DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

50 CFR Part 218

[Docket No. 130109022–3022–01]

RIN 0648–BC53

Takes of Marine Mammals Incidental to Specified Activities; U.S. Navy Training and Testing Activities in the Atlantic Fleet Training and Testing Study Area

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

ACTION: Notice of proposed rulemaking; request for comments and information.

SUMMARY: NMFS has received a request from the U.S. Navy (Navy) for authorization to take marine mammals incidental to the training and testing activities conducted in the Atlantic Fleet Training and Testing (AFTT) study area from January 2014 through January 2019. Pursuant to the Marine Mammal Protection Act (MMPA), NMFS is requesting comments on its proposal to issue regulations and subsequent Letters of Authorization (LOAs) to the Navy to incidentally harass marine mammals.

DATES: Comments and information must be received no later than March 11, 2013.

ADDRESSES: You may submit comments, identified by 0648–BC53, by either of the following methods:

- Electronic submissions: submit all electronic public comments via the Federal eRulemaking Portal *http://www.regulations.gov*
- Hand delivery of mailing of paper, disk, or CD–ROM comments should be addressed to P. Michael Payne, Chief, Permits and Conservation Division, Office of Protected Resources, National Marine Fisheries Service, 1315 East-West Highway, Silver Spring, MD 20910–3225.

Instructions: All comments received are a part of the public record and will generally be posted to *http://www.regulations.gov* without change. All Personal Identifying Information (for example, name, address, etc.) voluntarily submitted by the commenter may be publicly accessible. Do not submit Confidential Business Information or otherwise sensitive or protected information.

NMFS will accept anonymous comments (enter N/A in the required fields if you wish to remain anonymous). Attachments to electronic comments will be accepted in Microsoft Work, Excel, WordPerfect, or Adobe PDF file formats only.

FOR FURTHER INFORMATION CONTACT: Brian D. Hopper, Office of Protected Resources, NMFS, (301) 427–8401.

SUPPLEMENTARY INFORMATION:

Availability

A copy of the Navy's application may be obtained by visiting the internet at: *http://www.nmfs.noaa.gov/pr/permits/incidental.htm*. The Navy's Draft Environmental Impact Statement/Overseas Environmental Impact Statement (DEIS/OEIS) for AFTT was made available to the public on May 11, 2012 (77 FR 27742). Documents cited in this notice may also be viewed, by appointment, during regular business hours, at the aforementioned address.

Background

Sections 101(a)(5)(A) and (D) of the MMPA (16 U.S.C. 1361 *et seq.*) direct the Secretary of Commerce to allow, upon request, the incidental, but not intentional, taking of small numbers of marine mammals by U.S. citizens who engage in a specified activity (other than commercial fishing) within a specified geographical region if certain findings are made and either regulations are issued or, if the taking is limited to harassment, a notice of a proposed authorization is provided to the public for review.

Authorization for incidental takings 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 (where relevant), and if the permissible methods of taking and requirements pertaining to the mitigation, monitoring, and reporting of such takings are set forth. NMFS has defined ''negligible impact'' in 50 CFR 216.103 as ''* * * an impact resulting from the specified activity that cannot be reasonably expected to, and is not reasonably likely to, adversely affect the species or stock through effects on annual rates of recruitment or survival.''

The National Defense Authorization Act of 2004 (NDAA) (Pub. L. 108–136) removed the ''small numbers'' and ''specified geographic region'' limitations indicated above and amended the definition of ''harassment'' as applied to ''military readiness activity'' to read as follows (Section 3(18)(B) of the MMPA: ''(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].''

Summary of Request

On April 13, 2012, NMFS received an application from the Navy requesting regulations and two LOAs for the take of 42 species of marine mammals incidental to Navy training and testing activities to be conducted in the AFTT Study Area over 5 years. The Navy submitted addendums on September 24, 2012 and December 21, 2012, and the application was considered complete. This proposed rule is based on the information contained in the revised LOA applications. The Navy is requesting regulations that would establish a process for authorizing take, via two separate 5-year LOAs, of marine mammals for training activities and for testing activities, each proposed to be conducted from 2014 through 2019. The Study Area includes several existing study areas, range complexes, and testing ranges (Atlantic Fleet Active Sonar Training (AFAST), Northeast, Virginia Capes (VACAPES), Cherry Point (CHPT), Jacksonville (JAX), Gulf of Mexico (GOMEX), Naval Surface Warfare Center, Panama City, Naval Undersea Warfare Center Newport, South Florida Ocean Measurement Facility (SFOMF), and Key West) plus pierside locations and areas on the high seas where maintenance, training, or testing may occur. The proposed activities are classified as military readiness activities. Marine mammals present in the Study Area may be exposed to sound from active sonar, underwater detonations, and/or pile driving and removal. In addition, incidental takes of marine mammals may occur from ship strikes. The Navy requests authorization to take individuals of 42 marine mammal species by Level B harassment and individuals of 32 marine mammal species by Level A harassment. In addition, the Navy requests authorization for take by serious injury or mortality individuals of 16 marine mammal species due to the use of explosives, and 11 total marine mammals (any species except North Atlantic right whale) over the course of the 5-year rule due to vessel strike.

The Navy's application and the AFTT DEIS/OEIS contain proposed acoustic criteria and thresholds that would, in some instances, represent changes from what NMFS has used to evaluate the

Navy's proposed activities for past incidental take authorizations. The revised thresholds are based on evaluations of recent scientific studies; a detailed explanation of how they were derived is provided in the AFTT DEIS/OEIS Criteria and Thresholds Technical Report. NMFS is currently updating and revising all of its acoustic criteria and thresholds. Until that process is complete, NMFS will continue its long-standing practice of considering specific modifications to the acoustic criteria and thresholds currently employed for incidental take authorizations only after providing the public with an opportunity for review and comment. NMFS is requesting comments on all aspects of the proposed rule, and specifically requests comment on the proposed acoustic criteria and thresholds.

Background of Request

The Navy's mission is to maintain, train, and equip combat-ready naval forces capable of winning wars, deterring aggression, and maintaining freedom of the seas. Section 5062 of Title 10 of the United States Code directs the Chief of Naval Operations to train all military forces for combat. The Chief of Naval Operations meets that directive, in part, by conducting at-sea training exercises and ensuring naval forces have access to ranges, operating areas (OPAREAs) and airspace where they can develop and maintain skills for wartime missions and conduct research, development, testing, and evaluation (RDT&E) of naval systems.

The Navy proposes to continue conducting training and testing activities within the AFTT Study Area, which have been ongoing since the 1940s. Recently, most of these activities were analyzed in six separate EISs completed between 2009 and 2011; the Atlantic Fleet Active Sonar Training (AFAST) EIS/OEIS (U.S. Department of the Navy, 2009a), the Virginia Capes Range Complex (VACAPES) EIS/OEIS (U.S. Department of the Navy, 2009b), the Navy Cherry Point Range Complex (CHPT) EIS/OEIS (U.S. Department of the Navy, 2009c), the Jacksonville Range Complex (JAX) EIS/OEIS (U.S. Department of the Navy, 2009d), the Panama City (PCD) EIS/OEIS (U.S. Department of the Navy, 2009e), and the Gulf of Mexico (GOMEX) EIS/OEIS (U.S. Department of the Navy, 2011). These documents, among others, and their associated MMPA regulations and authorizations, describe the baseline of training and testing activities currently conducted in the Study Area. The tempo and types of training and testing activities have fluctuated due to changing requirements; new technologies; the dynamic nature of international events; advances in warfighting doctrine and procedures; and changes in basing locations for ships, aircraft, and personnel. Such developments influence the frequency, duration, intensity, and location of required training and testing. The Navy's request covers training and testing activities that would occur for a 5-year period following the expiration of the current MMPA authorizations for AFAST, VACAPES, CHPT, JAX, and GOMEX. The Navy has also prepared a DEIS/OEIS analyzing the effects on the human environment of implementing their preferred alternative (among others).

The quantified results of the marine mammal acoustic effects analysis presented in the Navy's LOA application differ from the quantified results presented in the AFTT DEIS/OEIS. The differences are due to three main factors: (1) Changes to tempo or location of certain training and testing activities; (2) refinement to the modeling inputs for training and testing; and (3) additional post-model analysis of acoustic effects to include animal avoidance of repeated sound sources, avoidance of areas of activity before use of a sound source or explosive by sensitive species, and implementation of mitigation. The additional post-model analysis of acoustic effects was performed to clarify potential misunderstandings of the numbers presented as modeling results in the AFTT DEIS/OEIS. Some comments indicated that the readers believed the acoustic effects to marine mammals presented in the DEIS/OEIS were representative of the actual expected effects, although the AFTT DEIS/OEIS did not account for animal avoidance of an area prior to commencing sound-producing activities, animal avoidance of repeated explosive noise exposures, and the protections due to standard Navy mitigations. The net result of these changes is an overall decrease in takes in the Mortality and Level A takes within the LOA application compared with the DEIS, a net reduction in Level B takes for training, and a net increase in Level B takes for testing. The Navy has advised NMFS that all comments received on the proposed rule that address: (1) Changes to the tempo or location of certain proposed activities; (2) refinement to the modeling inputs for training and testing; and (3) additional post-model analysis of acoustic effects and implementation of mitigation, will be reviewed and addressed by the Navy in its FEIS/OEIS for AFTT.

Description of the Specified Activity

The Navy requests authorization to take marine mammals incidental to conducting training and testing activities. The Navy has determined that non-impulsive sources (e.g. sonar), underwater detonations, pile driving and removal, and vessel strikes are the stressors most likely to result in impacts on marine mammals that could rise to the level of harassment. Detailed descriptions of these activities are provided in the Navy's Draft Environmental Impact Statement (DEIS) and LOA application (*http://www.nmfs.noaa.gov/pr/permits/incidental.htm*) and summarized here.

Overview of Training Activities

The Navy routinely trains in the AFTT Study Area in preparation for national defense missions. Training activities are categorized into eight functional warfare areas (anti-air warfare; amphibious warfare; strike warfare; anti-surface warfare; anti-submarine warfare; electronic warfare; mine warfare; and naval special warfare). The Navy determined that stressors used in the following warfare areas are most likely to result in impacts on marine mammals:

- Amphibious warfare (underwater detonations, pile driving and removal)
- Anti-surface warfare (underwater detonations)
- Anti-submarine warfare (active sonar, underwater detonations)
- Mine warfare (active sonar, underwater detonations)
- Naval special warfare (underwater detonations)

The Navy's activities in anti-air warfare, strike warfare, and electronic warfare do not produce stressors that could result in harassment of marine mammals. Therefore, these activities are not discussed further.

Amphibious Warfare

The mission of amphibious warfare is to project military power from the sea to the shore through the use of naval firepower and Marine Corps landing forces. The Navy uses amphibious warfare to attack a threat located on land by a military force embarked on ships. Amphibious warfare training ranges from individual, crew, and small unit events to large task force exercises. Individual and crew training include amphibious vehicles and naval gunfire support training for shore assaults, boat raids, airfield or port seizures, and reconnaissance. Large-scale amphibious exercises involve ship-to-shore maneuver, naval fire support, such as shore bombardment, and air strike and close air support training. However, the Navy only analyzed those portions of amphibious warfare training that occur at sea, in particular, underwater detonations associated with naval gunfire support training. The Navy conducts other amphibious warfare support activities that could potentially impact marine mammals (such as pile driving and removal) in the near shore region from the beach to about 914 m from shore.

Anti-Surface Warfare

The mission of anti-surface warfare is to defend against enemy ships or boats. When conducting anti-surface warfare, aircraft use cannons, air-launched cruise missiles, or other precision munitions (guided and unguided); ships use naval guns, and surface-to-surface missiles; and submarines use torpedoes or submarine-launched, anti-ship cruise missiles. Anti-surface warfare training includes surface-to-surface gunnery and missile exercises, air-to-surface gunnery and missile exercises, and submarine missile or exercise torpedo launch events.

Anti-Submarine Warfare

The mission of anti-submarine warfare is to locate, neutralize, and defeat hostile submarine threats to surface forces. Anti-submarine warfare is based on the principle of a layered defense of surveillance and attack aircraft, ships, and submarines all searching for hostile submarines. These forces operate together or independently to gain early warning and detection, and to localize, track, target, and attack hostile submarine threats. Anti-submarine warfare training addresses basic skills such as detection and classification of submarines, distinguishing between sounds made by enemy submarines and those of friendly submarines, ships, and marine life. More advanced, integrated anti-submarine warfare training exercises are conducted in coordinated, at-sea training events involving submarines, ships, and aircraft. This training integrates the full spectrum of anti-submarine warfare from detecting and tracking a submarine to attacking a target using either exercise torpedoes or simulated weapons.

Mine Warfare

The mission of mine warfare is to detect, and avoid or neutralize mines to protect Navy ships and submarines and to maintain free access to ports and shipping lanes. Mine warfare also includes offensive mine laying to gain control or deny the enemy access to sea space. Naval mines can be laid by ships, submarines, or aircraft. Mine warfare training includes exercises in which ships, aircraft, submarines, underwater vehicles, or marine mammal detection systems search for mines. Certain personnel train to destroy or disable mines by attaching and detonating underwater explosives to simulated mines. Other neutralization techniques involve impacting the mine with a bullet-like projectile or intentionally triggering the mine to detonate.

Naval Special Warfare

The mission of naval special warfare is to conduct unconventional warfare, direct action, combat terrorism, special reconnaissance, information warfare, security assistance, counter-drug operations, and recovery of personnel from hostile situations. Naval special warfare operations are highly specialized and require continual and intense training. Naval special warfare units are required to utilize a combination of specialized training, equipment, and tactics, including insertion and extraction operations using parachutes, submerged vehicles, rubber boats, and helicopters; boat-to-shore and boat-to-boat gunnery; underwater demolition training; reconnaissance; and small arms training.

Overview of Testing Activities

The Navy researches, develops, tests, and evaluates new platforms, systems, and technologies. Testing activities may occur independently of or in conjunction with training activities. Many testing activities are conducted similarly to Navy training activities and are also categorized under one of the primary mission areas. Other testing activities are unique and are described within their specific testing categories. The Navy determined that stressors used during the following testing activities are most likely to result in impacts on marine mammals:

- Naval Air Systems Command (NAVAIR) Testing
- Anti-surface warfare testing (underwater detonations)
- Anti-submarine warfare testing (active sonar, underwater detonations)
- Mine warfare testing (active sonar, underwater detonations)
- Naval Sea Systems Command (NAVSEA) Testing
- New ship construction (active sonar, underwater detonations)
- Shock trials (underwater detonations)
- Life cycle activities (active sonar, underwater detonations)
- Range Activities (active sonar, underwater detonations)
- Anti-surface warfare/anti-submarine warfare testing (active sonar, underwater detonations)
- Mine warfare testing (active sonar, underwater detonations)
- Ship protection systems and swimmer defense testing (active sonar, airguns)
- Unmanned vehicle testing (active sonar)
- Other testing (active sonar)
- Office of Naval Research (ONR) and Naval Research Laboratory (NRL) Testing
- ONR/NRL Research, Development, Test & Evaluation (active sonar)

Other Navy testing activities that do not involve underwater non-impulse sources or impulse sources that could result in marine mammal harassment are not discussed further.

Naval Air Systems Command Testing (NAVAIR)

NAVAIR events include testing of new aircraft platforms, weapons, and systems before delivery to the fleet for training activities. NAVAIR also conducts lot acceptance testing of weapons and systems, such as sonobuoys. In general, NAVAIR conducts its testing activities the same way the fleet conducts its training activities. However, NAVAIR testing activities may occur in different locations than equivalent fleet training activities and testing of a particular system may differ slightly from the way the fleet trains with the same system.

Anti-Surface Warfare Testing

Anti-surface warfare testing includes air-to-surface gunnery, missile, and rocket exercises. Testing is required to ensure the equipment is fully functional for defense from surface threats. Testing may be conducted on new guns or gun rounds, missiles, rockets, and aircraft, and also in support of scientific research to assess new and emerging technologies. Testing events are often integrated into training activities and in most cases the systems are used in the same manner in which they are used for fleet training activities.

Anti-Submarine Warfare Testing

Anti-submarine warfare testing addresses basic skills such as detection and classification of submarines, distinguishing between sounds made by enemy submarines and those of friendly submarines, ships, and marine life. More advanced, integrated anti-submarine warfare testing is conducted in coordinated, at-sea training events involving submarines, ships, and aircraft. This testing integrates the full spectrum of anti-submarine warfare from detecting and tracking a submarine to attacking a target using various torpedoes and weapons.

Mine Warfare Testing

Mine warfare testing includes activities in which aircraft detection systems are used to search for and record the location of mines for subsequent neutralization. Mine neutralization tests evaluate a system's effectiveness at intentionally detonating or otherwise disabling the mine. Different mine neutralization systems are designed to neutralize mines either at the sea surface or deployed deeper within the water column. All components of these systems are tested in the at-sea environment to ensure they meet mission requirements.

Naval Sea Systems Command Testing (NAVSEA)

NAVSEA testing activities are aligned with its mission of new ship construction, shock trials, life cycle activities, range activities, and other weapon systems development and testing.

New Ship Construction Activities

Ship construction activities include pierside testing of ship systems, tests to determine how the ship performs at-sea (sea trials), and developmental and operational test and evaluation programs for new technologies and systems. Pierside and at-sea testing of systems aboard a ship may include sonar, acoustic countermeasures, radars, and radio equipment. During sea trials, each new ship propulsion engine is operated at full power and subjected to high-speed runs and steering tests. At-sea test firing of shipboard weapon systems, including guns, torpedoes, and missiles, are also conducted.

Shock Trials

One ship of each new class (or major upgrade) of combat surface ships constructed for the Navy may undergo an at-sea shock trial. A shock trial is a series of underwater detonations that send a shock wave through the ship's hull to simulate near misses during combat. A shock trial allows the Navy to validate the shock hardness of the ship and assess the survivability of the hull and ship's systems in a combat environment as well as the capability of the ship to protect the crew.

Life Cycle Activities

Testing activities are conducted throughout the life of a Navy ship to verify performance and mission capabilities. Sonar system testing occurs pierside during maintenance, repair, and overhaul availabilities, and at sea immediately following most major overhaul periods. A Combat System Ship Qualification Trial is conducted for new ships and for ships that have undergone modification or overhaul of their combat systems.

Radar cross signature testing of surface ships is conducted on new vessels and periodically throughout a ship's life to measure how detectable the ship is by radar. Electromagnetic measurements of off-board electromagnetic signatures are also conducted for submarines, ships, and surface craft periodically.

Range Activities

NAVSEA's testing ranges are used to conduct principal testing, analysis, and assessment activities for ship and submarine platforms, including ordnance, mines, and machinery technology for surface combat systems. Naval Surface Warfare Center, Panama City Division Testing Range focuses on surface warfare tests that often involve mine countermeasures. Naval Undersea Warfare Center Division, Newport Testing Range focuses on the undersea aspects of warfare and is, therefore, structured to test systems such as torpedoes and unmanned underwater vehicles. The South Florida Ocean Measurement Facility Testing Range retains a unique capability that focuses on signature analysis operations and mine warfare testing events.

Other Weapon Systems Development and Testing

Numerous test activities and technical evaluations, in support of NAVSEA's systems development mission, often occur with fleet activities within the Study Area. Tests within this category include, but are not limited to, anti-surface, anti-submarine, and mine warfare, using torpedoes, sonobuoys, and mine detection and neutralization systems.

Office of Naval Research (ONR) and Naval Research Laboratory (NLR) Testing

As the Navy's Science and Technology provider, ONR and NRL provide technology solutions for Navy and Marine Corps needs. ONR's mission, defined by law, is to plan, foster, and encourage scientific research in recognition of its paramount importance as related to the maintenance of future naval power, and the preservation of national security. Further, ONR manages the Navy's basic, applied, and advanced research to foster transition from science and technology to higher levels of research, development, test and evaluation. The Ocean Battlespace Sensing Department explores science and technology in the areas of oceanographic and meteorological observations, modeling, and prediction in the battlespace environment; submarine detection and classification (anti-submarine warfare); and mine warfare applications for detecting and neutralizing mines in both the ocean and littoral environments. ONR events include: Research, development, test and evaluation activities; surface processes acoustic communications experiments; shallow water acoustic propagation experiments; and long range acoustic propagation experiments.

