally, passive acoustic means are used to detect marine mammals during the exercise. Continuous monitoring during an explosive exercise could potentially decrease the number of animals exposed to energy or pressure levels associated with take. However, one could assume that animals would continue to avoid the area to some degree if continuous explosions were occurring in the areas.

Of note, aside from SINKEXs, training events involving explosives are generally completed in a short amount of time. For smaller detonations such as those involving underwater demolitions training, the area is observed to insure all the charges detonated and that they did so in the manner intended; however, it is not possible to have visual contact 100 percent of the time for all explosive inwater events. Navy must clear all people from the explosive zone of influence prior to an inwater explosive event for the safety of personnel and assets. If there is an extended break between clearance procedures and the timing of the explosive event, clearance procedures are repeated.

4.3.11.2*Practicability of the Measure*

However, there are potentially serious safety concerns associated with monitoring an area where explosions will occur and the Navy must take those into consideration when determining when monitoring during an exercise is feasible.

4.5 Cumulative Impacts

A detailed assessment of potential cumulative impacts associated with the proposed Navy activities in the HRC is provided in the HRC Final EIS. The environmental consequences in this tiered Mitigation EA focus on evaluating the direct and indirect effects of mitigation measures that are under consideration for inclusion in any incidental take regulations that NMFS may issue to the Navy. For this Mitigation EA, an additional assessment of cumulative impacts is not warranted beyond that presented in the HRC Final EIS, as the goal of mitigation is specifically to reduce impacts to marine mammals and their habitats from the proposed Navy actions to the least practicable adverse level. NMFS' preference for certain mitigation is based on the practicability of the measures and the benefit the measures provide to reducing impacts to species under NMFS jurisdiction. The mitigation measures required by NMFS through a final rule and associated LOAs would be expected to reduce the potential for cumulatively significant impacts over time.

4.4 Comparison of Alternatives and Conclusion

No Action Alternative - As described in Section 4.1, NMFS determined that the measures included in the No Action Alternative will benefit marine mammals by being effective at avoiding the injury of marine mammals and minimizing exposure of marine mammals to received levels of sound or pressure associated with TTS (mitigation goals (a-d)). Additionally, these measures are practicable for the Navy to implement.

Alternative 1 - As described in Section 4.2, the additional measures included in Alternative 1 (the Humpback Whale Cautionary Area and the Stranding Response Plan) will provide additional benefit to marine mammals (above and beyond the standard Navy measures analyzed in the No Action Alternative). The Humpback Whale Cautionary Area will increase awareness of humpback whale presence and may potentially reduce impacts to humpback whales (through mitigation goals (b-d)) if MFAS use that would otherwise have occurred in this area does not because of implementation of the Humpback Whale Cautionary Area. When live stranded cetaceans are in the water and engaged in what is classified as an *Uncommon Stranding Event*, the shutdown component of the Stranding Response Plan will minimize the exposure of those animals to MFAS/HFAS and explosive detonations (goals (a) and (d) of the mitigation). Information gained from the investigations associated with the Stranding Response Plan may be used in the adaptive management of mitigation or monitoring measures in subsequent LOAs, if appropriate. Additionally, these measures are practicable to implement.

Alternative 2 – As described in Section 4.3, NMFS determined that all of the individual measures discussed as part of this alternative either could not likely be effectively implemented or would not likely reduce adverse effects to marine mammals (could not be tied to the goals of mitigation discussed in Section XXX) if they could, or the measures were not practicable for the Navy to implement.

For the reasons described above, Alternative 1 is considered the Preferred Alternative. The information and analysis contained in NMFS' proposed rule for the HRC, the Navy's HRC FEIS, and this document (in the context of the issuance of the MMPA incidental take regulations and future LOAs for the Navy's training, maintenance, and research, development, testing, and evaluation activities) support a conclusion that the mitigation measures identified in the preferred alternative (Alternative 1) will further the purposes of the MMPA by effecting the least practicable adverse impact on affected species or stocks and their habitat, while taking into account personnel safety, practicality of implementation and impact on the effectiveness of the military readiness activity.