Sonar, Ordnance, Targets, and Other Systems

The Navy uses a variety of sensors, platforms, weapons, and other devices to meet its mission. Training and testing with these systems may introduce acoustic (sound) energy into the environment. This section describes and organizes sonar systems, ordnance, munitions, targets, and other systems to facilitate understanding of the activities in which these systems are used. Underwater sound is described as one of two types for the purposes of the Navy's application: Impulsive and non-impulsive. Underwater detonations of explosives and other percussive events are impulsive sounds. Sonar and similar sound producing systems are categorized as non-impulsive sound sources.

Sonar and Other Non-Impulsive Sources

Modern sonar technology includes a variety of sonar sensor and processing systems. The simplest active sonar emits sound waves, or ''pings,'' sent out in multiple directions and the sound waves then reflect off of the target object in multiple directions. The sonar source calculates the time it takes for the reflected sound waves to return; this calculation determines the distance to the target object. More sophisticated active sonar systems emit a ping and then rapidly scan or listen to the sound waves in a specific area. This provides both distance to the target and directional information. Even more advanced sonar systems use multiple receivers to listen to echoes from several directions simultaneously and provide efficient detection of both direction and distance. The Navy rarely uses active sonar continuously throughout activities. When sonar is in use, the pings occur at intervals, referred to as a duty cycle, and the signals themselves are very short in duration. For example, sonar that emits a 1-second ping every 10 seconds has a 10 percent duty cycle. The Navy utilizes sonar systems and other acoustic sensors in support of a variety of mission requirements. Primary uses include the detection of, and defense against, submarines (anti-submarine warfare) and mines (mine warfare); safe navigation and effective communications; use of unmanned undersea vehicles; and oceanographic surveys.

Ordnance and Munitions

Most ordnance and munitions used during training and testing events fall into three basic categories: projectiles (such as gun rounds), missiles (including rockets), and bombs. Ordnance can be further defined by their net explosive weight, which considers the type and quantity of the explosive substance without the packaging, casings, bullets, etc. Net explosive weight (NEW) is the trinitrotoluene (TNT) equivalent of energetic material, which is the standard measure of strength of bombs and other explosives. For example, a 5-inch shell fired from a Navy gun is analyzed at about 9.5 pounds (lb) (4.3 kg) of NEW. The Navy also uses non-explosive ordnance in place of high explosive ordnance in many training and testing events. Non-explosive ordnance munitions look and perform similarly to high explosive ordnance, but lack the main explosive charge.

Defense Countermeasures

Naval forces depend on effective defensive countermeasures to protect themselves against missile and torpedo attack. Defensive countermeasures are devices designed to confuse, distract, and confound precision guided munitions. Defensive countermeasures analyzed in this LOA application include acoustic countermeasures, which are used by surface ships and submarines to defend against torpedo attack. Acoustic countermeasures are either released from ships and submarines, or towed at a distance behind the ship.

Mine Warfare Systems

The Navy divides mine warfare systems into two categories: Mine detection and mine neutralization. Mine detection systems are used to locate, classify, and map suspected mines, on the surface, in the water column, or on the sea floor. The Navy analyzed the following mine detection systems for potential impacts on marine mammals:

• Towed or hull-mounted mine detection systems. These detection systems use acoustic and laser or video sensors to locate and classify suspect mines. Fixed and rotary wing platforms, ships, and unmanned vehicles are used for towed systems, which can rapidly assess large areas.

• Unmanned/remotely operated vehicles. These vehicles use acoustic and video or lasers to locate and classify mines and provide unique capabilities in nearshore littoral areas, surf zones, ports, and channels.

Mine Neutralization Systems

Mine neutralization systems disrupt, disable, or detonate mines to clear ports and shipping lanes, as well as littoral, surf, and beach areas in support of naval amphibious operations. The Navy analyzed the following mine neutralization systems for potential impacts to marine mammals:

• Towed influence mine sweep systems. These systems use towed equipment that mimic a particular ship's magnetic and acoustic signature triggering the mine and causing it to explode.

• Unmanned/remotely operated mine neutralization systems. Surface ships and helicopters operate these systems, which place explosive charges near or directly against mines to destroy the mine.

• Airborne projectile-based mine clearance systems. These systems neutralize mines by firing a small or medium-caliber non-explosive, supercavitating projectile from a hovering helicopter.

• Diver emplaced explosive charges. Operating from small craft, divers put explosive charges near or on mines to destroy the mine or disrupt its ability to function.

Classification of Non-Impulsive and Impulsive Sources Analyzed

In order to better organize and facilitate the analysis of about 300 sources of underwater non-impulsive sound or impulsive energy, the Navy developed a series of source classifications, or source bins. This method of analysis provides the following benefits:

• Allows for new sources to be covered under existing authorizations, as long as those sources fall within the parameters of a ''bin;''

• Simplifies the data collection and reporting requirements anticipated under the MMPA;

• Ensures a conservative approach to all impact analysis because all sources in a single bin are modeled as the most powerful source (e.g., lowest frequency, highest source level, longest duty cycle, or largest net explosive weight within that bin);

• Allows analysis to be conducted more efficiently, without compromising the results;

• Provides a framework to support the reallocation of source usage (hours/explosives) between different source bins, as long as the total number of marine mammal takes remain within the overall analyzed and authorized limits. This flexibility is required to support evolving Navy training and testing requirements, which are linked to real world events.

A description of each source classification is provided in Tables 1–3. Non-impulsive sources are grouped into bins based on the frequency, source level when warranted, and how the source would be used. Impulsive bins are based on the net explosive weight of the munitions or explosive devices. The following factors further describe how non-impulsive sources are divided:

• Frequency of the non-impulsive source:
  ○ Low-frequency sources operate below 1 kilohertz (kHz)
  ○ Mid-frequency sources operate at and above 1 kHz, up to and including 10 kHz
  ○ High-frequency sources operate above 10 kHz, up to and including 100 kHz
  ○ Very high-frequency sources operate above 100 kHz, but below 200 kHz

• Source level of the non-impulsive source:
  ○ Greater than 160 decibels (dB), but less than 180 dB
  ○ Equal to 180 dB and up to 200 dB
  ○ Greater than 200 dB

How a sensor is used determines how the sensor's acoustic emissions are analyzed. Factors to consider include pulse length (time source is ''on''); beam pattern (whether sound is emitted as a narrow, focused beam, or, as with most explosives, in all directions); and duty cycle (how often a transmission occurs in a given time period during an event).

There are also non-impulsive sources with characteristics that are not anticipated to result in takes of marine mammals. These sources have low source levels, narrow beam widths, downward directed transmission, short pulse lengths, frequencies beyond known hearing ranges of marine mammals, or some combination of these factors. These sources were not modeled by the Navy, but are qualitatively analyzed in Table 1–5 of the LOA application and Table 2.3.3 of the AFTT Draft EIS/OEIS.

TABLE 1—EXPLOSIVE (IMPULSIVE) TRAINING AND TESTING SOURCE CLASSES ANALYZED

Source class	Representative munitions	Net Explosive weight (lbs)
E1	Medium-caliber projectiles	0.1–0.25
E2	Medium-caliber projectiles	0.26–0.5
E3	Large-caliber projectiles	>0.5–2.5
E4	Improved Extended Echo Ranging Sonobuoy	>2.5–5.0
E5	5 in. projectiles	>5–10
E6	15 lb. shaped charge	>10–20
E7	40 lb. demo block/shaped charge	>20–60
E8	250 lb. bomb	>60–100
E9	500 lb. bomb	>100–250
E10	1,000 lb. bomb	>250–500
E11	650 lb. mine	>500–650
E12	2,000 lb. bomb	>650–1,000
E13	1,200 lb. HBX charge	>1,000–1,740
E14	2,500 lb HBX charge	>1,740–3,625
E15	5,000 lb HBX charge	>3,625–7,250

TABLE 2—ACTIVE ACOUSTIC (NON-IMPULSIVE) SOURCE CLASSES ANALYZED

Source class category	Source class	Description
Low-Frequency (LF): Sources that produce low-frequency (less than 1 kHz) signals.	LF3	Low-frequency sources greater than 200 dB.
	LF4	Low-frequency sources equal to 180 dB and up to 200 dB.
	LF5	Low-frequency sources greater than 160 dB, but less than 180 dB.
Mid-Frequency (MF): Tactical and non-tactical sources that produce mid-frequency (1 to 10 kHz) signals.	MF1	Hull-mounted surface ship sonar (e.g., AN/SQS-53C and AN/SQS–60).
	MF1K	Kingfisher mode associated with MF1 sonar.
	MF2	Hull-mounted surface ship sonar (e.g., AN/SQS–56).
	MF2K	Kingfisher mode associated with MF2 sonar.
	MF3	Hull-mounted submarine sonar (e.g., AN/BQQ–10).
	MF4	Helicopter-deployed dipping sonar (e.g., AN/AQS–22 and AN/AQS–13).
	MF5	Active acoustic sonobuoys (e.g., DICASS).
	MF6	Active sound underwater signal devices (e.g., MK–84).
	MF8	Active sources (greater than 200 dB) not otherwise binned.
	MF9	Active sources (equal to 180 dB and up to 200 dB) not otherwise binned.
	MF10	Active sources (greater than 160 dB, but less than 180 dB) not otherwise binned.
	MF11	Hull-mounted surface ship sonar with an active duty cycle greater than 80%.
	MF12	Towed array surface ship sonar with an active duty cycle greater than 80%
High-Frequency (HF): Tactical and non-tactical sources that produce high-frequency (greater than 10 kHz but less than 180 kHz) signals.	HF1	Hull-mounted submarine sonar (e.g., AN/BQQ–10).
	HF2	High-Frequency Marine Mammal Monitoring System.
	HF3	Other hull-mounted submarine sonar (classified).
	HF4	Mine detection and classification sonar (e.g., Airborne Towed Minehunting Sonar System).
	HF5	Active sources (greater than 200 dB) not otherwise binned.
	HF6	Active sources (equal to 180 dB and up to 200 dB) not otherwise binned.
	HF7	Active sources (greater than 160 dB, but less than 180 dB) not otherwise binned.
	HF8	Hull-mounted surface ship sonar (e.g., AN/SQS-61).
Anti-Submarine Warfare (ASW): Tactical sources such as active sonobuoys and acoustic countermeasures systems used during the conduct of anti-submarine warfare training and testing activities.	ASW1	Mid-frequency Deep Water Active Distributed System (DWADS).
	ASW2	Mid-frequency Multistatic Active Coherent sonobuoy (e.g., AN/SSQ–125)—Sources that are analyzed by item.
	ASW2	Mid-frequency Multistatic Active Coherent sonobuoy (e.g., AN/SSQ–125)—Sources that are analyzed by hours.
	ASW3	Mid-frequency towed active acoustic countermeasure systems (e.g., AN/SLQ–25).
	ASW4	Mid-frequency expendable active acoustic device countermeasures (e.g., MK–3).

TABLE 2—ACTIVE ACOUSTIC (NON-IMPULSIVE) SOURCE CLASSES ANALYZED—Continued

Source class category	Source class	Description
Torpedoes (TORP): Source classes associated with the active acoustic signals produced by torpedoes.	TORP1	Lightweight torpedo (e.g., MK–46, MK–54, or Anti-Torpedo Torpedo).
	TORP2	Heavyweight torpedo (e.g., MK–48).
Doppler Sonars (DS): Sonars that use the Doppler effect to aid in navigation or collect oceanographic information.	DS1	Low-frequency Doppler sonar (e.g., Webb Tomography Source).
Forward Looking Sonar (FLS): Forward or upward looking object avoidance sonars.	FLS2–FLS3	High-frequency sources with short pulse lengths, narrow beam widths, and focused beam patterns used for navigation and safety of ships.
Acoustic Modems (M): Systems used to transmit data acoustically through the water.	M3	Mid-frequency acoustic modems (greater than 190 dB).
Swimmer Detection Sonars (SD): Systems used to detect divers and submerged swimmers.	SD1–SD2	High-frequency sources with short pulse lengths, used for detection of swimmers and other objects for the purposes of port security.
Synthetic Aperture Sonars (SAS): Sonars in which active acoustic signals are post-processed to form high-resolution images of the seafloor.	SAS1	MF SAS systems.
	SAS2	HF SAS systems.
	SAS3	VHF SAS systems.

TABLE 3—EXPLOSIVE SOURCE CLASSES ANALYZED FOR NON-ANNUAL TRAINING AND TESTING ACTIVITIES

Source class	Representative munitions	Net explosive weight [1] (lbs)
E1	Medium-caliber projectiles	0.1–0.25
E2	Medium-caliber projectiles	0.26–0.5
E4	Improved Extended Echo Ranging Sonobuoy	2.6–5
E16	10,000 lb. HBX charge	7,251–14,500
E17	40,000 lb. HBX charge	14,501–58,000

TABLE 4—ACTIVE ACOUSTIC (NON-IMPULSIVE) SOURCES ANALYZED FOR NON-ANNUAL TRAINING AND TESTING

Source class category	Source class	Description
Low-Frequency (LF): Sources that produce low-frequency (less than 1 kHz) signals.	LF5	Low-frequency sources greater than 160 dB, but less than 180 dB.
Mid-Frequency (MF): Tactical and non-tactical sources that produce mid-frequency (1 to 10 kHz) signals.	MF9	Active sources (equal to 180 dB and up to 200 dB) not otherwise binned.
High-Frequency (HF): Tactical and non-tactical sources that produce high-frequency (greater than 10 kHz but less than 180 kHz) signals.	HF4	Mine detection and classification sonar (e.g., AN/AQS–20).
	HF5	Active sources (greater than 200 dB) not otherwise binned.
	HF6	Active sources (equal to 180 dB and up to 200 dB) not otherwise binned.
	HF7	Active sources (greater than 160 dB, but less than 180 dB) not otherwise binned.
Forward Looking Sonar (FLS): Forward or upward looking object avoidance sonars.	FLS2–FLS3	High-frequency sources with short pulse lengths, narrow beam widths, and focused beam patterns used for navigation and safety of ships.
Sonars (SAS): Sonars in which active acoustic signals are post-processed to form high-resolution images of the seafloor.	SAS2	HF SAS systems.

Proposed Action

The Navy proposes to continue conducting training and testing activities within the AFTT Study Area. The Navy has been conducting similar military readiness training and testing activities in the AFTT Study Area since the 1940s. Recently, these activities were analyzed in separate EISs completed between 2009 and 2011. These documents, among others, and their associated MMPA regulations and authorizations, describe the baseline of training and testing activities currently conducted in the AFTT Study Area.

To meet all future training and testing requirements, the Navy has prepared the AFTT DEIS/OEIS to analyze changes to these activities due to fluctuations in the tempo and types of training and testing activities due to changing requirements; the introduction of new technologies; the dynamic nature of international events; advances in warfighting doctrine and procedures; and changes in basing locations for ships, aircraft, and personnel (force structure changes). Such developments have influenced the frequency, duration, intensity, and location of required training and testing. In addition, the Study Area has expanded beyond the areas included in previous NMFS authorizations. The expansion of the Study Area does not represent an increase in areas where the Navy will train and test, but is merely an expansion of the area to be included in the proposed incidental take authorization.

Training

The Navy proposes to conduct training activities in the AFTT Study Area as described in Table 5 of this proposed rule. Detailed information about each proposed activity (stressor, training event, description, sound source, duration, and geographic location) can be found in Appendix A of the AFTT DEIS/OEIS. The Navy's proposed action is an adjustment to existing baseline training activities to accommodate the following:

• Force structure changes including the relocation of ships, aircraft, and personnel to meet Navy needs. As forces are moved within the existing Navy structure, training needs will necessarily change as the location of forces change.

• Development and introduction of new ships, aircraft, and new weapons systems;

• Current training activities that were not addressed in previous documents.

TABLE 5—TRAINING ACTIVITIES WITHIN THE STUDY AREA

Stressor	Training event	Description	Source class	Number of events per year
Anti-Submarine Warfare (ASW)				
Non-Impulsive	Tracking Exercise/Torpedo Exercise—Submarine (TRACKEX/TORPEX—Sub).	Submarine crews search, track, and detect submarines. Exercise torpedoes may be used during this event.	ASW4; MF3; HF1; TORP2.	102
Non-Impulsive	Tracking Exercise/Torpedo Exercise—Surface (TRACKEX/TORPEX—Surface).	Surface ship crews search, track and detect submarines. Exercise torpedoes may be used during this event.	ASW1,3,4; MF1,2,3,4,5,11,12; HF1; TORP1.	764
Non-Impulsive	Tracking Exercise/Torpedo Exercise—Helicopter (TRACKEX/TORPEX—Helo).	Helicopter crews search, detect and track submarines. Recoverable air launched torpedoes may be employed against submarine targets.	ASW4; MF4,5; TORP1.	432
Non-Impulsive	Tracking Exercise/Torpedo Exercise—Maritime Patrol Aircraft (TRACKEX/TORPEX—MPA).	Maritime patrol aircraft crews search, detect, and track submarines. Recoverable air launched torpedoes may be employed against submarine targets.	MF5; TORP1	752
Non-Impulsive	Tracking Exercise—Maritime Patrol Aircraft Extended Echo Ranging Sonobuoy (TRACKEX—MPA sonobuoy).	Maritime patrol aircraft crews search, detect, and track submarines with extended echo ranging sonobuoys. Recoverable air launched torpedoes may be employed against submarine targets.	ASW2	160
Non-Impulsive	Anti-Submarine Warfare Tactical Development Exercise.	Multiple ships, aircraft and submarines coordinate their efforts to search, detect and track submarines with the use of all sensors. Anti-Submarine Warfare Tactical Development Exercise is a dedicated ASW event.	ASW3,4; HF1; MF1,2,3,4,5.	4
Non-Impulsive	Integrated Anti-Submarine Warfare Course (IAC).	Multiple ships, aircraft, and submarines coordinate the use of their sensors, including sonobuoys, to search, detect and track threat submarines. IAC is an intermediate level training event and can occur in conjunction with other major exercises.	ASW 3,4; HF1; MF1,2,3,4,5.	5
Non-Impulsive	Group Sail	Multiple ships and helicopters integrate the use of sensors, including sonobuoys, to search, detect and track a threat submarine. Group sails are not dedicated ASW events and involve multiple warfare areas.	ASW 2,3; HF1; MF1,2,3,4,5.	20
Non-Impulsive	ASW for Composite Training Unit Exercise (COMPTUEX).	Anti-Submarine Warfare activities conducted during a COMPTUEX.	ASW 2,3,4; HF1; MF1,2,3,4,5,12.	5
Non-Impulsive	ASW for Joint Task Force Exercise (JTFEX)/Sustainment Exercise (SUSTAINEX).	Anti-Submarine Warfare activities conducted during a JTFEX/SUSTAINEX.	ASW2,3,4; HF1; MF1,2,3,4,5,12.	4
Mine Warfare (MIW)				
Non-Impulsive	Mine Countermeasures Exercise (MCM)—Ship Sonar.	Littoral combat ship crews detect and avoid mines while navigating restricted areas or channels using active sonar.	HF4	116
Non-Impulsive	Mine Countermeasures—Mine Detection.	Ship crews and helicopter aircrews detect mines using towed and laser mine detection systems (e.g., AN/AQS–20, ALMDS).	HF4	2,538