CHAPTER 5 – LIST OF PREPARERS AND AGENCIES CONSULTED

This Mitigation EA was prepared by a Fisheries Biologist in the Office of Protected Resources with input from U.S. Navy personnel.

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APPENDIX A

HRC Stranding Response Plan

APPENDIX A

Stranding Response Plan for Major Navy Training Exercises in the Hawaii Range Complex
January 2009

Strandings

Strandings, as defined by the Marine Mammal Protection Act (MMPA), have occurred throughout recorded history, although U.S. stranding programs have only been keeping consistent records in some cases as long as the last three decades but more commonly the last decade. Strandings may result from many different causes, including, for example, infectious agents, biotoxicosis, starvation, fishery interaction, ship strike, unusual oceanographic or weather events, sound exposure, or combinations of these stressors sustained concurrently or in series. In many cases, a cause of stranding or death cannot be unequivocally determined for a number of reasons. Several marine mammal strandings have been associated with mid-frequency active sonar (MFAS), however, scientific uncertainty remains regarding the exact combination of behavioral and physiological responses that link MFAS exposure to strandings (though several mechanisms have been theorized). Available evidence suggests that in some cases it may be the presence of additional specific environmental or physical conditions working in confluence with the exposure of marine mammals to MFAS that can potentially result in a stranding. The National Marine Mammal Stranding Network (created under the Marine Mammal Health and Stranding Response Program Act (MMHSRPA)) consists of over 100 organizations partnered with the National Marine Fisheries Service (NMFS) to investigate marine mammal strandings in U.S. waters. NMFS is currently developing (with help anticipated from the Navy, the petroleum industry, and other agencies and entities) a series of studies to correlate long-term stranding patterns and pathologies with all known anthropogenic stressors, such as sound and including seismic surveys and active military sonar. Among other things, the plan discussed below is intended to contribute to the better understanding of why strandings occur.

Introduction to the Stranding Plan

Pursuant to 50 CFR Section 216.105, the plan outlined below will be included by reference and summarized in the regulations and included fully as part of (attached to) the Navy's MMPA Letter of Authorization (LOA), which indicates the conditions under which the Navy is authorized to take marine mammals pursuant to training activities involving MFAS or explosives in the Hawaii Range Complex (HRC). This Stranding Response plan is specifically intended to outline the applicable requirements the authorization is conditioned upon in the event that a marine mammal stranding is reported in the Hawaii Range Complex (HRC) during a *major training exercise* (MTE) (see glossary below). As mentioned above, NMFS considers all plausible causes within the course of a stranding investigation and this plan in no way presumes that any strandings in the HRC are related to, or caused by, Navy training activities, absent a determination made in a Phase 2 Investigation as outlined in Paragraph 7 of this plan, indicating that MFAS or explosive detonation in the HRC were a cause and/or contributed to the stranding. This plan is designed to address the following three issues:

- Mitigation – When marine mammals are in a situation that can be defined as a *stranding* (see glossary below), they are experiencing physiological stress. When animals are stranded, and alive, NMFS believes that exposing these compromised animals to additional known stressors would likely exacerbate the animal's distress and could potentially cause its death. Regardless of the factor(s) that may have initially contributed to the stranding, it is NMFS' goal to avoid exposing these animals to further stressors. Therefore, when live stranded cetaceans are in the water and engaged in what is classified as an *Uncommon Stranding Event* (USE) (see glossary below), the shutdown component of this plan is intended to minimize the exposure of those animals to mid-frequency active sonar (MFAS) and explosive detonations, regardless of whether or not these activities may have initially played a role in the event.

- Monitoring – This plan will enhance the understanding of how MFAS or explosive detonations (as well as other environmental conditions) may, or may not, be associated with marine mammal injury or strandings. Additionally, information gained from the investigations associated with this plan may be used in the adaptive management of mitigation or monitoring measures in subsequent LOAs, if appropriate.

- Compliance – The information gathered pursuant to this protocol will inform NMFS' decisions regarding compliance with Sections 101(a) (5) (B and C) of the MMPA.