TABLE 5—TRAINING ACTIVITIES WITHIN THE STUDY AREA—Continued

Stressor	Training event	Description	Source class	Number of events per year
Non-Impulsive	Coordinated Unit Level Helicopter Airborne Mine Countermeasure Exercises.	Helicopters aircrew members train as a squadron in the use of airborne mine countermeasures, such as towed mine detection and neutralization systems.	HF4	8
Non-Impulsive	Civilian Port Defense	Maritime security operations for military and civilian ports and harbors. Marine mammal systems may be used during the exercise.	HF4	1 event every other year.
Other Training Activities				
Non-Impulsive	Submarine Navigational (SUB NAV).	Submarine crews locate underwater objects and ships while transiting in and out of port.	HF1; MF3	282
Non-Impulsive	Submarine Navigation Under Ice Certification.	Submarine crews train to operate under ice. During training and certification other submarines and ships simulate ice.	HF1	24
Non-Impulsive	Surface Ship Object Detection	Surface ship crews locate underwater objects that may impede transit in and out of port.	MF1K; MF2K	144
Non-Impulsive	Surface Ship Sonar Maintenance.	Pierside and at-sea maintenance of sonar systems.	MF1,2	824
Non-Impulsive	Submarine Sonar Maintenance	Pierside and at-sea maintenance of sonar systems.	MF3	220
Amphibious Warfare (AMW)				
Impulsive	Naval Surface Fire Support Exercise—At Sea (FIREX [At Sea]).	Surface ship crews use large-caliber guns to support forces ashore; however, the land target is simulated at sea. Rounds impact the water and are scored by passive acoustic hydrophones located at or near the target area.	E5	50
Anti-Surface Warfare (ASUW)				
Impulsive	Maritime Security Operations (MSO)—Anti-swimmer Grenades.	Helicopter and surface ship crews conduct a suite of Maritime Security Operations (e.g., Visit, Board, Search, and Seizure; Maritime Interdiction Operations; Force Protection; and Anti-Piracy Operation).	E2	12
Impulsive	Gunnery Exercise (Surface-to-Surface) (Ship)—Medium-Caliber (GUNEX [S–S]—Ship).	Ship crews engage surface targets with ship's medium-caliber guns.	E1; E2	827
Impulsive	Gunnery Exercise (Surface-to-Surface) (Ship)—Large-Caliber (GUNEX [S–S]—Ship).	Ship crews engage surface targets with ship's large-caliber guns.	E3; E5	294
Impulsive	Gunnery Exercise (Surface-to-Surface) (Boat) (GUNEX [S–S]—Boat).	Small boat crews engage surface targets with small and medium-caliber guns.	E1; E2	434
Impulsive	Missile Exercise (Surface-to-Surface) (MISSILEX [S–S]).	Surface ship crews defend against threat missiles and other surface ships with missiles.	E10	20
Impulsive	Gunnery Exercise (Air-to-Surface) (GUNEX [A–S]).	Fixed-wing and helicopter aircrews, including embarked personnel, use small and medium-caliber guns to engage surface targets.	E1; E2	715
Impulsive	Missile Exercise (Air-to-Surface)—Rocket (MISSILEX [A–S]).	Fixed-wing and helicopter aircrews fire both precision-guided missiles and unguided rockets against surface targets.	E5	210
Impulsive	Missile Exercise (Air-to-Surface) (MISSILEX [A–S]).	Fixed-wing and helicopter aircrews fire both precision-guided missiles and unguided rockets against surface targets.	E6; E8	248
Impulsive	Bombing Exercise (Air-to-Surface) (BOMBEX [A–S]).	Fixed-wing aircrews deliver bombs against surface targets.	E8; E9; E10; E12	930
Impulsive	Sinking Exercise (SINKEX)	Aircraft, ship, and submarine crews deliver ordnance on a seaborne target, usually a deactivated ship, which is deliberately sunk using multiple weapon systems.	E3; E5; E8; E9; E10;E11;E12.	1

TABLE 5—TRAINING ACTIVITIES WITHIN THE STUDY AREA—Continued

Stressor	Training event	Description	Source class	Number of events per year
Anti-Submarine Warfare (ASW)				
Impulsive	Tracking Exercise—Maritime Patrol Aircraft Extended Echo Ranging Sonobuoy (TRACKEX—MPA sonobuoy).	Maritime patrol aircraft crews search, detect, and track submarines with extended echo ranging sonobuoys. Recoverable air launched torpedoes may be employed against submarine targets..	E4	160
Impulsive	Group Sail	Multiple ships and helicopters integrate the use of sensors, including sonobuoys, to search, detect and track a threat submarine. Group sails are not dedicated ASW events and involve multiple warfare areas.	E4	20
Impulsive	ASW for Composite Training Unit Exercise (COMPTUEX).	Anti-Submarine Warfare activities conducted during a COMPTUEX.	E4	4
Impulsive	ASW for Joint Task Force Exercise (JTFEX)/Sustainment Exercise (SUSTAINEX).	Anti-Submarine Warfare activities conducted during a JTFEX/SUSTAINEX.	E4	4
Mine Warfare (MIW)				
Impulsive	Explosive Ordnance Disposal (EOD)/Mine Neutralization.	Personnel disable threat mines. Explosive charges may be used.	E1; E4; E5; E6; E7; E8.	618
Impulsive	Mine Countermeasures—Mine Neutralization—Remotely Operated Vehicles.	Ship crews and helicopter aircrews disable mines using remotely operated underwater vehicles.	E4	508
Impulsive	Civilian Port Defense	Maritime security operations for military and civilian ports and harbors. Marine mammal systems may be used during the exercise.	E2; E4	1 event every other year.
Pile Driving and Pile Removal				
Impulsive	Elevated Causeway System (ELCAS).	A temporary pier is constructed off the beach. Supporting pilings are driven into the sand and then later removed. The Elevated Causeway System is a portion of a larger activity Joint Logistics Over the Shore (JLOTS) which is covered under separate documentation. Construction would involve intermittent impact pile driving of 24-inch, uncapped, steel pipe piles over approximately 2 weeks. Crews work 24 hours a day and can drive approximately 8 piles in that period. Each pile takes about 10 minutes to drive. When training events that use the elevated causeway system are complete, the piles would be removed using vibratory methods over approximately 6 days. Crews can remove about 14 piles per 24-hour period, each taking about 6 minutes to remove.	....	1

Testing

The Navy's proposed testing activities are described in Tables 6 and 7. Detailed information about each proposed activity (stressor, testing event, description, sound source, duration, and geographic location) can be found in Appendix A of the AFTT DEIS/OEIS. NMFS used the detailed information in Appendix A of the AFTT DEIS/OEIS to analyze the potential impacts on marine mammals; however, the Navy's proposed action is summarized in the Tables based on the type of sound source.

TABLE 6—NAVAL AIR SYSTEMS COMMAND TESTING ACTIVITIES WITHIN THE STUDY AREA

Stressor	Testing event	Description	Source class	Number of events per year
Anti-Submarine Warfare (ASW)				
Non-Impulsive	Anti-Submarine Warfare Torpedo Test.	This event is similar to the training event Torpedo Exercise. The test evaluates anti-submarine warfare systems onboard rotary wing and fixed wing aircraft and the ability to search for, detect, classify, localize, and track a submarine or similar target.	TORP1	242
Non-Impulsive	Kilo Dip	A kilo dip is the operational term used to describe a functional check of a helicopter deployed dipping sonar system. The sonar system is briefly activated to ensure all systems are functional. A kilo dip is simply a precursor to more comprehensive testing.	MF4	43
Non-Impulsive	Sonobuoy Lot Acceptance Test	Sonobuoys are deployed from surface vessels and aircraft to verify the integrity and performance of a lot, or group, of sonobuoys in advance of delivery to the Fleet for operational use.	ASW2; MF5,6	39
Non-Impulsive	ASW Tracking Test—Helicopter	This event is similar to the training event anti-submarine warfare Tracking Exercise—Helicopter. The test evaluates the sensors and systems used to detect and track submarines and to ensure that helicopter systems used to deploy the tracking systems perform to specifications.	MF4,5	428
Non-Impulsive	ASW Tracking Test—Maritime Patrol Aircraft.	This event is similar to the training event anti-submarine warfare Tracking Exercise—Maritime Patrol Aircraft. The test evaluates the sensors and systems used by maritime patrol aircraft to detect and track submarines and to ensure that aircraft systems used to deploy the tracking systems perform to specifications and meet operational requirements.	ASW2; MF5,6	75
Mine Warfare (MIW)				
Non-Impulsive	Airborne Towed Minehunting Sonar System Test.	Tests of the Airborne Towed Minehunting Sonar System to evaluate the search capabilities of this towed, mine hunting, detection, and classification system. The sonar on the Airborne Towed Minehunting Sonar System identifies mine-like objects in the deeper parts of the water column.	HF4	155
Anti-Surface Warfare (ASUW)				
Impulsive	Air to Surface Missile Test	This event is similar to the training event Missile Exercise Air to Surface. Test may involve both fixed wing and rotary wing aircraft launching missiles at surface maritime targets to evaluate the weapons system or as part of another systems integration test.	E6; E10	239
Impulsive	Air to Surface Gunnery Test	This event is similar to the training event Gunnery Exercise Air to Surface. Strike fighter and helicopter aircrews evaluate new or enhanced aircraft guns against surface maritime targets to test that the gun, gun ammunition, or associated systems meet required specifications or to train aircrew in the operation of a new or enhanced weapons system.	E1	165
Impulsive	Rocket Test	Rocket testing evaluates the integration, accuracy, performance, and safe separation of laser-guided and unguided 2.75-in rockets fired from a hovering or forward flying helicopter or from a fixed wing strike aircraft.	E5	332

TABLE 6—NAVAL AIR SYSTEMS COMMAND TESTING ACTIVITIES WITHIN THE STUDY AREA—Continued

Stressor	Testing event	Description	Source class	Number of events per year
Anti-Submarine Warfare (ASW)				
Impulsive	Sonobuoy Lot Acceptance Test	Sonobuoys are deployed from surface vessels and aircraft to verify the integrity and performance of a lot, or group, of sonobuoys in advance of delivery to the Fleet for operational use.	E3; E4	39
Impulsive	ASW Tracking Test—Helicopter	This event is similar to the training event anti-submarine warfare Tracking Exercise—Helicopter. The test evaluates the sensors and systems used to detect and track submarines and to ensure that helicopter systems used to deploy the tracking systems perform to specifications.	E3	428
Impulsive	ASW Tracking Test—Maritime Patrol Aircraft.	This event is similar to the training event anti-submarine warfare Tracking Exercise—Maritime Patrol Aircraft. The test evaluates the sensors and systems used by maritime patrol aircraft to detect and track submarines and to ensure that aircraft systems used to deploy the tracking systems perform to specifications and meet operational requirements.	E3; E4	75
Mine Warfare (MIW)				
Impulsive	Airborne Mine Neutralization System Test.	Airborne mine neutralization tests evaluate the system's ability to detect and destroy mines. The Airborne Mine Neutralization System Test uses up to four unmanned underwater vehicles equipped with HF sonar, video cameras, and explosive neutralizers.	E4; E11	165
Impulsive	Airborne Projectile-based Mine Clearance System.	An MH–60S helicopter uses a laser-based detection system to search for mines and to fix mine locations for neutralization with an airborne projectile-based mine clearance system. The system neutralizes mines by firing a small or medium-caliber inert, supercavitating projectile from a hovering helicopter.	E11	237
Impulsive	Airborne Towed Minesweeping Test.	Tests of the Airborne Towed Minesweeping System would be conducted by a MH–60S helicopter to evaluate the functionality of the system and the MH–60S at sea. The system is towed from a forward flying helicopter and works by emitting an electromagnetic field and mechanically generated underwater sound to simulate the presence of a ship. The sound and electromagnetic signature cause nearby mines to explode.	E11	72

TABLE 7—NAVAL SEA SYSTEMS COMMAND TESTING ACTIVITIES WITHIN THE STUDY AREA

Stressor	Testing event	Description	Source class	Number of events per year
New Ship Construction				
Non-Impulsive	Surface Combatant Sea Trials—Pierside Sonar Testing.	Tests ship's sonar systems pierside to ensure proper operation.	MF1,9,10; MF1K	12.
Non-Impulsive	Surface Combatant Sea Trials—Anti-Submarine Warfare Testing.	Ships demonstrate capability of countermeasure systems and underwater surveillance and communications systems.	ASW3; MF 1,9,10; MF1K	10.
Non-Impulsive	Submarine Sea Trials—Pierside Sonar Testing.	Tests ship's sonar systems pierside to ensure proper operation.	M3; HF1; MF3,10	6
Non-Impulsive	Submarine Sea Trials—Anti-Submarine Warfare Testing.	Submarines demonstrate capability of underwater surveillance and communications systems.	M3; HF1; MF3,10	12.

TABLE 7—NAVAL SEA SYSTEMS COMMAND TESTING ACTIVITIES WITHIN THE STUDY AREA—Continued

Stressor	Testing event	Description	Source class	Number of events per year
Non-Impulsive	Anti-submarine Warfare Mission Package Testing.	Ships and their supporting platforms (e.g., helicopters, unmanned aerial vehicles) detect, localize, and prosecute submarines.	ASW1,3; MF4,5,12; TORP1.	24.
Non-Impulsive	Mine Countermeasure Mission Package Testing.	Ships conduct mine countermeasure operations.	HF4	8.
Life Cycle Activities				
Non-Impulsive	Surface Ship Sonar Testing/Maintenance.	Pierside and at-sea testing of ship systems occurs periodically following major maintenance periods and for routine maintenance.	ASW3; MF1, 9,10; MF1K	16.
Non-Impulsive	Submarine Sonar Testing/Maintenance.	Pierside and at-sea testing of submarine systems occurs periodically following major maintenance periods and for routine maintenance.	HF1,3; M3; MF3	28.
Non-Impulsive	Combat System Ship Qualification Trial (CSSQT)—In-port Maintenance Period.	All combat systems are tested to ensure they are functioning in a technically acceptable manner and are operationally ready to support at-sea CSSQT events.	MF1	12.
Non-Impulsive	Combat System Ship Qualification Trial (CSSQT)—Undersea Warfare (USW).	Tests ships ability to track and defend against undersea targets.	HF4; MF1,2,4,5; TORP1	9.
NAVSEA Range Activities				
Naval Surface Warfare Center, Panama City Division (NSWC PCD)				
Non-Impulsive	Unmanned Underwater Vehicles Demonstration.	Testing and demonstrations of multiple Unmanned Underwater Vehicles and associated acoustic, optical, and magnetic systems.	HF5,6,7; LF5; FLS2; MF9; SAS2.	1 per 5 year period.
Non-Impulsive	Mine Detection and Classification Testing.	Air, surface, and subsurface vessels detect and classify mines and mine-like objects.	HF1,4; MF1K; SAS2	81.
Non-Impulsive	Stationary Source Testing	Stationary equipment (including swimmer defense systems) is deployed to determine functionality.	LF4; MF8; SD1,2	11.
Non-Impulsive	Special Warfare Testing	Testing of submersibles capable of inserting and extracting personnel and/or payloads into denied areas from strategic distances.	MF9	110.
Non-Impulsive	Unmanned Underwater Vehicle Testing.	Unmanned Underwater Vehicles are deployed to evaluate hydrodynamic parameters, to full mission, multiple vehicle functionality assessments.	FLS2; HF 5,6,7; LF5; MF9; SAS2.	88.
Naval Undersea Warfare Center Division, Newport (NUWCDIVNPT)				
Non-Impulsive	Torpedo Testing	Non-explosive torpedoes are launched to record operational data. All torpedoes are recovered.	TORP1; TORP2	30.
Non-Impulsive	Towed Equipment Testing	Surface vessel or Unmanned Underwater Vehicle deploys equipment to determine functionality of towed systems.	LF4; MF9; SAS1	33.
Non-Impulsive	Unmanned Underwater Vehicle Testing.	Unmanned Underwater Vehicles are deployed to evaluate hydrodynamic parameters, to full mission, multiple vehicle functionality assessments.	HF6,7; LF5; MF10; SAS2	123.
Non-Impulsive	Semi-Stationary Equipment Testing.	Semi-stationary equipment (e.g., hydrophones) is deployed to determine functionality.	ASW3,4; HF 5,6; LF 4,5; MF9,10.	154.
Non-Impulsive	Unmanned Underwater Vehicle Demonstrations.	Testing and demonstrations of multiple Unmanned Underwater Vehicles and associated acoustic, optical, and magnetic systems.	FLS2; HF5,6,7; LF5; MF9; SAS2.	1 per 5 year period.

TABLE 7—NAVAL SEA SYSTEMS COMMAND TESTING ACTIVITIES WITHIN THE STUDY AREA—Continued

Stressor	Testing event	Description	Source class	Number of events per year
Non-Impulsive	Pierside Integrated Swimmer Defense Testing.	Swimmer defense testing ensures that systems can effectively detect, characterize, verify, and defend against swimmer/diver threats in harbor environments.	LF4; MF8; SD1	6.
South Florida Ocean Measurement Facility (SFOMF)				
Non-Impulsive	Signature Analysis Activities.	Testing of electromagnetic, acoustic, optical, and radar signature measurements of surface ship and submarine.	ASW2; HF1,6; LF4; M3; MF9.	18.
Non-Impulsive	Mine Testing	Air, surface, and sub-surface systems detect, counter, and neutralize ocean-deployed mines.	HF4	33.
Non-Impulsive	Surface Testing	Various surface vessels, moored equipment and materials are testing to evaluate performance in the marine environment.	FLS2; HF5,6,7; LF5; MF9; SAS2.	33.
Non-Impulsive	Unmanned Underwater Vehicles Demonstrations.	Testing and demonstrations of multiple Unmanned Underwater Vehicles and associated acoustic, optical, and magnetic systems.	FLS2; HF5,6,7; LF5; MF9; SAS2.	1 per 5 year period.
Additional Activities at Locations Outside of NAVSEA Ranges				
Anti-Surface Warfare (ASUW)/Anti-Submarine Warfare (ASW) Testing				
Non-Impulsive	Torpedo (Non-explosive) Testing.	Air, surface, or submarine crews employ inert torpedoes against submarines or surface vessels. All torpedoes are recovered.	ASW3,4; HF1; M3; MF1,3,4,5; TORP1,2.	26.
Non-Impulsive	Torpedo (Explosive) Testing.	Air, surface, or submarine crews employ explosive torpedoes against artificial targets or deactivated ships.	TORP1; TORP2	2.
Non-Impulsive	Countermeasure Testing	Towed sonar arrays and anti-torpedo torpedo systems are employed to detect and neutralize incoming weapons.	ASW3; HF5; TORP 1,2	3.
Non-Impulsive	Pierside Sonar Testing	Pierside testing to ensure systems are fully functional in a controlled pierside environment prior to at-sea test activities.	ASW3; HF1,3; M3; MF1,3	23.
Non-Impulsive	At-sea Sonar Testing	At-sea testing to ensure systems are fully functional in an open ocean environment.	ASW4; HF1; M3; MF3	15.
Mine Warfare (MIW) Testing				
Non-Impulsive	Mine Detection and Classification Testing.	Air, surface, and subsurface vessels detect and classify mines and mine-like objects.	HF4	66.
Non-Impulsive	Mine Countermeasure/Neutralization Testing.	Air, surface, and subsurface vessels neutralize threat mines that would otherwise restrict passage through an area.	HF4; M3	14.
Shipboard Protection Systems and Swimmer Defense Testing				
Non-Impulsive	Pierside Integrated Swimmer Defense Testing.	Swimmer defense testing ensures that systems can effectively detect, characterize, verify, and defend against swimmer/diver threats in harbor environments.	LF4; MF8; SD1	3.
Unmanned Vehicle Testing				
Non-Impulsive	Unmanned Vehicle Development and Payload Testing.	Vehicle development involves the production and upgrade of new unmanned platforms on which to attach various payloads used for different purposes.	MF9; SAS2	111.

TABLE 7—NAVAL SEA SYSTEMS COMMAND TESTING ACTIVITIES WITHIN THE STUDY AREA—Continued

Stressor	Testing event	Description	Source class	Number of events per year
		Other Testing Activities		
Non-Impulsive	Special Warfare Testing	Special warfare includes testing of submersibles capable of inserting and extracting personnel and/or payloads into denied areas from strategic distances.	HF1; M3; MF9	4.
		Ship Construction and Maintenance		
		New Ship Construction		
Impulsive	Aircraft Carrier Sea Trials—Gun Testing—Medium-Caliber.	Medium-caliber gun systems are tested using non-explosive and explosive rounds.	E1	410.
Impulsive	Surface Warfare Mission Package—Gun Testing-Medium Caliber.	Ships defense against surface targets with medium-caliber guns.	E1	5.
Impulsive	Surface Warfare Mission Package—Gun Testing-Large Caliber.	Ships defense against surface targets with large-caliber guns.	E3	5.
Impulsive	Surface Warfare Mission Package—Missile/Rocket Testing.	Ships defense against surface targets with medium range missiles or rockets.	E6	15.
Impulsive	Mine Countermeasure Mission Package Testing.	Ships conduct mine countermeasure operations..	E4	8.
		Ship Shock Trials		
Impulsive	Aircraft Carrier Full Ship Shock Trial.	Explosives are detonated underwater against surface ships.	E17	1 per 5 year period.
Impulsive	DDG 1000 Zumwalt Class Destroyer Full Ship Shock Trial.	Explosives are detonated underwater against surface ships.	E16	1 per 5 year period.
Impulsive	Littoral Combat Ship Full Ship Shock Trial.	Explosives are detonated underwater against surface ships.	E16	2 per 5 year period.
		NAVSEA Range Activities		
		Naval Surface Warfare Center, Panama City Division (NSWC PCD)		
Impulsive	Mine Countermeasure/ Neutralization Testing.	Air, surface, and subsurface vessels neutralize threat mines and mine-like objects.	E4	15.
Impulsive	Ordnance Testing	Airborne and surface crews defend against surface targets with small-, medium-, and large-caliber guns, as well as line charge testing.	E5; E14	37.
		Additional Activities at Locations Outside of NAVSEA Ranges		
		Anti-Surface Warfare (ASUW)/Anti-Submarine Warfare (ASW) Testing		
Impulsive	Torpedo (Explosive) Testing.	Air, surface, or submarine crews employ explosive torpedoes against artificial targets or deactivated ships.	E8; E11	2.
		Mine Warfare (MIW) Testing		
Impulsive	Mine Countermeasure/ Neutralization Testing.	Air, surface, and subsurface vessels neutralize threat mines that would otherwise restrict passage through an area.	E4; E8	14.
		Other Testing Activities		
Impulsive	At-Sea Explosives Testing	Explosives are detonated at sea	E5	4.