In addition to outlining the necessary procedural steps for the Navy to undertake in the event of a USE during an MTE (as required by the LOA), this document describes NMFS' planned participation in stranding responses in the HRC, as NMFS' response relates specifically to the Navy requirements described here. The NMFS MMHSRP and the participating Pacific Island regional Stranding Networks have specific responsibilities regarding unusual marine mammal mortality events (UMEs) pursuant to Title IV of the MMPA. This document does not serve to replace or preclude any of the procedures currently in place for NMFS' response to UMEs. NMFS will pursue any activities to fulfill obligations relative to UMEs any time that a trigger is reached as determined by the Working Group on Marine Mammal Unusual Mortality Events. This document highlights (or adds to) applicable existing (and developing) protocols and procedures to be used with the specific circumstances and specific subset of strandings addressed here, namely a USE within the HRC during the MTE. This document has been reviewed and approved by the NMFS staff responsible for conducting and overseeing the referenced activities in Hawaii and this plan will be implemented by NMFS to the degree that resources are available and logistics are feasible.

General Notification Provision

If, at any time or place within the HRC, Navy personnel find a *stranded* marine mammal (see glossary below) either on the shore, near shore, or floating at sea, NMFS requests the Navy contact NMFS immediately (or as soon as clearance procedures allow) as described in the HRC Stranding Communication Protocol (currently under development, but subject to incorporation into this plan upon mutual agency approval). NMFS requests the Navy provide NMFS with species or description of animal (s), the condition of the animal (including carcass condition if

the animal is dead), location, time of first discovery, observed behaviors (if alive), and photo or video (if available).

Operational Response Plan

This section describes the specific actions the Navy must take in order to comply with the LOA if a USE is reported to the Navy in the HRC coincident to, or within 72 hours of, an MTE. This Stranding Response Plan will include an associated HRC Stranding Communication Protocol (currently under development, but subject to incorporation into this plan upon mutual agency approval), which will indicate, among other things, the specific individuals (NMFS Office of Protected Resources - HQ senior administrators) authorized to advise the Navy that certain actions are prescribed by the Stranding Response Plan. A glossary is included at the end of this document. Words included in the glossary are italicized in this section the first time they are used.

1. Initial Stranding Response - The NMFS regional stranding network will respond to all reports of stranded marine mammals, when feasible. All marine mammals will receive examination appropriate to the condition code of the animal and the feasibility of the logistics. If a *qualified* individual determines that the stranding is a *USE,* NMFS staff (or qualified individual) will initiate a *Phase 1 Investigation*. NMFS will contact appropriate NMFS and Navy personnel (pursuant to the HRC Stranding Communication Protocol). NMFS and Navy will maintain a dialogue, as needed, regarding the identification of the USE and the potential need to implement shutdown procedures.

2. *Shutdown* Procedures – Shutdown procedures are not related to the investigation of the cause of the stranding and their implementation is in no way intended to imply that MFAS is the cause of the stranding. Rather, as noted above, shutdown procedures are intended to protect cetaceans *exhibiting indicators of distress* and involved in a USE (see glossary) by minimizing their exposure to possible stressors (MFAS or explosive detonations), regardless of the factors that initially contributed to the USE. Only individuals specifically identified in the HRC Stranding Communication Protocol (NMFS Protected Resources – HQ senior administrators) will be authorized to advise the Navy of the need to implement shutdown procedures (pursuant to the Stranding Response Plan/LOA).

a) If no live or freshly dead cetaceans are involved in the USE, NMFS will advise the Navy that shutdown procedures need not be implemented. Aerial surveys will be conducted if feasible (see second bullet under b, below).

b) If live or freshly dead cetaceans are involved in the USE, the Navy will implement the following procedures:

- If live cetaceans involved in the USE are in the water (i.e., could be exposed to sonar), NMFS will advise the Navy of the need to implement shutdown

procedures defined in the glossary (pursuant to the Stranding Response Plan/LOA).

- NMFS will coordinate internally, with the Navy, and with other agencies and entities with the intent of obtaining aerial survey arrangements. If an aircraft is available, a survey will be conducted within 14 nm (on the shore and in the water) to look for additional animals that meet the USE criteria. NMFS will request that the Navy assist with aerial surveys, as resources are available.

    - If no additional animals that meet the USE criteria are found (including if no aircraft were available to conduct a survey), and the originally detected animals are not in the water, and will not be put back in the water for rehabilitation or release purposes, or are dead, NMFS will advise the Navy that shutdown procedures need not be implemented at any additional locations.

    - If additional cetacean(s) meeting the USE criteria are detected by surveys, the shutdown procedures will be followed for the newly detected animal(s) beginning at 2(a) above.

- If a qualified individual determines that it is appropriate to put live animals that were initially on the beach back in the water for rehabilitation or release purposes, NMFS will advise the Navy of the need to implement shutdown procedures pursuant to the Stranding Response Plan/LOA.

c) If the Navy finds an injured or dead animal floating at sea during an MTE, the Navy shall notify NMFS (pursuant to HRC Stranding Communication Protocol) immediately or as soon as operational security considerations allow. The Navy should provide NMFS with the information outlined in the general notification provision above, as available. Based on the information provided, NMFS will determine if a modified shutdown is appropriate on a case-by-case basis.

d) In the event, following a USE, that: a) qualified individuals are attempting to herd animals back out to the open ocean and animals are not willing to leave, or b) animals are seen repeatedly heading for the open ocean but turning back to shore, NMFS and the Navy will coordinate (including an investigation of other potential anthropogenic stressors in the area) to determine if the proximity of MFAS operations or explosive detonations, though farther than 14 nm from the distressed animal(s), is likely decreasing the likelihood that the animals return to the open water. If so, NMFS and the Navy will further coordinate to determine what measures are necessary to further minimize that likelihood and implement those measures as appropriate. Navy and NMFS will maintain a dialogue regarding the plan to return the animal(s) to the water.

3. Restart Procedures

- If at any time, the subject(s) of the USE at one location die or are euthanized, NMFS will immediately advise the Navy that the shutdown around that location is no longer needed,

- Shutdown procedures will remain in effect until NMFS determines that, and advises the Navy that, all live animals involved in the USE have left the area (either of their own volition or herded). Leading up to restart, NMFS will coordinate internally, with the Navy, and with other federal and state agencies with the intent of securing arrangements to track the movement of the animals following the dispersal of the USE (aircraft, vessel, or tags). If the Navy has restarted operations in the vicinity of the animals, NMFS and the Navy will further coordinate to determine (based on location and behavior of tracked animals and location/nature of Navy activities) if the proximity of MFAS operations or explosive detonations is likely increasing the likelihood that the animals re-strand. If so, NMFS and the Navy will further coordinate to determine what measures are necessary to minimize that likelihood and implement those measures as appropriate.

4. Information - Within 72 hours of the notification of the USE the Navy will inform NMFS where and when they were operating MFAS or conducting explosive detonations (within 80 nm and 72 hours of the event). Within 7 days of the completion of any exercises that were being conducted within 80 nm or 72 hours prior to the event, the Navy will further provide information to NMFS (per the HRC Stranding Communication Protocol), *as available*, regarding the number and types of acoustic/explosive sources, direction and speed of units using MFAS, and marine mammal sightings information associated with those training activities. Information not initially available regarding the 80 nm, 72 hours, period prior to the event will be provided as soon as it becomes available. The Navy will provide NMFS investigative teams with additional relevant unclassified information as requested (or classified information to qualified NMFS staff), if available.

5. Phase 1 Investigation – Within 4 weeks of a USE (when feasible), NMFS will conduct and complete the Phase 1 Investigation (list of procedures typically included in Phase 1 investigation are included in the Glossary of this document, description of actual procedures are contained in the Biomonitoring Protocols) for all USEs that occur in the HRC coincident with MTEs. Results from the Phase 1 Investigation will be categorized in one of the two ways discussed below and trigger the indicated action:

- If the results of the Phase 1 Investigation indicate that the USE was likely caused by something (such as entanglement or ship strike) other than MFAS or explosive detonations authorized by the Navy's LOA, the USE investigation will be considered complete as related to the MMPA authorization.