Vessels

Vessels used as part of the proposed action include ships, submarines, Unmanned Undersea Vehicles (UUVs), and boats ranging in size from small, 16 ft (5 m) Rigid Hull Inflatable Boats to 1,092-ft (333 m) long aircraft carriers. Representative Navy vessel types, lengths, and speeds used in both training and testing activities are shown in Table 5 of this proposed rule. While these speeds are representative, some vessels operate outside of these speeds due to unique training, testing, or safety requirements for a given event. Examples include increased speeds needed for flight operations, full speed runs to test engineering equipment, time critical positioning needs, etc. Examples of decreased speeds include speeds less than 5 knots or completely stopped for launching small boats, certain tactical maneuvers, target launch or retrievals, UUVs, etc.

The number of Navy vessels in the Study Area varies based on training and testing schedules. These activities could be widely dispersed throughout the Study Area, but would be more concentrated near naval ports, piers, and range areas. Activities involving vessel movements occur intermittently and are variable in duration, ranging from a few hours up to 2 weeks. Navy vessel traffic would especially be concentrated near Naval Station Norfolk in Norfolk, VA and Naval Station Mayport in Jacksonville, FL. Surface and sub-surface vessel operations in the Study Area may result in marine mammal strikes.

TABLE 8—TYPICAL NAVY BOAT AND VESSEL TYPES WITH LENGTH GREATER THAN 18 METERS USED WITHIN THE AFTT STUDY AREA

Vessel Type (>18 m)	Example(s) (specifications in meters (m) for length, metric tons (mt) for mass, and knots for speed)	Typical operating speed (knots)
Aircraft Carrier	Aircraft Carrier (CVN)	10 to 15.
	length: 333 m beam: 41 m draft: 12 m displacement: 81,284 mt max. speed: 30+ knots.	
Surface Combatants	Cruiser (CG)	10 to 15.
	length: 173 m beam: 17 m draft: 10 m displacement: 9,754 mt max. speed: 30+ knots.	
	Destroyer (DDG).	
	length: 155 m beam: 18 m draft: 9 m displacement: 9,648 mt max. speed: 30+ knots.	
	Frigate (FFG).	
	length: 136 m beam: 14 m draft: 7 m displacement: 4,166 mt max. speed: 30+ knots.	
	Littoral Combat Ship (LCS).	
	length: 115 m beam: 18 m draft: 4 m displacement: 3,000 mt max. speed: 40+ knots.	
Amphibious Warfare Ships	Amphibious Assault Ship (LHA, LHD)	10 to 15.
	length: 253 m beam: 32 m draft: 8 m displacement: 42,442 mt max. speed: 20+knots.	
	Amphibious Transport Dock (LPD).	
	length: 208 m beam: 32 m draft: 7 m displacement: 25,997 mt max. speed: 20+knots.	
	Dock Landing Ship (LSD).	
	length: 186 m beam: 26 m draft: 6 m displacement: 16,976 mt max. speed: 20+knots.	
Mine Warship Ship	Mine Countermeasures Ship (MCM)	5 to 8.
	length: 68 m beam: 12 m draft: 4 m displacement: 1,333 max. speed: 14 knots.	
Submarines	Attack Submarine (SSN)	8 to 13.
	length: 115 m beam: 12 m draft: 9 m displacement: 12,353 mt max. speed: 20+knots.	
	Guided Missile Submarine (SSGN).	
	length: 171 m beam: 13 m draft: 12 m displacement: 19,000 mt max. speed: 20+knots.	
Combat Logistics Force Ships	Fast Combat Support Ship (T–AOE)	8 to 12.
	length: 230 m beam: 33 m draft: 12 m displacement: 49,583 max. speed: 25 knots.	
	Dry Cargo/Ammunition Ship (T–AKE).	
	length: 210 m beam: 32 m draft: 9 m displacement: 41,658 mt max speed: 20 knots.	
	Fleet Replenishment Oilers (T–AO).	
	length: 206 m beam: 30 m draft: 11 m displacement: 42,674 mt max. speed: 20 knots.	
	Fleet Ocean Tugs (T–ATF).	
	length: 69 m beam: 13 m draft: 5 m displacement: 2,297 max. speed: 14 knots.	
Support Craft/Other	Landing Craft, Utility (LCU)	3 to 5.
	length: 41m beam: 9 m draft: 2 m displacement: 381 mt max. speed: 11 knots.	
	Landing Craft, Mechanized (LCM).	
	length: 23 m beam: 6 m draft: 1 m displacement: 107 mt max. speed: 11 knots.	

TABLE 8—TYPICAL NAVY BOAT AND VESSEL TYPES WITH LENGTH GREATER THAN 18 METERS USED WITHIN THE AFTT STUDY AREA—Continued

Vessel Type (>18 m)	Example(s) (specifications in meters (m) for length, metric tons (mt) for mass, and knots for speed)	Typical operating speed (knots)
Support Craft/Other Specialized High Speed.	MK V Special Operations Craft length: 25 m beam: 5 m displacement: 52 mt max. speed: 50 knots	Variable.

Duration and Location

Training and testing activities would be conducted in the AFTT Study Area throughout the year from January 2014 to January 2019. The AFTT Study Area is in the western Atlantic Ocean and encompasses the east coast of North America and the Gulf of Mexico. The Study Area has expanded slightly beyond the areas included in previous Navy authorizations. However, this expansion is not an increase in the Navy's training and testing area, but merely an increase in the area to be analyzed under an incidental take authorization in support of the AFTT EIS/OEIS. The Study Area includes several existing study areas, range complexes, and testing ranges: The Atlantic Fleet Active Sonar Training (AFAST) Study Area; Northeast Range Complexes; Naval Undersea Warfare Center Division, Newport (NUWCDIVNPT) Testing Range; Virginia Capes (VACAPES) Range Complex; Cherry Point (CHPT) Range Complex; Jacksonville (JAX) Range Complex; Naval Surface Warfare Center (NSWC) Carderock Division, South Florida Ocean Measurement Facility (SFOMF) Testing Range; Key West Range Complex; Gulf of Mexico (GOMEX); and Naval Surface Warfare Center, Panama City Division (NSWC PCD) Testing Range. In addition, the Study Area includes Narragansett Bay, the lower Chesapeake Bay and St. Andrew Bay for training and testing activities. Ports included for Civilian Port Defense training events include Earle, New Jersey; Groton, Connecticut; Norfolk, Virginia; Morehead City, North Carolina; Wilmington, North Carolina; Kings Bay, Georgia; Mayport, Florida; Beaumont, Texas; and Corpus Christi, Texas.

The Study Area includes pierside locations where Navy surface ship and submarine sonar maintenance and testing occur. Pierside locations include channels and transit routes in ports and facilities associated with ports and shipyards. These locations in the AFTT Study Area are located at the following Navy ports and naval shipyards:

- Portsmouth Naval Shipyard, Kittery, Maine;
- Naval Submarine Base New London, Groton, Connecticut;
- Naval Station Norfolk, Norfolk, Virginia;
- Joint Expeditionary Base Little Creek—Fort Story, Virginia Beach, Virginia;
- Norfolk Naval Shipyard, Portsmouth, Virginia;
- Naval Submarine Base Kings Bay, Kings Bay, Georgia;
- Naval Station Mayport, Jacksonville, Florida; and
- Port Canaveral, Cape Canaveral, Florida.

Navy-contractor shipyards in the following cities are also in the Study Area:

- Bath, Maine;
- Groton, Connecticut;
- Newport News, Virginia; and
- Pascagoula, Mississippi.

More detailed information is provided in the Navy's LOA application (*http://www.nmfs.noaa.gov/pr/permits/incidental.htm*).

Description of Marine Mammals in the Area of the Specified Activities

There are 48 marine mammal species with possible or known occurrence in the AFTT Study Area, 45 of which are managed by NMFS. As indicated in Table 9, there are 39 cetacean species (8 mysticetes and 31 odontocetes) and six pinnipeds. Seven marine mammal species are listed under the Endangered Species Act: Bowhead whale, North Atlantic right whale, humpback whale, sei whale, fin whale, blue whale, and sperm whale.

TABLE 9—MARINE MAMMAL OCCURRENCE WITHIN THE AFTT STUDY AREA

Common name	Scientific name [1]	ESA/MMPA status [2]	Stock [3]	Stock abundance [3] best (CV)/min	Occurrence in study area [4]		
					Open ocean	Large marine ecosystems	Bays, rivers, and estuaries
Order Cetacea							
Suborder Mysticeti (baleen whales)							
Family Balaenidae (right whales)							
North Atlantic right whale.	Eubalaena glacialis.	Endangered, Strategic, Depleted.	Western North Atlantic.	361 (0)/361	Gulf Stream, Labrador Current.	Southeast U.S. Continental Shelf, Northeast U.S. Continental Shelf, Scotian Shelf, Newfoundland-Labrador Shelf.	
Bowhead whale	Balaena mysticetus.	Endangered, Strategic, Depleted.	West Greenland	1,230 [5]/490–2,940	Labrador Current	Newfoundland-Labrador Shelf, West Greenland Shelf.	

TABLE 9—MARINE MAMMAL OCCURRENCE WITHIN THE AFTT STUDY AREA—Continued

Common name	Scientific name [1]	ESA/MMPA status [2]	Stock [3]	Stock abundance [3] best (CV)/min	Occurrence in study area [4]		
					Open ocean	Large marine ecosystems	Bays, rivers, and estuaries
Family Balaenopteridae (rorquals)							
Humpback whale	Megaptera novaeangliae.	Endangered, Strategic, Depleted.	Gulf of Maine	847 (0.55)/549	Gulf Stream, North Atlantic Gyre, Labrador Current.	Gulf of Mexico, Caribbean Sea, Southeast U.S. Continental Shelf, Northeast U.S. Continental Shelf, Scotian Shelf, Newfoundland-Labrador Shelf.	
Minke whale	Balaenoptera acutorostrata.		Canadian east coast.	8,987 (0.32)/6,909	Gulf Stream, North Atlantic Gyre, Labrador Current.	Caribbean Sea, Southeast U.S. Continental Shelf, Northeast U.S. Continental Shelf, Scotian Shelf, Newfoundland-Labrador Shelf.	
Bryde's whale	Balaenoptera brydei/edeni.		Gulf of Mexico Oceanic.	15 (1.98)/5	Gulf Stream, North Atlantic Gyre.	Gulf of Mexico, Caribbean Sea, Southeast U.S. Continental Shelf.	
Sei whale	Balaenoptera borealis.	Endangered, Strategic, Depleted.	Nova Scotia	386 (0.85)/208	Gulf Stream, North Atlantic Gyre, Labrador Current.	Gulf of Mexico, Caribbean Sea, Southeast U.S. Continental Shelf, Northeast U.S. Continental Shelf, Scotian Shelf, Newfoundland-Labrador Shelf.	
Fin whale	Balaenoptera physalus.	Endangered, Strategic, Depleted.	Western North Atlantic.	3,985 (0.24)/3,269	Gulf Stream, North Atlantic Gyre, Labrador Current.	Caribbean Sea, Southeast U.S. Continental Shelf, Northeast U.S. Continental Shelf, Scotian Shelf, Newfoundland-Labrador Shelf.	
Blue whale	Balaenoptera musculus.	Endangered, Strategic, Depleted.	Western North Atlantic.	NA/440 [6]	Gulf Stream, North Atlantic Gyre, Labrador Current.	Northeast U.S. Continental Shelf, Scotian Shelf, Newfoundland-Labrador Shelf.	
Suborder Odontoceti (toothed whales)							
Family Physeteridae (sperm whale)							
Sperm whale	Physeter macrocephalus.	Endangered, Strategic, Depleted.	North Atlantic	4,804 (0.38)/3,539	Gulf Stream, North Atlantic Gyre, Labrador Current.	Southeast U.S. Continental Shelf, Northeast U.S. Continental Shelf, Scotian Shelf, Newfoundland-Labrador Shelf.	
		Endangered, Strategic, Depleted.	Gulf of Mexico Oceanic.	1,665 (0.2)/1,409		Gulf of Mexico.	
		Endangered, Strategic, Depleted.	Puerto Rico and U.S. Virgin Islands.	unknown	North Atlantic Gyre.	Caribbean Sea.	

TABLE 9—MARINE MAMMAL OCCURRENCE WITHIN THE AFTT STUDY AREA—Continued

Common name	Scientific name [1]	ESA/MMPA status [2]	Stock [3]	Stock abundance [3] best (CV)/min	Occurrence in study area [4]		
					Open ocean	Large marine ecosystems	Bays, rivers, and estuaries
Family Kogiidae (sperm whales)							
Pygmy sperm whale.	Kogia breviceps	Strategic	Western North Atlantic.	395 (0.4)/285 [7]	Gulf Stream, North Atlantic Gyre.	Southeast U.S. Continental Shelf, Northeast U.S. Continental Shelf, Scotian Shelf, Newfoundland-Labrador Shelf.	
			Gulf of Mexico Oceanic.	453(0.35)/340 [7]		Gulf of Mexico, Caribbean Sea.	
Dwarf sperm whale	Kogia sima		Western North Atlantic.	395 (0.4)/285 [7]	Gulf Stream, North Atlantic Gyre.	Southeast U.S. Continental Shelf, Northeast U.S. Continental Shelf, Scotian Shelf.	
			Gulf of Mexico Oceanic.	453(0.35)/340 [7]		Gulf of Mexico, Caribbean Sea.	
Family Monodontidae (beluga whale and narwhal)							
Beluga whale	Delphinapterus leucas.		NA8	NA [8]		Northeast U.S. Continental Shelf, Scotian Shelf, Newfoundland-Labrador Shelf.	
Narwhal	Monodon monoceros.		NA9	NA [9]		Newfoundland-Labrador Shelf, West Greenland Shelf.	
Family Ziphiidae (beaked whales)							
Cuvier's beaked whale.	Ziphius cavirostris		Western North Atlantic.	3,513 (0.63)/ 2,154 [10].	Gulf Stream, North Atlantic Gyre, Labrador Current.	Southeast U.S. Continental Shelf, Northeast U.S. Continental Shelf, Scotian Shelf, Newfoundland-Labrador Shelf.	
			Gulf of Mexico Oceanic.	65 (0.67)/39		Gulf of Mexico, Caribbean Sea.	
True's beaked whale.	Mesoplodon mirus		Western North Atlantic.	3,513 (0.63)/ 2,154 [10].	Gulf Stream, North Atlantic Gyre, Labrador Current.	Southeast U.S. Continental Shelf, Northeast U.S. Continental Shelf, Scotian Shelf, Newfoundland-Labrador Shelf.	
Gervais' beaked whale.	Mesoplodon europaeus.		Western North Atlantic.	3,513 (0.63)/ 2,154 [10].	Gulf Stream, North Atlantic Gyre.	Southeast U.S. Continental Shelf, Northeast United States Continental Shelf.	
			Gulf of Mexico Oceanic.	57 (1.4)/24 [11]	Gulf Stream, North Atlantic Gyre.	Southeast U.S. Continental Shelf, Northeast U.S. Continental Shelf.	
Sowerby's beaked whale.	Mesoplodon bidens.		Western North Atlantic.	3,513 (0.63)/ 2,154 [10].	Gulf Stream, North Atlantic Gyre.	Northeast U.S. Continental Shelf, Scotian Shelf, Newfoundland-Labrador Shelf.	

TABLE 9—MARINE MAMMAL OCCURRENCE WITHIN THE AFTT STUDY AREA—Continued

Common name	Scientific name [1]	ESA/MMPA status [2]	Stock [3]	Stock abundance [3] best (CV)/min	Occurrence in study area [4]		
					Open ocean	Large marine ecosystems	Bays, rivers, and estuaries
Blainville's beaked whale.	Mesoplodon densirostris.	....	Western North Atlantic.	3,513 (0.63)/ 2,154 [10].	Gulf Stream, North Atlantic Gyre, Labrador Current.	Southeast U.S. Continental Shelf, Northeast U.S. Continental Shelf, Scotian Shelf, Newfoundland-Labrador Shelf.	
			Gulf of Mexico Oceanic.	57 (1.4)/24 [11]	....	Gulf of Mexico, Caribbean Sea.	
Northern bottlenose whale.	Hyperoodon ampullatus.	....	Western North Atlantic.	Unknown	Gulf Stream, North Atlantic Gyre, Labrador Current.	Northeast U.S. Continental Shelf, Scotian Shelf, Newfoundland-Labrador Shelf.	
Family Delphinidae (dolphins)							
Rough-toothed dolphin.	Steno bredanensis.	....	Western North Atlantic.	Unknown	Gulf Stream, North Atlantic Gyre.	Caribbean Sea, Southeast U.S. Continental Shelf.	
			Gulf of Mexico (Outer continental shelf and Oceanic).	Unknown	....	Gulf of Mexico, Caribbean Sea.	
Bottlenose dolphin	Tursiops truncatus	Strategic, Depleted.	Western North Atlantic, offshore [12].	81,588 (0.17)/ 70,775.	Gulf Stream, North Atlantic Gyre.	Southeast U.S. Continental Shelf, Northeast U.S. Continental Shelf.	
		Strategic, Depleted.	Western North Atlantic, coastal, northern migratory.	9,604 (0.36)/7,147	....	Southeast U.S. Continental Shelf.	Island Sound, Sandy Hook Bay, Lower Chesapeake Bay, James River, Elizabeth River.
		Strategic, Depleted.	Western North Atlantic, coastal, southern migratory.	12,482 (0.32)/ 9,591.	....	Southeast U.S. Continental Shelf.	Lower Chesapeake Bay, James River, Elizabeth River, Beaufort Inlet, Cape Fear River, Kings Bay, St. Johns River.
		Strategic, Depleted.	Western North Atlantic, coastal, South Carolina/ Georgia.	7,738 (0.23)/6,399	....	Southeast U.S. Continental Shelf.	Kings Bay, St. Johns River.
		Strategic, Depleted.	Western North Atlantic, coastal, Northern Florida.	3,064 (0.24)/2,511	....	Southeast U.S. Continental Shelf.	Kings Bay, St. Johns River.
		Strategic	Western North Atlantic, coastal, Central Florida.	6,318 (0.26)/5,094	....	Southeast U.S. Continental Shelf.	Port Canaveral.
		Strategic	Northern North Carolina Estuarine System.	Unknown	....	Southeast U.S. Continental Shelf.	Beaufort Inlet, Cape Fear River.
		Strategic	Southern North Carolina Estuarine System.	2,454 (0.53)/1,614	....	Southeast U.S. Continental Shelf.	Beaufort Inlet, Cape Fear River.
		Strategic	Charleston Estuarine System.	Unknown	....	Southeast U.S. Continental Shelf.	
		Strategic	Northern Georgia/ Southern South Carolina Estuarine System.	Unknown	....	Southeast U.S. Continental Shelf.	
		Strategic	Southern Georgia Estuarine System.	Unknown	....	Southeast U.S. Continental Shelf.	Kings Bay, St. Johns River.
		Strategic	Jacksonville Estuarine System.	Unknown	....	Southeast U.S. Continental Shelf.	Kings Bay, St. Johns River.