- If NMFS cannot conclude that the stranding was likely caused by something other than MFAS or explosive detonations authorized by the Navy LOA, rather, the results of the Phase 1 Investigation range from completely inconclusive to including potential early indicators that acoustic exposure could have played a role, a Phase 2 Investigation will be conducted by qualified individuals, under the direction of NMFS staff, and an individual case report will be prepared for each animal (list of procedures typically included in

Phase 2 investigation are included in the Glossary of this document, description of actual procedures are contained in the Biomonitoring Protocols).

6. Memorandum of Agreement (MOA) - The Navy and NMFS will develop an MOA, or other mechanism consistent with federal fiscal law requirements (and all other applicable laws), that allows the Navy to assist NMFS with the Phase 1 and 2 Investigations of USEs through the provision of in-kind services, such as (but not limited to) the use of plane/boat/truck for transport of stranding responders or animals, use of Navy property for necropsies or burial, or assistance with aerial surveys to discern the extent of a USE. The Navy may assist NMFS with the Investigations by providing one or more of the in-kind services outlined in the MOA, when available and logistically feasible and which do not negatively affect Fleet operational commitments.

7. Phase 2 Investigation - Results from the Phase 2 Investigation (procedures outlined in the Biomonitoring Protocols) will be categorized in one of the three ways discussed below and trigger the indicated action:

- If the results indicate that the USE was likely caused by something (such as entanglement or blunt force trauma) other than MFAS or explosive detonations authorized by the Navy's LOA, the *USE* investigation will be considered complete as related to the MMPA authorization.

- If the results are inconclusive which is, historically, the most likely result, i.e. NMFS can neither conclude that the USE was likely caused by something other than acoustic trauma nor conclude that there is a high likelihood that exposure to MFAS or explosive detonations were a cause of the USE, the USE investigation will be considered complete as related to the MMPA authorization.

- If the results of a comprehensive and detailed scientific investigation into all possible causes of the stranding event indicate that there is a high likelihood that MFAS or explosive detonation were a cause of the USE, one of the following will occur:

    - If the total mortalities determined to be caused by MFAS or explosive detonation do not exceed the number analyzed for the 5-yr period in the regulations (10 and 0, respectively), they will be recorded (to add on to if there is another stranding) and NMFS will take no further action beyond that indicated in 8, below.

    - If the total mortalities determined to be caused by MFAS exceed the number analyzed for the 5-yr period in the regulations, NMFS will begin the process of determining whether or not suspension or withdrawal of the authorization is appropriate.

The Navy will be provided at least ten working days to review and provide comments on NMFS' summary and characterization of the factors involved in the USE. NMFS will consider the Navy's comments prior to finalizing any conclusions and/or deciding to take any action involving any take authorization.

8. USE Response Debrief and Evaluation – Within 2 months after a USE, NMFS and Navy staff will meet to discuss the implementation of the USE response and recommend modifications or clarifications to improve the Stranding Response Plan. These recommendations will feed into the adaptive management strategy discussed below.

9. Adaptive Management - The regulations under which the Navy's LOA (and this Stranding Response Plan) are issued will contain an adaptive management component. This gives NMFS the ability to consider the results of the previous years' monitoring and/or the results of stranding investigations when prescribing mitigation or monitoring requirements in subsequent years. In the event that NMFS concludes that there is a high likelihood that MFAS or explosive detonations were a cause of a USE, NMFS will review the analysis of the environmental and operational circumstances surrounding the USE. In subsequent LOAs, based on this review and through the adaptive management component of the regulations, NMFS may require the mitigation measures or Stranding Response Plan be modified or supplemented if the new data suggest that modifications would either have a reasonable likelihood of reducing the chance of future USEs resulting from a similar confluence of events or would increase the effectiveness of the stranding investigations. Further based on this review and the adaptive management component of the regulations, NMFS may modify or add to the existing monitoring requirements if the data suggest that the addition of a particular measure would likely fill in a specifically important data gap. Additionally, the USE Debrief and Evaluation discussed above (in combination with adaptive management) will allow NMFS and the Navy to further refine the Stranding Response Plan for maximum effectiveness.

Communication

Effective communication is critical to the successful implementation of this Stranding Response Plan. Very specific protocols for communication, including identification of the Navy personnel authorized to implement a shutdown and the NMFS personnel authorized to advise the Navy of the need to implement shutdown procedures (NMFS Protected Resources HQ – senior administrators) and the associated phone trees, etc. (to be included in the document entitled "HRC Stranding Communication Protocols") are currently in usable draft form and will be finalized for the HRC by March 2009 and updated yearly (or more frequently, as appropriate).

The Stranding Response Plan is dependent upon advance notice to NMFS of the planned upcoming MTE. NMFS and the Navy will develop a mechanism (that conforms with operational security requirements) wherein the Navy can provide NMFS with necessary advance notification of MTEs.

NMFS will keep information about planned MTE's in a confidential manner and will transmit information to NMFS personnel responding to USE's to the minimum necessary to accomplish the NMFS mission under this plan.

Glossary:

Freshly dead – Code 2 carcass condition (2a-as if just died, no bloating; or 2b-slight decomposition, slight bloating, blood imbibitions visible).

Major training exercise (MTE) – An MTE, within the context of this document, means RIMPAC, USWEX, and Multi Strike Group exercises involving MFAS or explosives. These exercises are expected to encompass approximately 40 to 60 days per year.

Exhibiting Indicators of Distress – Animals exhibiting an uncommon combination of behavioral and physiological indicators typically associated with distressed or stranded animals. This situation would be identified by a qualified individual and typically includes some combination of the following characteristics:

- Marine mammals continually circling or moving haphazardly in a tightly packed group – with a member occasionally breaking away and swimming towards the beach.
- Abnormal respirations including increased or decreased rate or volume of breathing, abnormal content or odor
- Presence of an individual of a species that has not historically been seen in a particular habitat, for example a pelagic species in a shallow bay when historic records indicate that it is a rare event.
- Abnormal behavior for that species, such as abnormal surfacing or swimming pattern, listing, and abnormal appearance

Phase 1 Investigation – A Phase 1 Investigation, for the purposes of this document, will typically include the following tests and procedures (which are described in NMFS' Biomonitoring Protocols):

- Demographics of the stranding
- Environmental parameters
- Behavioral assessment of group
- Live animal
    - physical examination
    - blood work
    - diagnostics such as AEP or ultrasound
    - assessment or treatment
- Dead animal
    - External examination and external human interaction evaluation
    - Morphometrics
    - Photographs
    - Diagnostic imaging including CT/MRI scans or ultrasound as appropriate and feasible
    - Necropsy with internal examination, descriptions, photographs and sample collection

Note that several factors will dictate whether all or a subset of these procedures are conducted, including:

- The condition of a carcass
- For live cetaceans - the time it would take necessary personnel and equipment to arrive at the site

- Availability (both in time and space) of resources and feasibility of implementation

Phase 2 Investigation – A Phase 2 Investigation, for the purposes of this document, will typically include the following tests and procedures (which are described in NMFS' Biomonitoring Protocols):

- Analyses and review of diagnostic imaging obtained in Phase I
- Histopathology
- Special stains
- Ancillary diagnostics (e.g., PCR for infections, gas emboli)
- CT of ears
- Additional diagnostic imaging as needed
- Histology of ears
- Case summaries
- Review

Note that several factors will dictate whether all or a subset of these procedures are conducted, including:

- The condition of a carcass
- Logistics for transport
- Available resources
- Validated diagnostic techniques

Qualified – NMFS has a rigorous set of standards and training in place to qualify stranding responders. For the purposes of this document, NMFS will identify (in the Biomonitoring Protocol) the specific qualifications necessary for individuals to be considered qualified for the following activities: 1) identifying a USE; 2) determining if an animal is freshly dead (Code 2); 3) conducting a Phase 1 or Phase 2 Investigation; and, 4) making determinations as to cause of death. These qualifications are currently in development and will be refined and finalized in the Biomonitoring Protocols for the HRC. Not all qualified individuals (veterinarians, technicians, etc.) will be NMFS employees. However, only specific individuals (NMFS Protected Resources, HQ – senior administrators) indicated in the HRC Stranding Communication Protocol will be empowered to advise the Navy of the need to implement shutdown procedures.