TABLE 9—MARINE MAMMAL OCCURRENCE WITHIN THE AFTT STUDY AREA—Continued

Common name	Scientific name [1]	ESA/MMPA status [2]	Stock [3]	Stock abundance [3] best (CV)/min	Occurrence in study area [4]		
					Open ocean	Large marine ecosystems	Bays, rivers, and estuaries
		Strategic	Indian River Lagoon Estuarine System.	Unknown		Southeast U.S. Continental Shelf.	Port Canaveral.
		Strategic	Biscayne Bay	Unknown		Southeast U.S. Continental Shelf.	
			Florida Bay	514 (0.17)/447		Gulf of Mexico.	
			Gulf of Mexico Continental Shelf.	Unknown		Gulf of Mexico.	
			Gulf of Mexico, eastern coastal.	7,702 (0.19)/6,551		Gulf of Mexico.	
			Gulf of Mexico, northern coastal.	2,473 (0.25)/2,004		Gulf of Mexico	St. Andrew Bay, Pascagoula River.
		Strategic	Gulf of Mexico, western coastal.	Unknown		Gulf of Mexico	Corpus Christi Bay, Galveston Bay.
			Gulf of Mexico Oceanic.	3,708 (0.42)/2,641		Gulf of Mexico.	
		Strategic	Gulf of Mexico bay, sound, and estuarine.	Unknown		Gulf of Mexico	St. Andrew Bay, Pascagoula River, Sabine Lake, Corpus Christi Bay, and Galveston Bay.
Pantropical spotted dolphin.	Stenella attenuata		Western North Atlantic.	4,439 (0.49)/3,010	Gulf Stream, North Atlantic Gyre.	Southeast U.S. Continental Shelf, Northeast U.S. Continental Shelf.	
			Gulf of Mexico Oceanic.	34,067 (0.18)/ 29,311.		Gulf of Mexico, Caribbean Sea.	
Atlantic spotted dolphin.	Stenella frontalis		Western North Atlantic.	50,978 (0.42)/ 36,235.	Gulf Stream	Southeast U.S. Continental Shelf, Northeast U.S. Continental Shelf, Scotian Shelf, Newfoundland-Labrador Shelf.	
			Gulf of Mexico (Continental shelf and Oceanic).	Unknown		Gulf of Mexico, Caribbean Sea.	
Spinner dolphin	Stenella longirostris.		Western North Atlantic.	Unknown	Gulf Stream, North Atlantic Gyre.	Southeast U.S. Continental Shelf, Northeast U.S. Continental Shelf.	
			Gulf of Mexico Oceanic.	1,989 (0.48)/1,356		Gulf of Mexico, Caribbean Sea.	
Clymene dolphin	Stenella clymene		Western North Atlantic.	Unknown	Gulf Stream	Southeast U.S. Continental Shelf.	
			Gulf of Mexico Oceanic.	6,575 (0.36)/4,901		Gulf of Mexico, Caribbean Sea.	
Striped dolphin	Stenella coeruleoalba.		Western North Atlantic.	94,462 (0.4)/ 68,558.	Gulf Stream.		
			Gulf of Mexico Oceanic.	3,325 (0.48)/2,266		Gulf of Mexico, Caribbean Sea.	
Fraser's dolphin	Lagenodelphis hosei.		Western North Atlantic.	Unknown	North Atlantic Gyre.	Southeast U.S. Continental Shelf.	
			Gulf of Mexico Oceanic.	Unknown		Gulf of Mexico, Caribbean Sea.	
Risso's dolphin	Grampus griseus		Western North Atlantic.	20,479 (0.59)/ 12,920.	Gulf Stream	Southeast U.S. Continental Shelf, Northeast U.S. Continental Shelf, Scotian Shelf, Newfoundland-Labrador Shelf.	
			Gulf of Mexico Oceanic.	1,589 (0.27)/1,271		Gulf of Mexico, Caribbean Sea.	

TABLE 9—MARINE MAMMAL OCCURRENCE WITHIN THE AFTT STUDY AREA—Continued

Common name	Scientific name [1]	ESA/MMPA status [2]	Stock [3]	Stock abundance [3] best (CV)/min	Occurrence in study area [4]		
					Open ocean	Large marine ecosystems	Bays, rivers, and estuaries
Atlantic white-sided dolphin.	Lagenorhynchus acutus.	....	Western North Atlantic.	63,368 (0.27)/ 50,883.	Labrador Current	Northeast U.S. Continental Shelf, Scotian Shelf, Newfoundland-Labrador Shelf.	
White-beaked dolphin.	Lagenorhynchus albirostris.	....	Western North Atlantic.	2,003 (0.94)/1,023	Labrador Current	Northeast U.S. Continental Shelf, Scotian Shelf, Newfoundland-Labrador Shelf.	
Long-beaked common dolphin.	Delphinus capensis.	....	NA [13]	Unknown [13]	....	Caribbean Sea 13.	
Short-beaked common dolphin.	Delphinus delphis	....	Western North Atlantic.	120,743 (0.23)/ 99,975.	Gulf Stream	Southeast U.S. Continental Shelf, Northeast U.S. Continental Shelf, Scotian Shelf, Newfoundland-Labrador Shelf.	
Melon-headed whale.	Peponocephala electra.	....	Western North Atlantic.	Unknown	Gulf Stream, North Atlantic Gyre.	Southeast U.S. Continental Shelf.	
			Gulf of Mexico Oceanic.	2,283 (0.76)/1,293	....	Gulf of Mexico, Caribbean Sea.	
Pygmy killer whale	Feresa attenuata	....	Western North Atlantic.	Unknown	Gulf Stream, North Atlantic Gyre.	Southeast U.S. Continental Shelf.	
			Gulf of Mexico Oceanic.	323 (0.6)/203	....	Gulf of Mexico, Caribbean Sea, Southeast U.S. Continental Shelf.	
False killer whale ..	Pseudorca crassidens.	....	Gulf of Mexico Oceanic.	777 (0.56)/501	Gulf Stream, North Atlantic Gyre.	Gulf of Mexico, Caribbean Sea, Southeast U.S. Continental Shelf.	
Killer whale	Orcinus orca	....	Western North Atlantic.	Unknown	Gulf Stream, North Atlantic Gyre, Labrador Current.	Southeast U.S. Continental Shelf, Northeast U.S. Continental shelf, Scotian Shelf, Newfoundland-Labrador Shelf.	
			Gulf of Mexico Oceanic.	49 (0.77)/28	....	Gulf of Mexico, Caribbean Sea.	
Long-finned pilot whale.	Globicephala melas.	....	Western North Atlantic.	12,619 (0.37)/ 9,333.	Gulf Stream	Northeast U.S. Continental Shelf, Scotian Shelf, Newfoundland-Labrador Shelf.	
Short-finned pilot whale.	Globicephala macrorhynchus.	....	Western North Atlantic.	24,674 (0.45)/ 17,190.	Gulf Stream	Northeast U.S. Continental Shelf, Southeast U.S. Continental Shelf.	
			Gulf of Mexico Oceanic.	716 (0.34)/542	....	Gulf of Mexico, Caribbean Sea.	

TABLE 9—MARINE MAMMAL OCCURRENCE WITHIN THE AFTT STUDY AREA—Continued

Common name	Scientific name [1]	ESA/MMPA status [2]	Stock [3]	Stock abundance [3] best (CV)/min	Occurrence in study area [4]		
					Open ocean	Large marine ecosystems	Bays, rivers, and estuaries
Family Phocoenidae (porpoises)							
Harbor porpoise	Phocoena phocoena.		Gulf of Maine/Bay of Fundy.	89,054 (0.47)/ 60,970.		Northeast U.S. Continental Shelf, Scotian Shelf, New-foundland-Labrador Shelf.	Narragansett Bay, Rhode Island Sound, Block Island Sound, Buzzards Bay, Vineyard Sound, Long Island Sound, Piscataqua River, Thames River, Kennebec River.
Order Carnivora							
Suborder Pinnipedia							
Family Phocidae (true seals)							
Ringed seal	Pusa hispida	Proposed [15]	NA [14]	Unknown		Newfoundland-Labrador Shelf, West Greenland Shelf.	
Bearded seal	Erignathus barbatus.		NA [14]	Unknown		Scotian Shelf, Newfoundland-Labrador Shelf, West Greenland Shelf.	
Hooded seal	Cystophora cristata.		Western North Atlantic.	592,100/512,000		Southeast U.S. Continental Shelf, Northeast U.S. Continental Shelf, Scotian Shelf, Newfoundland-Labrador Shelf, West Greenland Shelf.	Narragansett Bay, Rhode Island Sound, Block Island Sound, Buzzards Bay, Vineyard Sound, Long Island Sound, Piscataqua River, Thames River, Kennebec River.
Harp seal	Pagophilus groenlandicus.		Western North Atlantic.	Unknown		Northeast U.S. Continental Shelf, Scotian Shelf, Newfoundland-Labrador Shelf.	
Gray seal	Halichoerus grypus.		Western North Atlantic.	Unknown		Northeast U.S. Continental Shelf, Scotian Shelf, Newfoundland-Labrador Shelf.	Narragansett Bay, Rhode Island Sound, Block Island Sound, Buzzards Bay, Vineyard Sound, Long Island Sound, Piscataqua River, Thames River, Kennebeck River.
Harbor seal	Phoca vitulina		Western North Atlantic.	Unknown [16]		Southeast U.S. Continental Shelf, Northeast U.S. Continental Shelf, Scotian Shelf, Newfoundland-Labrador Shelf.	Narragansett Bay, Rhode Island Sound, Block Island Sound, Buzzards Bay, Vineyard Sound, Long Island Sound, Piscataqua River, Thames River, Kennebeck River.

[1] Taxonomy follows Perrin 2009.
[2] ESA listing status. All marine mammals are protected under MMPA. Populations or stocks for which the level of direct human-caused mortality exceeds the potential biological removal level, which, based on the best available scientific information, is declining and is likely to be listed as a threatened species under the ESA within the foreseeable future, or is listed as a threatened or endangered species under the ESA, or is designated as depleted under the MMPA are considered "strategic" under MMPA.
[3] Best CV/Min is a statistic measurement used as an indicator of the accuracy of the estimate. Stock designations for the U.S. Exclusive Economic Zone and abundance estimates from 2010 Stock Assessment Report (Waring *et al.* 2010).
[4] Occurrence in the Study Area includes open ocean areas—Labrador Current, North Atlantic Gyre, and Gulf Stream, and coastal/shelf waters of seven Large Marine Ecosystems—Gulf of Mexico, Southeast U.S. Continental Shelf, Northeast U.S. Continental Shelf, Caribbean Sea, Scotian Shelf, Newfoundland-Labrador Shelf, West Greenland Shelf, and inland waters of—Kennebec River, Piscataqua River, Thames River, Narragansett Bay, Rhode Island Sound, Block Island Sound, Buzzards Bay, Vineyard Sound, Long Island Sound, Sandy Hook Bay, Lower Chesapeake Bay, James River, Elizabeth River, Beaufort Inlet, Cape Fear River, Kings Bay, St. Johns River, Port Canaveral, St. Andrew Bay, Pascagoula River, Sabine Lake, Corpus Christi Bay, and Galveston Bay.
[5] This species occurs in the Atlantic outside of the U.S. Exclusive Economic Zone; and therefore has no associated Stock Assessment Report. See the appropriate subsections below for details of populations that may be found within the Study Area. Abundance and 95 percent confidence interval are provided by the International Whaling Commission.
[6] Photo identification catalogue count of 440 recognizable blue whale individuals from the Gulf of St. Lawrence is considered to be a minimum population estimate for the western North Atlantic stock.
[7] Estimate may include both the pygmy and dwarf sperm whales.
[8] This species occurs in the Atlantic outside of the U.S. Exclusive Economic Zone; and therefore has no associated Stock Assessment Report. See the appropriate subsections below for details of populations that may be found within the Study Area.
[9] Narwhals in the Atlantic are not managed by NMFS and have no associated Stock Assessment Report.
[10] Estimate includes Cuvier's beaked whales and undifferentiated Mesoplodon species.
[11] Estimate includes Gervais' and Blainville's beaked whales.
[12] Estimate may include sightings of the coastal form.
[13] Long-beaked common dolphins are only known in the western Atlantic from a discrete population off the east coast of South America.
[14] This species occurs in the Atlantic outside of the U.S. Exclusive Economic Zone; and therefore has no associated Stock Assessment Report. See the appropriate subsections below for details of populations that may be found within the Study Area.
[15] Arctic sub-species of ringed seal has been proposed as threatened under the ESA (75 **Federal Register** [FR] 77476).
[16] 2010 Stock Assessment Report states that present data are insufficient to calculate a minimum population estimate for this stock, however, the 2009 Stock Assessment Report indicated the "best" population estimate was 99,340 (CV = .097) and minimum population estimate was 91,546.

NMFS has reviewed the information complied by the Navy on the abundance, behavior, status and distribution, and vocalizations of marine mammal species in the waters of the AFTT Study Area, which was derived from peer reviewed literature, the Navy Marine Resource Assessments, NMFS Stock Assessment Reports, and marine mammal surveys using acoustic or visual observations from aircraft or ships. NMFS considers this information to be the best available science with which we can conduct the analyses necessary to propose these regulations and future LOAs. This information may be viewed in the Navy's LOA application and the Navy's EIS for AFTT (*see* Availability). Additional information is available in the NMFS Stock Assessment Reports, which may be viewed at: *http://www.nmfs.noaa.gov/pr/sars/species.htm*.

Bowhead whales, beluga whales, and narwhal are considered rare in the AFTT Study Area. Bowhead whales inhabit only the arctic and subarctic regions, often close to the ice edge. The St. Lawrence estuary is at the southern limit of the beluga whales' distribution (Lesage and Kingsley, 1998). Beluga distribution does not include the Gulf of Mexico or the southeastern Atlantic coast and they are considered extralimital in the Northeast. Narwhals inhabit Arctic waters, but populations from the Hudson Strait and Davis Strait—at the northwest extreme of the Study Area—may extend into the AFTT Study Area, but the possibility of narwhal actually occurring is considered remote. Based on the rare occurrence of these species in the AFTT Study Area, the Navy and NMFS do not anticipate any take of bowhead whales, beluga whales, or narwhals; therefore, these species are not addressed further in this proposed rule.

Important Areas

NMFS identifies biologically important areas when considering an application to authorize the incidental take of marine mammals. The negligible impact finding necessary for the issuance of an MMPA authorization requires NMFS to consider areas where marine mammals are known to selectively breed or calve/pup. In addition, NMFS must prescribe regulations setting forth the permissible methods of taking and other means of effecting the least practicable adverse impact on marine mammals species or stocks by paying particular attention to rookeries, mating grounds, and other areas of similar significance. This section identifies and discusses known important reproductive and feeding areas within the AFTT Study Area.

Little is known about the breeding and calving behaviors of many of the marine mammals that occur within the AFTT Study Area. For rorquals (humpback whale, minke whale, Bryde's whale, sei whale, fin whale, and blue whale) and sperm whales, mating is generally thought to occur in tropical and sub-tropical waters between mid-winter and mid-summer in deep offshore waters. Delphinids (Melon-headed whale, killer whale, pygmy killer whale, false killer whale, pilot whale, common dolphin, Atlantic spotted dolphin, clymene dolphin, pantropical spotted dolphin, spinner dolphin, striped dolphin, rough-toothed dolphin, bottlenose dolphin, Risso's dolphin, Fraser's dolphin, Atlantic white-sided dolphin, white-beaked dolphin) may mate throughout their distribution during any time of year. For pinnipeds, mating and pupping typically occur in coastal waters near northeast rookeries. With one notable exception, no specific areas for breeding or calving/pupping have been identified in the AFTT Study Area for the species that occur there. However, under the Endangered Species Act (ESA), critical habitat has been designated for the North Atlantic right whale. Additional biologically important areas have been identified for humpback whales and sperm whales. Biologically important areas for all three species are discussed below.

North Atlantic Right Whale

Most North Atlantic right whale sightings follow a well-defined seasonal migratory pattern through several consistently utilized habitats (Winn *et al.,* 1986). It should be noted, however, that some individuals may be sighted in these habitats outside of the typical time of year and that migration routes are not well known (there may be a regular offshore component). The population migrates as two separate components, although some whales may remain in the feeding grounds throughout the winter (Winn *et al.,* 1986, Kenney *et al.,* 2001). Pregnant females and some juveniles migrate from the feeding grounds to the calving grounds off the southeastern United States in late fall to winter. The cow-calf pairs return northward in late winter to early spring. The majority of the right whale population leaves the feeding grounds for unknown habitats in the winter but returns to the feeding grounds coinciding with the return of the cow-calf pairs. Some individuals as well as cow-calf pairs can be seen through the fall and winter on the feeding grounds with feeding being observed (e.g., Sardi *et al.,* 2005).

During the spring through early summer, North Atlantic right whales are found on feeding grounds off the northeastern United States and Canada. Individuals may be found in Cape Cod Bay in February through April (Winn *et al.,* 1986; Hamilton and Mayo, 1990) and in the Great South Channel east of Cape Cod in April through June (Winn *et al.,* 1986; Kenney *et al.,* 1995). Right whales are found throughout the remainder of summer and into fall (June through November) on two feeding grounds in Canadian waters (Gaskin, 1987 and 1991), with peak abundance in August, September, and early October. The majority of summer/fall sightings of mother/calf pairs occur east of Grand Manan Island (Bay of Fundy), although some pairs might move to other unknown locations (Schaeff *et al.,* 1993). Jeffreys Ledge appears to be important habitat for right whales, with extended whale residences; this area appears to be an important fall feeding area for right whales and an important nursery area during summer (Weinrich *et al.,* 2000). The second feeding area is off the southern tip of Nova Scotia in the Roseway Basin between Browns, Baccaro, and Roseway banks (Mitchell *et al.,* 1986; Gaskin, 1987; Stone *et al.,* 1988; Gaskin, 1991). The Cape Cod Bay and Great South Channel feeding grounds have been designated as critical habitat under the ESA (Silber and Clapham, 2001).

During the winter (as early as November and through March), North Atlantic right whales may be found in coastal waters off North Carolina, Georgia, and northern Florida (Winn *et al.,* 1986). The waters off Georgia and northern Florida are the only known calving ground for western North Atlantic right whales and they have been designated as critical habitat under the ESA. Calving occurs from December through March (Silber and Clapham, 2001). On 1 January 2005, the first observed birth on the calving grounds was reported (Zani *et al.,* 2005). The majority of the population is not accounted for on the calving grounds, and not all reproductively active females return to this area each year (Kraus *et al.,* 1986a).

The coastal waters of the Carolinas are suggested to be a migratory corridor for the right whale (Winn *et al.,* 1986). This area, consisting of coastal waters between North Carolina and northern Florida, was mainly a winter and early spring (January–March) right whaling ground during the late 1800s (Reeves and Mitchell, 1986). The whaling ground was centered along the coasts of South Carolina and Georgia (Reeves and Mitchell, 1986). An examination of sighting records from all sources between 1950 and 1992 found that wintering right whales were observed widely along the coast from Cape Hatteras, North Carolina, to Miami, Florida (Kraus *et al.,* 1993). Sightings off the Carolinas were comprised of single individuals that appeared to be transients (Kraus *et al.,* 1993). These observations are consistent with the hypothesis that the coastal waters of the Carolinas are part of a migratory corridor for the North Atlantic right whale (Winn *et al.,* 1986). Knowlton *et al.* (2002) analyzed sightings data collected in the mid-Atlantic from northern Georgia to southern New England and found that the majority of North Atlantic right whale sightings occurred within approximately 30 NM (56 km) from shore. Critical habitat for the north Atlantic population of the North Atlantic right whale exists in portions of the JAX and Northeast OPAREAs (Figure 4–1 of the Navy's Application). The following three areas occur in U.S. waters and were designated by NMFS as critical habitat in June 1994 (NMFS, 2005):

• Coastal Florida and Georgia (Sebastian Inlet, Florida, to the Altamaha River, Georgia),

• The Great South Channel, east of Cape Cod, and

• Cape Cod and Massachusetts Bays.

The northern critical habitat areas serve as feeding and nursery grounds, while the southern area from the mid-Georgia coast extending southward along the Florida coast serves as calving grounds. A large portion of this habitat lies within the coastal waters of the JAX OPAREA. The physical features correlated with the distribution of right whales in the southern critical habitat area provide an optimum environment for calving. For example, the bathymetry of the inner and nearshore middle shelf area minimizes the effect of strong winds and offshore waves, limiting the formation of large waves and rough water. The average temperature of critical habitat waters is cooler during the time right whales are present due to a lack of influence by the Gulf Stream and cool freshwater runoff from coastal areas. The water temperatures may provide an optimal balance between offshore waters that are too warm for nursing mothers to tolerate, yet not too cool for calves that may only have minimal fatty insulation. On the calving grounds, the reproductive females and calves are expected to be concentrated near the critical habitat in the JAX OPAREA from December through April.

Two additional biologically important habitat areas are located in Canadian waters—Grand Manan Basin and Roseway Basin. These areas were identified in Canada's final recovery strategy for the North Atlantic right whale. On October 6, 2010, NMFS published a notice announcing 90-day finding and 12-month determination on a petition to revise critical habitat for the North Atlantic right whale (75 FR 61690). NMFS found that the petition, in addition with the information readily available, presents substantial scientific information indicating that the requested revision may be warranted. NMFS determined that we would proceed with the ongoing rulemaking process for revising critical habitat for the North Atlantic right whale.

Humpback Whale

In the North Atlantic Ocean, humpbacks are found from spring through fall on feeding grounds that are located from south of New England to northern Norway (NMFS, 1991). The Gulf of Maine is one of the principal summer feeding grounds for humpback whales in the North Atlantic. The largest numbers of humpback whales are present from mid-April to mid-November. Feeding locations off the northeastern United States include Stellwagen Bank, Jeffreys Ledge, the Great South Channel, the edges and shoals of Georges Bank, Cashes Ledge, Grand Manan Banks, the banks on the Scotian Shelf, the Gulf of St. Lawrence, and the Newfoundland Grand Banks (CETAP, 1982; Whitehead, 1982; Kenney and Winn, 1986; Weinrich *et al.,* 1997). Distribution in this region has been largely correlated to prey species and abundance, although behavior and bottom topography are factors in foraging strategy (Payne *et al.,* 1986; Payne *et al.,* 1990b). Humpbacks typically return to the same feeding areas each year.

Feeding most often occurs in relatively shallow waters over the inner continental shelf and sometimes in deeper waters. Large multi-species feeding aggregations (including humpback whales) have been observed over the shelf break on the southern edge of Georges Bank (CETAP, 1982; Kenney and Winn, 1987) and in shelf break waters off the U.S. mid-Atlantic coast (Smith *et al.,* 1996).

Sperm Whale

The region of the Mississippi River Delta (Desoto Canyon) has been recognized for high densities of sperm whales and may potentially represent an important calving and nursery, or feeding area for these animals

(Townsend, 1935; Collum and Fritts, 1985; Mullin *et al.,* 1994a; Würsig *et al.,* 2000; Baumgartner *et al.,* 2001; Davis *et al.,* 2002; Mullin *et al.,* 2004; Jochens *et al.,* 2006). Sperm whales typically exhibit a strong affinity for deep waters beyond the continental shelf, though in the area of the Mississippi Delta they also occur on the outer continental shelf break.

Marine Mammal Density Estimates

A quantitative analysis of impacts on a species requires data on the abundance and distribution of the species population in the potentially impacted area. One metric for performing this type of analysis is density, which is the number of animals present per unit area. The Navy compiled existing, publically available density data for use in the quantitative acoustic impact analysis.

There is no single source of density data for every area of the world, species, and season because of the costs, resources, and effort required to provide adequate survey coverage to sufficiently estimate density. Therefore, to estimate the marine mammal densities for large areas like the AFTT Study Area, the Navy compiled data from several sources. To compile and structure the most appropriate database of marine species density data, the Navy developed a protocol to select the best available data sources based on species, area, and time (season). The resulting Geographic Information System database, called the Navy Marine Species Density Database, includes seasonal density values for every marine mammal species present within the AFTT Study Area (Navy, 2012).

The Navy Marine Species Density Database includes a compilation of the best available density data from several primary sources and published works including survey data from NMFS within the U.S. Exclusive Economic Zone.

Additional information on the density data sources and how the database was applied to the AFTT Study Area is detailed in the Navy Marine Species Density Database Technical Report (*aftteis.com/DocumentsandReferences/AFTTDocuments/SupportingTechnicalDocuments.aspx*).

Marine Mammal Hearing and Vocalizations

Cetaceans have an auditory anatomy that follows the basic mammalian pattern, with some changes to adapt to the demands of hearing underwater. The typical mammalian ear is divided into an outer ear, middle ear, and inner ear. The outer ear is separated from the inner ear by a tympanic membrane, or eardrum. In terrestrial mammals, the outer ear, eardrum, and middle ear transmit airborne sound to the inner ear, where the sound waves are propagated through the cochlear fluid. Since the impedance of water is close to that of the tissues of a cetacean, the outer ear is not required to transduce sound energy as it does when sound waves travel from air to fluid (inner ear). Sound waves traveling through the inner ear cause the basilar membrane to vibrate. Specialized cells, called hair cells, respond to the vibration and produce nerve pulses that are transmitted to the central nervous system. Acoustic energy causes the basilar membrane in the cochlea to vibrate. Sensory cells at different positions along the basilar membrane are excited by different frequencies of sound (Pickles, 1998).

Marine mammal vocalizations often extend both above and below the range of human hearing; vocalizations with frequencies lower than 20 Hz are labeled as infrasonic and those higher than 20 kHz as ultrasonic (National Research Council (NRC), 2003; Figure 4–1). Measured data on the hearing abilities of cetaceans are sparse, particularly for the larger cetaceans such as the baleen whales. The auditory thresholds of some of the smaller odontocetes have been determined in captivity. It is generally believed that cetaceans should at least be sensitive to the frequencies of their own vocalizations. Comparisons of the anatomy of cetacean inner ears and models of the structural properties and the response to vibrations of the ear's components in different species provide an indication of likely sensitivity to various sound frequencies. The ears of small toothed whales are optimized for receiving high-frequency sound, while baleen whale inner ears are best in low to infrasonic frequencies (Ketten, 1992; 1997; 1998).

Baleen whale vocalizations are composed primarily of frequencies below 1 kHz, and some contain fundamental frequencies as low as 16 Hz (Watkins *et al.,* 1987; Richardson *et al.,* 1995; Rivers, 1997; Moore *et al.,* 1998; Stafford *et al.,* 1999; Wartzok and Ketten, 1999) but can be as high as 24 kHz (humpback whale; Au *et al.,* 2006). Clark and Ellison (2004) suggested that baleen whales use low-frequency sounds not only for long-range communication, but also as a simple form of echo ranging, using echoes to navigate and orient relative to physical features of the ocean. Information on auditory function in baleen whales is extremely lacking. Sensitivity to low-frequency sound by baleen whales has been inferred from observed vocalization frequencies, observed reactions to playback of sounds, and anatomical analyses of the auditory system. Although there is apparently much variation, the source levels of most baleen whale vocalizations lie in the range of 150–190 dB re 1 µPa at 1 m. Low-frequency vocalizations made by baleen whales and their corresponding auditory anatomy suggest that they have good low-frequency hearing (Ketten, 2000), although specific data on sensitivity, frequency or intensity discrimination, or localization abilities are lacking. Marine mammals, like all mammals, have typical U-shaped audiograms that begin with relatively low sensitivity (high threshold) at some specified low frequency with increased sensitivity (low threshold) to a species specific optimum followed by a generally steep rise at higher frequencies (high threshold) (Fay, 1988).

The toothed whales produce a wide variety of sounds, which include species-specific broadband ''clicks'' with peak energy between 10 and 200 kHz, individually variable ''burst pulse'' click trains, and constant frequency or frequency-modulated (FM) whistles ranging from 4 to 16 kHz (Wartzok and Ketten, 1999). The general consensus is that the tonal vocalizations (whistles) produced by toothed whales play an important role in maintaining contact between dispersed individuals, while broadband clicks are used during echolocation (Wartzok and Ketten, 1999). Burst pulses have also been strongly implicated in communication, with some scientists suggesting that they play an important role in agonistic encounters (McCowan and Reiss, 1995), while others have proposed that they represent ''emotive'' signals in a broader sense, possibly representing graded communication signals (Herzing, 1996). Sperm whales, however, are known to produce only clicks, which are used for both communication and echolocation (Whitehead, 2003). Most of the energy of toothed whale social vocalizations is concentrated near 10 kHz, with source levels for whistles as high as 100 to 180 dB re 1 µPa at 1 m (Richardson *et al.,* 1995). No odontocete has been shown audiometrically to have acute hearing (<80 dB re 1 µPa) below 500 Hz (Southall *et al.,* 2007). Sperm whales produce clicks, which may be used to echolocate (Mullins *et al.,* 1988), with a frequency range from less than 100 Hz to 30 kHz and source levels up to 230 dB re 1 µPa 1 m or greater (Mohl *et al.,* 2000).

Brief Background on Sound

An understanding of the basic properties of underwater sound is necessary to comprehend many of the concepts and analyses presented in this document. A summary is included below.

Sound is a wave of pressure variations propagating through a medium (e.g., water). Sound measurements can be expressed in two forms: intensity and pressure. Acoustic intensity is the average rate of energy transmitted through a unit area in a specified direction and is expressed in watts per square meter (W/m^2). Acoustic intensity is rarely measured directly, but rather from ratios of pressures; the standard reference pressure for underwater sound is 1 microPascal (μPa); for airborne sound, the standard reference pressure is 20 μPa (Richardson *et al.,* 1995).

Acousticians have adopted a logarithmic scale for sound intensities, which is denoted in decibels (dB). Decibel measurements represent the ratio between a measured pressure value and a reference pressure value (in this case 1 μPa or, for airborne sound, 20 μPa.). The logarithmic nature of the scale means that each 10-dB increase is a ten-fold increase in acoustic power (and a 20-dB increase is then a 100-fold increase in power; and a 30-dB increase is a 1,000-fold increase in power). A ten-fold increase in acoustic power does not mean that the sound is perceived as being ten times louder. Humans perceive a 10-dB increase in sound level as a doubling of loudness, and a 10-dB decrease in sound level as a halving of loudness. The term ''sound pressure level'' implies a decibel measure and a reference pressure that is used as the denominator of the ratio. Throughout this document, NMFS uses 1 microPascal (denoted re: 1μPa) as a standard reference pressure unless noted otherwise.

It is important to note that decibels underwater and decibels in air are not the same and cannot be directly compared. To estimate a comparison between sound in air and underwater, because of the different densities of air and water and the different decibel standards (i.e., reference pressures) in air and water, a sound with the same intensity (i.e., power) in air and in water would be approximately 62 dB lower in air. Thus a sound that measures 160 dB (re 1μPa) underwater would have the same approximate effective level as a sound that is 98 dB (re 20 1μPa) in air.

Sound frequency is measured in cycles per second, or Hertz (abbreviated Hz), and is analogous to musical pitch; high-pitched sounds contain high frequencies and low-pitched sounds contain low frequencies. Natural sounds in the ocean span a huge range of frequencies: From earthquake noise at 5 Hz to harbor porpoise clicks at 150,000 Hz (150 kHz). These sounds are so low or so high in pitch that humans cannot even hear them; acousticians call these infrasonic (typically below 20 Hz) and ultrasonic (typically above 20,000 Hz) sounds, respectively. A single sound may be made up of many different frequencies together. Sounds made up of only a small range of frequencies are called ''narrowband,'' and sounds with a broad range of frequencies are called ''broadband''; tactical sonars are an example of a narrowband sound source and explosives are an example of a broadband sound source.

When considering the influence of various kinds of sound on the marine environment, it is necessary to understand that different kinds of marine life are sensitive to different frequencies of sound. Based on available behavioral data, audiograms derived using auditory evoked potential (AEP) techniques, anatomical modeling, and other data, Southall *et al.* (2007) designated ''functional hearing groups'' for marine mammals and estimated the lower and upper frequencies of functional hearing of the groups. Further, the frequency range in which each group's hearing is estimated as being most sensitive is represented in the flat part of the M-weighting functions (which are derived from the audiograms described above; see Figure 1 in Southall *et al.,* 2007) developed for each group. The functional groups and the associated frequencies are indicated below (though, again, animals are less sensitive to sounds at the outer edge of their functional range and most sensitive to sounds of frequencies within a smaller range somewhere in the middle of their functional hearing range):

- Low frequency cetaceans (13 species of mysticetes): functional hearing is estimated to occur between approximately 7 Hz and 30 kHz.
- Mid-frequency cetaceans (32 species of dolphins, six species of larger toothed whales, and 19 species of beaked and bottlenose whales): functional hearing is estimated to occur between approximately 150 Hz and 160 kHz.
- High frequency cetaceans (eight species of true porpoises, six species of river dolphins, *Kogia,* the franciscana, and four species of cephalorhynchids): functional hearing is estimated to occur between approximately 200 Hz and 180 kHz.
- Pinnipeds in Water: functional hearing is estimated to occur between approximately 75 Hz and 75 kHz, with the greatest sensitivity between approximately 700 Hz and 20 kHz.

The estimated hearing range for low-frequency cetaceans has been slightly extended from previous analyses (from 22 to 30 kHz). This decision is based on data from Watkins *et al.* (1986) for numerous mysticete species, Au *et al.* (2006) for humpback whales, and abstract from Frankel (2005) and a paper from Lucifredi and Stein (2007) on gray whales, and an unpublished report (Ketten and Mountain, 2009) and abstract (Tubelli *et al.,* 2012) for minke whales. As more data from additional species become available, these estimated hearing ranges may require modification.

When sound travels away (propagates) from its source, its loudness decreases as the distance traveled by the sound increases. Thus, the loudness of a sound at its source is higher than the loudness of that same sound a kilometer distant. Acousticians often refer to the loudness of a sound at its source (typically referenced to one meter from the source) as the source level and the loudness of sound elsewhere as the received level (i.e., typically the receiver). For example, a humpback whale 3 kilometers from a device that has a source level of 230 dB re 1 μPa may only be exposed to sound that is 160 dB re 1 μPa loud, depending on how the sound travels through the water (in this example, it is spherical spreading [3 dB reduction with doubling of distance]). As a result, it is important to understand the difference between source levels and received levels when discussing the loudness of sound in the ocean or its impacts on the marine environment.

As sound travels from a source, its propagation in water is influenced by various physical characteristics, including water temperature, depth, salinity, and surface and bottom properties that cause refraction, reflection, absorption, and scattering of sound waves. Oceans are not homogeneous and the contribution of each of these individual factors is extremely complex and interrelated. The physical characteristics that determine the sound's speed through the water will change with depth, season, geographic location, and with time of day (as a result, in actual sonar operations, crews will measure oceanic conditions, such as sea water temperature and depth, to calibrate models that determine the path the sonar signal will take as it travels through the ocean and how strong the sound signal will be at a given range along a particular transmission path). As sound travels through the ocean, the intensity associated with the wavefront diminishes, or attenuates. This decrease in intensity is referred to as propagation loss, also commonly called transmission loss.

Metrics Used in This Document

This section includes a brief explanation of the two sound measurements (sound pressure level (SPL) and sound exposure level (SEL)) frequently used to describe sound levels in the discussions of acoustic effects in this document.

SPL

Sound pressure is the sound force per unit area, and is usually measured in micropascals (μPa), where 1 Pa is the pressure resulting from a force of one newton exerted over an area of one square meter. SPL is expressed as the ratio of a measured sound pressure and a reference level.

SPL (in dB) = 20 log (pressure/reference pressure)

The commonly used reference pressure level in underwater acoustics is 1 μPa, and the units for SPLs are dB re: 1 μPa. SPL is an instantaneous measurement and can be expressed as the peak, the peak-to-peak, or the root mean square (rms). Root mean square, which is the square root of the arithmetic average of the squared instantaneous pressure values, is typically used in discussions of the effects of sounds on vertebrates and all references to SPL in this document refer to the root mean square. SPL does not take the duration of a sound into account. SPL is the applicable metric used in the Behavioral Response Function (BRF), which is used to estimate behavioral harassment takes.

SEL

SEL is an energy metric that integrates the squared instantaneous sound pressure over a stated time interval. The units for SEL are dB re: 1 μPa^2 s.

SEL = SPL + 10 log(duration in seconds)

As applied to sonar and other active acoustic sources, the SEL includes both the SPL of a sonar ping and the total duration. Longer duration pings and/or pings with higher SPLs will have a higher SEL. If an animal is exposed to multiple pings, the SEL in each individual ping is summed to calculate the cumulative SEL. The cumulative SEL depends on the SPL, duration, and number of pings received. The thresholds that NMFS uses to indicate at what received level the onset of temporary threshold shift (TTS) and permanent threshold shift (PTS) in hearing are likely to occur are expressed as cumulative SEL.

Potential Effects of Specified Activities on Marine Mammals

The Navy has requested authorization for the take of marine mammals that may occur incidental to training and testing activities in the AFTT Study Area. The Navy has analyzed the potential impacts on marine mammals from impulsive and non-impulsive sound sources and vessel strikes.

Other potential impacts on marine mammals from AFTT training and testing activities were analyzed in the Navy's AFTT EIS/OEIS, in consultation with NMFS as a cooperating agency, and determined to be unlikely to result in marine mammal harassment. Therefore, the Navy has not requested authorization for take of marine mammals that might occur incidental to other components of their proposed activities. In this document, NMFS analyzes the potential effects on marine mammals from exposure to non-impulsive (sonar and other active acoustic sources) and impulsive (underwater detonations, pile driving, and air guns) stressors, and vessel strikes.

For the purpose of MMPA authorizations, NMFS' effects assessments serve four primary purposes: (1) To prescribe the permissible methods of taking (i.e., Level B Harassment (behavioral harassment), Level A Harassment (injury), or mortality, including an identification of the number and types of take that could occur by harassment or mortality) and to prescribe other means of effecting the least practicable adverse impact on such species or stock and its habitat (i.e., mitigation); (2) to determine whether the specified activity would have a negligible impact on the affected species or stocks of marine mammals (based on the likelihood that the activity would adversely affect the species or stock through effects on annual rates of recruitment or survival); (3) to determine whether the specified activity would have an unmitigable adverse impact on the availability of the species or stock(s) for subsistence uses (however, there are no subsistence communities that would be affected in the AFTT Study Area, so this determination is inapplicable to the AFTT rulemaking); and (4) to prescribe requirements pertaining to monitoring and reporting.

More specifically, for activities involving non-impulsive or impulsive sources, NMFS' analysis will identify the probability of lethal responses, physical trauma, sensory impairment (permanent and temporary threshold shifts and acoustic masking), physiological responses (particular stress responses), behavioral disturbance (that rises to the level of harassment), and social responses (effects to social relationships) that would be classified as a take and whether such take will have a negligible impact on such species or stocks. Vessel strikes, which have the potential to result in incidental take from direct injury and/or mortality, will be discussed in more detail in the Estimated Take of Marine Mammals Section. In this section, we will focus qualitatively on the different ways that non-impulsive and impulsive sources may affect marine mammals (some of which NMFS does not classify as harassment). Then, in the Estimated Take of Marine Mammals Section, we will relate the potential effects on marine mammals from non-impulsive and impulsive sources to the MMPA definitions of Level A and Level B Harassment, along with the potential effects from vessel strikes, and attempt to quantify those effects.

Non-Impulsive Sources

Direct Physiological Effects

Based on the literature, there are two basic ways that non-impulsive sources might directly result in direct physiological effects: Noise-induced loss of hearing sensitivity (more commonly-called ''threshold shift'') and acoustically mediated bubble growth. Separately, an animal's behavioral reaction to an acoustic exposure might lead to physiological effects that might ultimately lead to injury or death, which is discussed later in the Stranding Section.

Threshold Shift (Noise-Induced Loss of Hearing)

When animals exhibit reduced hearing sensitivity (i.e., sounds must be received at a higher level 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 can last from minutes or hours to days (i.e., there is recovery), 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 animal's hearing sensitivity might be reduced by only 6 dB or reduced by 30 dB). PTS is permanent, but some recovery is possible. PTS can also occurs in a specific frequency range and amount as mentioned above for TTS.

The following physiological mechanisms are thought to play a role in inducing auditory TSs: Effects on sensory hair cells in the inner ear that reduce their sensitivity, modification of the chemical environment within the sensory cells, residual muscular activity in the middle ear, displacement of certain inner ear membranes, increased blood flow, and post-stimulatory reduction in both efferent and sensory neural output (Southall *et al.,* 2007). The amplitude, duration, frequency, temporal pattern, and energy distribution of sound exposure all affect the amount of associated TS and the frequency range in which it occurs. As amplitude and duration of sound exposure increase, so, generally, does the amount of TS, along with the recovery time. For continuous sounds, exposures of equal energy (the same SEL) will lead to approximately equal effects. For intermittent sounds, less TS will occur than from a continuous exposure with the same energy (some recovery will occur between intermittent exposures) (Kryter *et al.,* 1966; Ward, 1997). For example, one short but loud (higher SPL) sound exposure may induce the same impairment as one longer but softer sound, which in turn may cause more impairment than a series of several intermittent softer sounds with the same total energy (Ward, 1997). Additionally, though TTS is temporary, very prolonged exposure to sound strong enough to elicit TTS, or shorter-term exposure to sound levels well above the TTS threshold, can cause PTS, at least in terrestrial mammals (Kryter, 1985). Although in the case of sonar and other active acoustic sources, animals are not expected to be exposed to levels high enough or durations long enough to result in PTS.