Stranding – an event in the wild in which:

(a) a marine mammal is dead and is –

(i) on the beach or shore of the United States; or

(ii) in waters under the jurisdiction of the United States (including any navigable waters); or

(b) a marine mammal is alive and is –

(i) on a beach or shore of the United States and unable to return to the water;

(ii) on a beach or shore of the United States and, although able to return to the water, is in apparent need of medical attention; or

(iii) in the waters under the jurisdiction of the United States (including navigable waters), but is unable to return to its natural habitat under its own power or without assistance.

Shutdown Procedures – The act of the Navy ceasing operation of sonar or explosive detonations within a designated area for a designated time. The time is designated by the Restart Procedures (# 3, above). The designated area, for the purposes of this document, is an area within 14 nm of any live, in-water animal involved in the USE. This distance (14 nm) is the distance at which sound from the sonar source is anticipated to attenuate to approximately 140-145 dB (SPL). The risk function predicts that less than 1% of the animals exposed to sonar at this level (mysticete or odontocete) would respond in a manner that NMFS considers Level B Harassment. As indicated above in 2(d), if this distance appears too short (i.e, the proximity of sonar use may likely be deterring the animals from returning to the open water), NMFS and the Navy will further coordinate to determine what measures are necessary to further minimize that likelihood and implement those measures as appropriate.

Uncommon Stranding Event (USE) – A stranding event that takes place during an MTE and involves any one of the following:

- Two or more individuals of any cetacean species (not including mother/calf pairs, unless of species of concern listed in next bullet) found dead or live on shore within a two day period and occurring on same shore lines or facing shorelines of different islands.
- A single individual or mother/calf pair of any of the following marine mammals of concern: beaked whale of any species, kogia sp., risso's dolphin, melon-headed whale, pilot whales, humpback whales, sperm whales, blue whales, fin whales, sei whales, or monk seal.
- A group of 2 or more cetaceans of any species exhibiting indicators of distress.

Supplemental Documents in Development

HRC Stranding Communication Protocol – This document, which is currently in development, will include all of the communication protocols (phone trees, etc.) and associated contact information required for NMFS and the Navy to carry out the actions outlined in this Stranding Response Plan. This document is currently in usable draft form and will be finalized by March 2009 and updated yearly (or more frequently, as appropriate).

Biomonitoring Protocols for the HRC – This document (which is currently in a usable draft form, but will be finalized in 2009) will contain protocols for the procedures that are necessary for NMFS staff to implement this Stranding Plan including:

- Qualifications necessary for individuals to implement certain parts of the Stranding Plan, such as: identifying a USE, identifying a Code 2 animal, or conducting a Phase 1 or 2 Investigation
- A protocol for the stranding responders that outlines the actions to take in the event of a stranding during MTEs
- Protocols for the investigators that describe in detail the procedures implemented for Phase 1 and Phase 2 Investigations

Memorandum of Agreement – This document (or other mechanism consistent with federal fiscal law requirements and all other applicable laws), which will be finalized in 2009, will establish a framework whereby the Navy can assist with stranding investigations when feasible. This

document will include a comprehensive list of the specific ways the Navy could provide this assistance.

LOA Stranding Plans in Other Geographic Regions

The frequency and nature of strandings (naturally occurring or otherwise), the nature of military operations, and the NMFS resources and qualified staff available for stranding response, can be very different in different geographic regions. Measures and procedures developed for and implemented in this Stranding Response Plan may not be appropriate, or even possible, in other geographic regions. As the need arises, NMFS and the Navy will work together to develop appropriate Stranding Response Plans for other geographic regions based on available information and resources. This Stranding Response Plan is not intended to serve as a template for other geographic regions, and, in fact, Stranding Plans for other areas may be significantly different.