PTS is considered auditory injury (Southall *et al.,* 2007). Irreparable damage to the inner or outer cochlear hair cells may cause PTS, however, other mechanisms are also involved, such as exceeding the elastic limits of certain tissues and membranes in the middle and inner ears and resultant changes in the chemical composition of the inner ear fluids (Southall *et al.,* 2007).

Although the published body of scientific literature contains numerous theoretical studies and discussion papers on hearing impairments that can occur with exposure to a loud sound, only a few studies provide empirical information on the levels at which noise-induced loss in hearing sensitivity occurs in nonhuman animals. For cetaceans, published data are limited to the captive bottlenose dolphin, beluga, harbor porpoise, and Yangtze finless porpoise (Finneran *et al.,* 2000, 2002b, 2003, 2005a, 2007, 2010a, 2010b; Finneran and Schlundt, 2010; Lucke et al, 2009; Mooney *et al.,* 2009a, 2009b; Popov *et al.,* 2011a, 2011b; Popov and Supin, 2012; Kastelein *et al.,* 2012a; Schlundt *et al.,* 2000; Nachtigall *et al.,* 2003, 2004). For pinnipeds in water, data are limited to measurement of TTS in harbor seals, one elephant seal, and California sea lions (Kastak *et al.,* 1999, 2005; Kastelien *et al.,* 2012b).

Marine mammal hearing plays a critical role in communication with conspecifics, and interpretation of environmental cues for purposes such as predator avoidance and prey capture. Depending on the degree (elevation of threshold in dB), duration (i.e., recovery time), and frequency range of TTS, and the context in which it is experienced, TTS can have effects on marine mammals ranging from discountable to serious (similar to those discussed in auditory masking, below). For example, a marine mammal may be able to readily compensate for a brief, relatively small amount of TTS in a non-critical frequency range that takes place during a time when the animal is traveling through the open ocean, where ambient noise is lower and there are not as many competing sounds present. Alternatively, a larger amount and longer duration of TTS sustained during time when communication is critical for successful mother/calf interactions could have more serious impacts. Also, depending on the degree and frequency range, the effects of PTS on an animal could range in severity, although it is considered generally more serious because it is a permanent condition. Of note, reduced hearing sensitivity as a simple function of aging has been observed in marine mammals, as well as humans and other taxa (Southall *et al.,* 2007), so we can infer that strategies exist for coping with this condition to some degree, though likely not without cost.

Acoustically Mediated Bubble Growth

A suggested indirect cause of injury to marine mammals is rectified diffusion (Crum and Mao, 1996), the process of increasing the size of a bubble by exposing it to a sound field. The process depends on many factors, including the sound pressure level and duration. Under this hypothesis, microscopic bubbles assumed to exist in the tissues of marine mammals may experience one of three things: (1) Bubbles grow to the extent that tissue hemorrhage (injury) occurs; (2) bubbles develop to the extent that an immune response is triggered or nervous system tissue is subjected to enough localized pressure that pain or dysfunction occurs (a stress response without injury); or (3) the bubbles are cleared by the lung without negative consequence to the animal. The probability of rectified diffusion, or any other indirect tissue effect, will necessarily be based on what is known about the specific process involved. Rectified diffusion is facilitated if the environment in which the ensonified bubbles exist is supersaturated with gas. Repetitive diving by marine mammals can cause the blood and some tissues to accumulate nitrogen gas to a greater degree than is supported by the surrounding environmental pressure (Ridgway and Howard, 1979). The dive patterns of some marine mammals (for example, beaked whales) are theoretically predicted to induce greater nitrogen gas supersaturation (Houser *et al.,* 2001). If rectified diffusion were possible in marine mammals exposed to a high level of sound, conditions of tissue supersaturation could theoretically speed the rate and increase the size of bubble growth. Subsequent effects due to tissue trauma and emboli would presumably mirror those observed in humans suffering from decompression sickness (e.g., nausea, disorientation, localized pain, breathing problems, etc.).

It is unlikely that the short duration of sonar or explosion sounds would last long enough to drive bubble growth to any substantial size, if such a phenomenon occurs. However, an alternative but related hypothesis is also suggested: stable microbubbles could be destabilized by high-level sound exposures so bubble growth would occur through static diffusion of gas out of the tissues. In such a scenario, the marine mammal would need to be in a gas-supersaturated state for a long enough time for bubbles to become a problematic size. Recent research with *ex vivo* supersaturated bovine tissues suggests that for a 37 kHz signal, a sound exposure of approximately 215 dB re 1 μPa would be required before microbubbles became destabilized and grew (Crum *et al.,* 2005). Assuming spherical spreading loss and a nominal sonar source level of 235 dB re 1 μPa, a whale would need to be within 33 ft. (10 m) of the sonar dome to be exposed to such sound levels. Furthermore, tissues in the study were supersaturated by exposing them to pressures of 400 to 700 kiloPascals (kPa) for periods of hours and then releasing them to ambient pressures. Assuming the equilibration of gases with the tissues occurred when the tissues were exposed to the high pressures, levels of supersaturation in the tissues could have been as high as 400 to 700 percent. These levels of tissue supersaturation are substantially higher than model predictions for marine mammals (Houser *et al.,* 2001). It is improbable that this mechanism would be responsible for stranding events or traumas associated with beaked whale strandings. Both the degree of supersaturation and exposure levels observed to cause microbubble destabilization are unlikely to occur, either alone or in concert.

There is considerable disagreement among scientists as to the likelihood of bubble formation in diving marine mammals (Evans and Miller, 2003; Piantadosi and Thalmann, 2004). Although it has been argued that traumas from recent beaked whale strandings are consistent with gas emboli and bubble-induced tissue separations (Fernández *et al.,* 2005; Jepson *et al.,* 2003), nitrogen bubble formation as the cause of the traumas has not been verified. The presence of bubbles postmortem, particularly after decompression, is not necessarily indicative of bubble pathology. Prior experimental work demonstrates that the postmortem presence of bubbles following decompression in laboratory animals can occur as a result of invasive investigative procedures (Stock *et al.,* 1980). Also, variations in diving behavior or avoidance responses can possibly result in nitrogen tissue supersaturation and nitrogen off-gassing, possibly to the point of deleterious vascular bubble formation (Jepson *et al.,* 2003). The mechanism for bubble formation would be different from rectified diffusion, but the effects would be similar. Although hypothetical, the potential process is under debate in the scientific community. The hypothesis speculates that if exposure to a startling sound elicits a rapid ascent to the surface, tissue gas saturation sufficient for the evolution of nitrogen bubbles might result (Fernández *et al.,* 2005; Jepson *et al.,* 2003). In this scenario, the rate of ascent would need to be sufficiently rapid to compromise behavioral or physiological protections against nitrogen bubble formation.

Recent modeling suggests that even unrealistically rapid rates of ascent from normal dive behaviors are unlikely to result in supersaturation to the extent that bubble formation would be expected in beaked whales (Zimmer and Tyack, 2007). Tyack *et al.* (Tyack *et al.,* 2006) suggested that emboli observed in animals exposed to mid-frequency active sonar (Fernández *et al.,* 2005; Jepson *et al.,* 2003) could stem instead from a behavioral response that involves repeated dives, shallower than the depth of lung collapse. A bottlenose dolphin was trained to repetitively dive to specific depths to elevate nitrogen saturation to the point that asymptomatic nitrogen bubble formation was predicted to occur. However, inspection of the vascular system of the dolphin via ultrasound did not demonstrate the formation of any nitrogen gas bubbles (Houser *et al.,* 2009).

More recently, modeling has suggested that the long, deep dives performed regularly by beaked whales over a lifetime could result in the saturation of long-halftime tissues (e.g. fat, bone lipid) to the point that they are supersaturated when the animals are at the surface (Hooker *et al.* 2009). Proposed adaptations for prevention of bubble formation under conditions of persistent tissue saturation have been suggested (Fahlman *et al.,* 2006; Hooker *et al.,* 2009), while the condition of supersaturation required for bubble formation has been demonstrated in bycatch animals drowned at depth and brought to the surface (Moore *et al.,* 2009). Since bubble formation is facilitated by compromised blood flow, it has been suggested that rapid stranding may lead to bubble formation in animals with supersaturated, long-halftime tissues because of the stress of stranding and the cardiovascular collapse that can accompany it (Houser *et al.,* 2009).

A fat embolic syndrome was identified by Fernández *et al.* (2005) coincident with the identification of bubble emboli in stranded beaked whales. The fat embolic syndrome was the first pathology of this type identified in marine mammals, and was thought to possibly arise from the formation of bubbles in fat bodies, which subsequently resulted in the release of fat emboli into the blood stream. Recently, Dennison *et al.* (2011) reported on investigations of dolphins stranded in 2009–2010 and, using ultrasound, identified gas bubbles in kidneys of 21 of 22 live-stranded dolphins and in the liver of two of 22. The authors postulated that stranded animals are unable to recompress by diving, and thus may retain bubbles that are otherwise re-absorbed in animals that can continue to dive. The researchers concluded that the minor bubble formation observed can be tolerated since the majority of stranded dolphins released did not re-strand. As a result, no marine mammals addressed in this analysis are given differential treatment due to the possibility for acoustically mediated bubble growth.

Acoustic Masking

Marine mammals use acoustic signals for a variety of purposes, which differ among species, but include communication between individuals, navigation, foraging, reproduction, and learning about their environment (Erbe and Farmer 2000, Tyack 2000). 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. Masking these acoustic signals can disturb the behavior of individual animals, groups of animals, or entire populations.

The extent of the masking interference depends on the spectral, temporal, and spatial relationships between the signals an animal is trying to receive and the masking noise, in addition to other factors. In humans, significant masking of tonal signals occurs as a result of exposure to noise in a narrow band of similar frequencies. As the sound level increases, though, the detection of frequencies above those of the masking stimulus decreases also. This principle is expected to apply to marine mammals as well because of common biomechanical cochlear properties across taxa.

Richardson *et al.* (1995b) argued that the maximum radius of influence of an industrial noise (including broadband low frequency sound transmission) on a marine mammal is the distance from the source to the point at which the noise can barely be heard. This range is determined by either the hearing sensitivity of the animal or the background noise level present. Industrial masking is most likely to affect some species' ability to detect communication calls and natural sounds (i.e., surf noise, prey noise, etc.; Richardson *et al.,* 1995).

The echolocation calls of toothed whales are subject to masking by high frequency sound. Human data indicate low-frequency sound can mask high-frequency sounds (i.e., upward masking). Studies on captive odontocetes by Au *et al.* (1974, 1985, 1993) indicate that some species may use various processes to reduce masking effects (e.g., adjustments in echolocation call intensity or frequency as a function of background noise conditions). There is also evidence that the directional hearing abilities of odontocetes are useful in reducing masking at the high-frequencies these cetaceans use to echolocate, but not at the low-to-moderate frequencies they use to communicate (Zaitseva *et al.,* 1980). A recent study by Nachtigall and Supin (2008) showed that false killer whales adjust their hearing to compensate for ambient sounds and the intensity of returning echolocation signals.

As mentioned previously, the functional hearing ranges of mysticetes, odontocetes, and pinnipeds underwater all encompass the frequencies of the sonar sources used in the Navy's training exercises. Additionally, almost all species, vocal repertoires span across the frequencies of these sonar sources used by the Navy. The closer the characteristics of the masking signal to the signal of interest, the more likely masking is to occur. For hull-mounted sonar, the duty cycle of the signal makes it less likely that masking will occur as a result.

Impaired Communication

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. When they vocalize, animals are aware of environmental conditions that affect the ''active space'' of their vocalizations, which is the maximum area within which their vocalizations can be detected before it drops to the level of ambient noise (Brenowitz, 2004; Brumm *et al.,* 2004; Lohr *et al.,* 2003). Animals are also aware of environment conditions that affect whether listeners can discriminate and recognize their vocalizations from other sounds, which is more important than simply detecting that a vocalization is occurring (Brenowitz, 1982; Brumm *et al.,* 2004; Dooling, 2004, Marten and Marler, 1977; Patricelli *et al.,* 2006). Most animals that vocalize have evolved with an ability to make adjustments to their vocalizations to increase the signal-to-noise ratio, active space, and recognizability/distinguishability of their vocalizations in the face of temporary changes in background noise (Brumm *et al.,* 2004; Patricelli *et al.,* 2006). Vocalizing animals can make adjustments to vocalization characteristics such as the frequency structure, amplitude, temporal structure, and temporal delivery.

Many animals will combine several of these strategies to compensate for high levels of background noise. Anthropogenic sounds that reduce the signal-to-noise ratio of animal vocalizations, increase the masked auditory thresholds of animals listening for such vocalizations, or reduce the active space of an animal's vocalizations impair communication between animals. Most animals that vocalize have evolved strategies to compensate for the effects of short-term or temporary increases in background or ambient noise on their songs or calls. Although the fitness consequences of these vocal adjustments remain unknown, like most other trade-offs animals must make, some of these strategies probably come at a cost (Patricelli *et al.,* 2006). For example, vocalizing more loudly in noisy environments may have energetic costs that decrease the net benefits of vocal adjustment and alter a bird's energy budget (Brumm, 2004; Wood and Yezerinac, 2006). Shifting songs and calls to higher frequencies may also impose energetic costs (Lambrechts, 1996).

Stress Responses

Classic stress responses begin when an animal's central nervous system perceives a potential threat to its homeostasis. That perception triggers stress responses regardless of whether a stimulus actually threatens the animal; the mere perception of a threat is sufficient to trigger a stress response (Moberg, 2000; Sapolsky *et al.,* 2005; Seyle, 1950). Once an animal's central nervous system perceives a threat, it mounts a biological response or defense that consists of a combination of the four general biological defense responses: Behavioral responses, autonomic nervous system responses, neuroendocrine responses, or immune response.

In the case of many stressors, an animal's first and most economical (in terms of biotic costs) response is behavioral avoidance of the potential stressor or avoidance of continued exposure to a stressor. An animal's second line of defense to stressors involves the sympathetic part of the autonomic nervous system and the classical ''fight or flight'' response which includes the cardiovascular system, the gastrointestinal system, the exocrine glands, and the adrenal medulla to produce changes in heart rate, blood pressure, and gastrointestinal activity that humans commonly associate with ''stress.'' These responses have a relatively short duration and may or may not have significant long-term effect on an animal's welfare.

An animal's third line of defense to stressors involves its neuroendocrine or sympathetic nervous systems; the system that has received the most study has been the hypothalmus-pituitary-adrenal system (also known as the HPA axis in mammals or the hypothalamus-pituitary-interrenal axis in fish and some reptiles). Unlike stress responses associated with the autonomic nervous system, virtually all neuro-endocrine functions that are affected by stress—including immune competence, reproduction, metabolism, and behavior—are regulated by pituitary hormones. Stress-induced changes in the secretion of pituitary hormones have been implicated in failed reproduction (Moberg, 1987; Rivier, 1995) and altered metabolism (Elasser *et al.,* 2000), reduced immune competence (Blecha, 2000) and behavioral disturbance. Increases in the circulation of glucocorticosteroids (cortisol, corticosterone, and aldosterone in marine mammals; see Romano *et al.,* 2004) have been equated with stress for many years.

The primary distinction between stress (which is adaptive and does not normally place an animal at risk) and distress is the biotic cost of the response. During a stress response, an animal uses glycogen stores that can be quickly replenished once the stress is alleviated. In such circumstances, the cost of the stress response would not pose a risk to the animal's welfare. However, 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 function, which impairs those functions that experience the diversion. For example, when mounting a stress response diverts energy away from growth in young animals, those animals may experience stunted growth. When mounting a stress response diverts energy from a fetus, an animal's reproductive success and its fitness will suffer. In these cases, the animals will have entered a pre-pathological or pathological state which is called ''distress'' (sensu Seyle 1950) or ''allostatic loading'' (sensu McEwen and Wingfield, 2003). This pathological state will last until the animal replenishes its biotic reserves sufficient to restore normal function. Note that these examples involved a long-term (days or weeks) stress response exposure to stimuli.

Relationships between these physiological mechanisms, animal behavior, and the costs of stress responses have also been documented fairly well through controlled experiment; because this physiology exists in every vertebrate that has been studied, it is not surprising that stress responses and their costs have been documented in both laboratory and free-living animals (for examples see, Holberton *et al.,* 1996; Hood *et al.,* 1998; Jessop *et al.,* 2003; Krausman *et al.,* 2004; Lankford *et al.,* 2005; Reneerkens *et al.,* 2002; Thompson and Hamer, 2000). Information has also been collected on the physiological responses of marine mammals to exposure to anthropogenic sounds (Fair and Becker, 2000; Romano *et al.,* 2002; Wright *et al.,* 2008). For example, Rolland *et al.* (2012) found that noise reduction from reduced ship traffic in the Bay of Fundy was associated with decreased stress in North Atlantic right whales. In a conceptual model developed by the Population Consequences of Acoustic Disturbance (PCAD) working group, serum hormones were identified as possible indicators of behavioral effects that translated into altered rates of reproduction and mortality. The Office of Naval Research hosted a workshop (Effects of Stress on Marine Mammals Exposed to Sound) in 2009 that focused on this very topic (ONR, 2009).

Studies of other marine animals and terrestrial animals would lead us to expect some marine mammals to experience physiological stress responses and, perhaps, physiological responses that would be classified as ''distress'' upon exposure to high frequency, mid-frequency and low-frequency sounds. For example, Jansen (1998) reported on the relationship between acoustic exposures and physiological responses that are indicative of stress responses in humans (for example, elevated respiration and increased heart rates). Jones (1998) reported on reductions in human performance when faced with acute, repetitive exposures to acoustic disturbance. Trimper *et al.* (1998) reported on the physiological stress responses of osprey to low-level aircraft noise while Krausman *et al.* (2004) reported on the auditory and physiology stress responses of endangered Sonoran pronghorn to military overflights. Smith *et al.* (2004a, 2004b) identified noise-induced physiological transient stress responses in hearing-specialist fish (i.e., goldfish) that accompanied short- and long-term hearing losses. Welch and Welch (1970) reported physiological and behavioral stress responses that accompanied damage to the inner ears of fish and several mammals.

Hearing is one of the primary senses marine mammals use to gather information about their environment and to communicate with conspecifics. Although empirical information on the relationship between sensory impairment (TTS, PTS, and acoustic masking) on marine mammals remains limited, it seems reasonable to assume that reducing an animal's ability to gather information about its environment and to communicate with other members of its species would be stressful for animals that use hearing as their primary sensory mechanism. Therefore, we assume that acoustic exposures sufficient to trigger onset PTS or TTS would be accompanied by physiological stress responses because terrestrial animals exhibit those responses under similar conditions (NRC, 2003). More importantly, marine mammals might experience stress responses at received levels lower than those necessary to trigger onset TTS. Based on empirical studies of the time required to recover from stress responses (Moberg, 2000), we also assume that stress responses are likely to persist beyond the time interval required for animals to recover from TTS and might result in pathological and pre-pathological states that would be as significant as behavioral responses to TTS.

Behavioral Disturbance

Behavioral responses to sound are highly variable and context-specific. Many different variables can influence an animal's perception of and response to (nature and magnitude) an acoustic event. An animal's prior experience with a sound or sound source effects whether it is less likely (habituation) or more likely (sensitization) to respond to certain sounds in the future (animals can also be innately pre-disposed to respond to certain sounds in certain ways) (Southall *et al.,* 2007). Related to the sound itself, the perceived nearness of the sound, bearing of the sound (approaching vs. retreating), similarity of a sound to biologically relevant sounds in the animal's environment (i.e., calls of predators, prey, or conspecifics), and familiarity of the sound may affect the way an animal responds to the sound (Southall *et al.,* 2007). Individuals (of different age, gender, reproductive status, etc.) among most populations will have variable hearing capabilities, and differing behavioral sensitivities to sounds that will be affected by prior conditioning, experience, and current activities of those individuals. Often, specific acoustic features of the sound and contextual variables (i.e., proximity, duration, or recurrence of the sound or the current behavior that the marine mammal is engaged in or its prior experience), as well as entirely separate factors such as the physical presence of a nearby vessel, may be more relevant to the animal's response than the received level alone.

Exposure of marine mammals to sound sources can result in no response or responses including, but not limited to increased alertness; orientation or attraction to a sound source; vocal modifications; cessation of feeding; cessation of social interaction; alteration of movement or diving behavior; habitat abandonment (temporary or permanent); and, in severe cases, panic, flight, stampede, or stranding, potentially resulting in death (Southall *et al.,* 2007). A review of marine mammal responses to anthropogenic sound was first conducted by Richardson and others in 1995. A review by Nowacek *et al.* (2007) addresses studies conducted since 1995 and focuses on observations where the received sound level of the exposed marine mammal(s) was known or could be estimated. The following sub-sections provide examples of behavioral responses that provide an idea of the variability in behavioral responses that would be expected given the differential sensitivities of marine mammal species to sound and the wide range of potential acoustic sources to which a marine mammal may be exposed.

Flight Response—A flight response is a dramatic change in normal movement to a directed and rapid movement away from the perceived location of a sound source. Relatively little information on flight responses of marine mammals to anthropogenic signals exist, although observations of flight responses to the presence of predators have occurred (Connor and Heithaus, 1996). Flight responses have been speculated as being a component of marine mammal strandings associated with sonar activities (Evans and England, 2001).

Response to Predator—Evidence suggests that at least some marine mammals have the ability to acoustically identify potential predators. For example, harbor seals that reside in the coastal waters off British Columbia are frequently targeted by certain groups of killer whales, but not others. The seals discriminate between the calls of threatening and non-threatening killer whales (Deecke *et al.,* 2002), a capability that should increase survivorship while reducing the energy required for attending to and responding to all killer whale calls. The occurrence of masking or hearing impairment provides a means by which marine mammals may be prevented from responding to the acoustic cues produced by their predators. Whether or not this is a possibility depends on the duration of the masking/hearing impairment and the likelihood of encountering a predator during the time that predator cues are impeded.

Diving—Changes in dive behavior can vary widely. They may consist of increased or decreased dive times and surface intervals as well as changes in the rates of ascent and descent during a dive. Variations in dive behavior may reflect interruptions in biologically significant activities (e.g., foraging) or they may be of little biological significance. Variations in dive behavior may also expose an animal to potentially harmful conditions (e.g., increasing the chance of ship-strike) or may serve as an avoidance response that enhances survivorship. The impact of a variation in diving resulting from an acoustic exposure depends on what the animal is doing at the time of the exposure and the type and magnitude of the response.

Nowacek *et al.* (2004) reported disruptions of dive behaviors in foraging North Atlantic right whales when exposed to an alerting stimulus, an action, they noted, that could lead to an increased likelihood of ship strike. However, the whales did not respond to playbacks of either right whale social sounds or vessel noise, highlighting the importance of the sound characteristics in producing a behavioral reaction. Conversely, Indo-Pacific humpback dolphins have been observed to dive for longer periods of time in areas where vessels were present and/or approaching (Ng and Leung, 2003). In both of these studies, the influence of the sound exposure cannot be decoupled from the physical presence of a surface vessel, thus complicating intepretations of the relative contribution of each stimulus to the response. Indeed, the presence of surface vessels, their approach and speed of approach, seemed to be significant factors in the response of the Indo-Pacific humpback dolphins (Ng and Leung, 2003). Low frequency signals of the Acoustic Thermometry of Ocean Climate (ATOC) sound source were not found to affect dive times of humpback whales in Hawaiian waters (Frankel and Clark, 2000) or to overtly affect elephant seal dives (Costa *et al.,* 2003). They did, however, produce subtle effects that varied in direction and degree among the individual seals, illustrating the equivocal nature of behavioral effects and consequent difficulty in defining and predicting them.

Due to past incidents of beaked whale strandings associated with sonar operations, feedback paths are provided between avoidance and diving and indirect tissue effects. This feedback accounts for the hypothesis that variations in diving behavior and/or avoidance responses can possibly result in nitrogen tissue supersaturation and nitrogen off-gassing, possibly to the point of deleterious vascular bubble formation (Jepson *et al.,* 2003). Although hypothetical, discussions surrounding this potential process are controversial.

Foraging—Disruption of feeding behavior can be difficult to correlate with anthropogenic sound exposure, so it is usually inferred by observed displacement from known foraging areas, the appearance of secondary indicators (e.g., bubble nets or sediment plumes), or changes in dive behavior. Noise from seismic surveys was not found to impact the feeding behavior in western grey whales off the coast of Russia (Yazvenko *et al.,* 2007) and sperm whales engaged in foraging dives did not abandon dives when exposed to distant signatures of seismic airguns (Madsen *et al.,* 2006). Balaenopterid whales exposed to moderate low-frequency signals similar to the ATOC sound source demonstrated no variation in foraging activity (Croll *et al.,* 2001), whereas five out of six North Atlantic right whales exposed to an acoustic alarm interrupted their foraging dives (Nowacek *et al.,* 2004). Although the received sound pressure level at the animals was similar in the latter two studies, the frequency, duration, and temporal pattern of signal presentation were different. These factors, as well as differences in species sensitivity, are likely contributing factors to the differential response. A determination of whether foraging disruptions incur fitness consequences will require information on or estimates of the energetic requirements of the individuals and the relationship between prey availability, foraging effort and success, and the life history stage of the animal.

Breathing—Variations in respiration naturally vary with different behaviors and variations in respiration rate as a function of acoustic exposure can be expected to co-occur with other behavioral reactions, such as a flight response or an alteration in diving. However, respiration rates in and of themselves may be representative of annoyance or an acute stress response. Mean exhalation rates of gray whales at rest and while diving were found to be unaffected by seismic surveys conducted adjacent to the whale feeding grounds (Gailey *et al.,* 2007). Studies with captive harbor porpoises showed increased respiration rates upon introduction of acoustic alarms (Kastelein *et al.,* 2001; Kastelein *et al.,* 2006a) and emissions for underwater data transmission (Kastelein *et al.,* 2005). However, exposure of the same acoustic alarm to a striped dolphin under the same conditions did not elicit a response (Kastelein *et al.,* 2006a), again highlighting the importance in understanding species differences in the tolerance of underwater noise when determining the potential for impacts resulting from anthropogenic sound exposure.

Social relationships—Social interactions between mammals can be affected by noise via the disruption of communication signals or by the displacement of individuals. Disruption of social relationships therefore depends on the disruption of other behaviors (e.g., caused avoidance, masking, etc.) and no specific overview is provided here. However, social disruptions must be considered in context of the relationships that are affected. Long-term disruptions of mother/calf pairs or mating displays have the potential to affect the growth and survival or reproductive effort/success of individuals, respectively.

Vocalizations (also see Masking Section)—Vocal changes in response to anthropogenic noise can occur across the repertoire of sound production modes used by marine mammals, such as whistling, echolocation click production, calling, and singing. Changes may result in response to a need to compete with an increase in background noise or may reflect an increased vigilance or startle response. For example, in the presence of low-frequency active sonar, humpback whales have been observed to increase the length of their ''songs'' (Miller *et al.,* 2000; Fristrup *et al.,* 2003), possibly due to the overlap in frequencies between the whale song and the low-frequency active sonar. A similar compensatory effect for the presence of low frequency vessel noise has been suggested for right whales; right whales have been observed to shift the frequency content of their calls upward while reducing the rate of calling in areas of increased anthropogenic noise (Parks *et al.,* 2007). Killer whales off the northwestern coast of the United States have been observed to increase the duration of primary calls once a threshold in observing vessel density (e.g., whale watching) was reached, which has been suggested as a response to increased masking noise produced by the vessels (Foote *et al.,* 2004). In contrast, both sperm and pilot whales potentially ceased sound production during the Heard Island feasibility test (Bowles *et al.,* 1994), although it cannot be absolutely determined whether the inability to acoustically detect the animals was due to the cessation of sound production or the displacement of animals from the area.

Avoidance—Avoidance is the displacement of an individual from an area as a result of the presence of a sound. Richardson *et al.,* (1995) noted that avoidance reactions are the most obvious manifestations of disturbance in marine mammals. It is qualitatively different from the flight response, but also differs in the magnitude of the response (i.e., directed movement, rate of travel, etc.). Oftentimes avoidance is temporary, and animals return to the area once the noise has ceased. Longer term displacement is possible, however, which can lead to changes in abundance or distribution patterns of the species in the affected region if they do not become acclimated to the presence of the sound (Blackwell *et al.,* 2004; Bejder *et al.,* 2006; Teilmann *et al.,* 2006). Acute avoidance responses have been observed in captive porpoises and pinnipeds exposed to a number of different sound sources (Kastelein *et al.,* 2001; Finneran *et al.,* 2003; Kastelein *et al.,* 2006a; Kastelein *et al.,* 2006b). Short term avoidance of seismic surveys, low frequency emissions, and acoustic deterrants has also been noted in wild populations of odontocetes (Bowles *et al.,* 1994; Goold, 1996; 1998; Stone *et al.,* 2000; Morton and Symonds, 2002) and to some extent in mysticetes (Gailey *et al.,* 2007), while longer term or repetitive/chronic displacement for some dolphin groups and for manatees has been suggested to be due to the presence of chronic vessel noise (Haviland-Howell *et al.,* 2007; Miksis-Olds *et al.,* 2007).

Maybaum (1993) conducted sound playback experiments to assess the effects of MFAS on humpback whales in Hawaiian waters. Specifically, she exposed focal pods to sounds of a 3.3-kHz sonar pulse, a sonar frequency sweep from 3.1 to 3.6 kHz, and a control (blank) tape while monitoring behavior, movement, and underwater vocalizations. The two types of sonar signals (which both contained mid- and low-frequency components) differed in their effects on the humpback whales, but both resulted in avoidance behavior. The whales responded to the pulse by increasing their distance from the sound source and responded to the frequency sweep by increasing their swimming speeds and track linearity. In the Caribbean, sperm whales avoided exposure to mid-frequency submarine sonar pulses, in the range of 1000 Hz to 10,000 Hz (IWC 2005).

Kvadsheim *et al.,* (2007) conducted a controlled exposure experiment in which killer whales fitted with D-tags were exposed to mid-frequency active sonar (Source A: a 1.0 second upsweep 209 dB @ 1–2 kHz every 10 seconds for 10 minutes; Source B: with a 1.0 second upsweep 197 dB @ 6–7 kHz every 10 seconds for 10 minutes). When exposed to Source A, a tagged whale and the group it was traveling with did not appear to avoid the source. When exposed to Source B, the tagged whales along with other whales that had been carousel feeding, ceased feeding during the approach of the sonar and moved rapidly away from the source. When exposed to Source B, Kvadsheim and his co-workers reported that a tagged killer whale seemed to try to avoid further exposure to the sound field by the following behaviors: Immediately swimming away (horizontally) from the source of the sound; engaging in a series of erratic and frequently deep dives that seemed to take it below the sound field; or swimming away while engaged in a series of erratic and frequently deep dives. Although the sample sizes in this study are too small to support statistical analysis, the behavioral responses of the orcas were consistent with the results of other studies.

In 2007, the first in a series of behavioral response studies conducted by NMFS and other scientists showed one beaked whale (*Mesoplodon densirostris*) responding to an MFAS playback. The BRS–07 cruise report indicates that the playback began when the tagged beaked whale was vocalizing at depth (at the deepest part of a typical feeding dive), following a previous control 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) received level 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 results are from a single experiment and that a greater sample size is needed before robust and definitive conclusions can be drawn.

Studies on the Atlantic Undersea Test and Evaluation Center instrumented range in the Bahamas have shown that some Blainville's beaked whales may be resident during all or part of the year in the area, and that individuals may move off of the range for several days during and following a sonar event. However, animals are thought to continue feeding at short distances (a few kilometers) from the range out of the louder sound fields (less than 157 dB re 1 μPa) (McCarthy *et al.,* 2011; Tyack *et al.,* 2011). With these studies, there are now statistically strong data suggesting that beaked whales tend to avoid both actual naval mid-frequency sonar in real anti-submarine training scenarios as well as sonar-like signals and other signals used during controlled sound exposure studies in the same area.

Results from a 2007–2008 study conducted near the Bahamas showed a change in diving behavior of an adult Blainville's beaked whale to playback of mid-frequency source and predator sounds (Boyd *et al.,* 2008; Tyack *et al.,* 2011). Reaction to mid-frequency sounds included premature cessation of clicking and termination of a foraging dive, and a slower ascent rate to the surface. Preliminary results from a similar behavioral response study in southern California waters have been presented for the 2010–2011 field season (Southall *et al.* 2011). Cuvier's beaked whale responses suggested particular sensitivity to sound exposure as consistent with results for Blainville's beaked whale. Similarly, beaked whales exposed to sonar during British training exercises stopped foraging (DSTL 2007), and preliminary results of controlled playback of sonar may indicate feeding/foraging disruption of killer whales and sperm whales (Miller *et al.* 2011).

Orientation—A shift in an animal's resting state or an attentional change via an orienting response represent behaviors that would be considered mild disruptions if occurring alone. As previously mentioned, the responses may co-occur with other behaviors; for instance, an animal may initially orient toward a sound source, and then move away from it. Thus, any orienting response should be considered in context of other reactions that may occur.

There are few empirical studies of avoidance responses of free-living cetaceans to mid-frequency sonars. Much more information is available on the avoidance responses of free-living cetaceans to other acoustic sources, such as seismic airguns and low frequency tactical sonar, than mid-frequency active sonar.

Behavioral Responses (Southall et al. (2007))

Southall *et al.,* (2007) reports the results of the efforts of a panel of experts in acoustic research from behavioral, physiological, and physical disciplines that convened and reviewed the available literature on marine mammal hearing and physiological and behavioral responses to human-made sound with the goal of proposing exposure criteria for certain effects. This peer-reviewed compilation of literature is very valuable, though Southall *et al.*

(2007) note that not all data are equal, some have poor statistical power, insufficient controls, and/or limited information on received levels, background noise, and other potentially important contextual variables—such data were reviewed and sometimes used for qualitative illustration but were not included in the quantitative analysis for the criteria recommendations. All of the studies considered, however, contain an estimate of the received sound level when the animal exhibited the indicated response.

In the Southall *et al.,* (2007) publication, for the purposes of analyzing responses of marine mammals to anthropogenic sound and developing critieria, the authors differentiate between single pulse sounds, multiple pulse sounds, and non-pulse sounds. Sonar and other active acoustic sources are considered a non-pulse sound. Southall *et al.,* (2007) summarize the studies associated with low-frequency, mid-frequency, and high-frequency cetacean and pinniped responses to non-pulse sounds, based strictly on received level, in Appendix C of their article (incorporated by reference and summarized in the three paragraphs below).

The studies that address responses of low frequency cetaceans to non-pulse sounds include data gathered in the field and related to several types of sound sources (of varying similarity to sonar and other active acoustic sources) including: vessel noise, drilling and machinery playback, low-frequency M-sequences (sine wave with multiple phase reversals) playback, tactical low-frequency active sonar playback, drill ships, Acoustic Thermometry of Ocean Climate (ATOC) source, and non-pulse playbacks. These studies generally indicate no (or very limited) responses to received levels in the 90 to 120 dB re: 1 μPa range and an increasing likelihood of avoidance and other behavioral effects in the 120 to 160 dB range. As mentioned earlier, though, contextual variables play a very important role in the reported responses and the severity of effects are not linear when compared to received level. Also, few of the laboratory or field datasets had common conditions, behavioral contexts or sound sources, so it is not surprising that responses differ.

The studies that address responses of mid-frequency cetaceans to non-pulse sounds include data gathered both in the field and the laboratory and related to several different sound sources (of varying similarity to sonar and other active acoustic sources) including: pingers, drilling playbacks, ship and ice-breaking noise, vessel noise, Acoustic Harassment Devices (AHDs), Acoustic Deterrent Devices (ADDs), MFAS, and non-pulse bands and tones. Southall *et al.* (2007) were unable to come to a clear conclusion regarding the results of these studies. In some cases, animals in the field showed significant responses to received levels between 90 and 120 dB, while in other cases these responses were not seen in the 120 to 150 dB range. The disparity in results was likely due to contextual variation and the differences between the results in the field and laboratory data (animals typically responded at lower levels in the field).

The studies that address responses of high frequency cetaceans to non-pulse sounds include data gathered both in the field and the laboratory and related to several different sound sources (of varying similarity to sonar and other active acoustic sources) including: pingers, AHDs, and various laboratory non-pulse sounds. All of these data were collected from harbor porpoises. Southall *et al.* (2007) concluded that the existing data indicate that harbor porpoises are likely sensitive to a wide range of anthropogenic sounds at low received levels (~90–120 dB), at least for initial exposures. All recorded exposures above 140 dB induced profound and sustained avoidance behavior in wild harbor porpoises (Southall *et al.,* 2007). Rapid habituation was noted in some but not all studies. There is no data to indicate whether other high frequency cetaceans are as sensitive to anthropogenic sound as harbor porpoises are.

The studies that address the responses of pinnipeds in water to non-pulse sounds include data gathered both in the field and the laboratory and related to several different sound sources (of varying similarity to sonar and other active acoustic sources) including: AHDs, ATOC, various non-pulse sounds used in underwater data communication; underwater drilling, and construction noise. Few studies exist with enough information to include them in the analysis. The limited data suggested that exposures to non-pulse sounds between 90 and 140 dB generally do not result in strong behavioral responses in pinnipeds in water, but no data exist at higher received levels.

In addition to summarizing the available data, the authors of Southall *et al.* (2007) developed a severity scaling system with the intent of ultimately being able to assign some level of biological significance to a response. Following is a summary of their scoring system, a comprehensive list of the behaviors associated with each score may be found in the report:

- 0–3 (Minor and/or brief behaviors) includes, but is not limited to: no response; minor changes in speed or locomotion (but with no avoidance); individual alert behavior; minor cessation in vocal behavior; minor changes in response to trained behaviors (in laboratory).
- 4–6 (Behaviors with higher potential to affect foraging, reproduction, or survival) includes, but is not limited to: moderate changes in speed, direction, or dive profile; brief shift in group distribution; prolonged cessation or modification of vocal behavior (duration > duration of sound), minor or moderate individual and/or group avoidance of sound; brief cessation of reproductive behavior; or refusal to initiate trained tasks (in laboratory).
- 7–9 (Behaviors considered likely to affect the aforementioned vital rates) includes, but is not limited to: extensive of prolonged aggressive behavior; moderate, prolonged or significant separation of females and dependent offspring with disruption of acoustic reunion mechanisms; long-term avoidance of an area; outright panic, stampede, stranding; threatening or attacking sound source (in laboratory).

Potential Effects of Behavioral Disturbance

The different ways that marine mammals respond to sound are sometimes indicators of the ultimate effect that exposure to a given stimulus will have on the well-being (survival, reproduction, etc.) of an animal. There is little marine mammal data quantitatively relating the exposure of marine mammals to sound to effects on reproduction or survival, though data exists for terrestrial species to which we can draw comparisons for marine mammals.

Attention is the cognitive process of selectively concentrating on one aspect of an animal's environment while ignoring other things (Posner, 1994). Because animals (including humans) have limited cognitive resources, there is a limit to how much sensory information they can process at any time. The phenomenon called ''attentional capture'' occurs when a stimulus (usually a stimulus that an animal is not concentrating on or attending to) ''captures'' an animal's attention. This shift in attention can occur consciously or unconsciously (for example, when an animal hears sounds that it associates with the approach of a predator) and the shift in attention can be sudden (Dukas, 2002; van Rij, 2007).

Once a stimulus has captured an animal's attention, the animal can respond by ignoring the stimulus, assuming a ''watch and wait'' posture, or treat the stimulus as a disturbance and respond accordingly, which includes scanning for the source of the stimulus or ''vigilance'' (Cowlishaw *et al.,* 2004).

Vigilance is normally an adaptive behavior that helps animals determine the presence or absence of predators, assess their distance from conspecifics, or to attend cues from prey (Bednekoff and Lima, 1998; Treves, 2000). Despite those benefits, however, vigilance has a cost of time: when animals focus their attention on specific environmental cues, they are not attending to other activities such as foraging. These costs have been documented best in foraging animals, where vigilance has been shown to substantially reduce feeding rates (Saino, 1994; Beauchamp and Livoreil, 1997; Fritz *et al.,* 2002).

Animals will spend more time being vigilant, which may translate to less time foraging or resting, when disturbance stimuli approach them more directly, remain at closer distances, have a greater group size (for example, multiple surface vessels), or when they co-occur with times that an animal perceives increased risk (for example, when they are giving birth or accompanied by a calf). Most of the published literature, however, suggests that direct approaches will increase the amount of time animals will dedicate to being vigilant. For example, bighorn sheep and Dall's sheep dedicated more time being vigilant, and less time resting or foraging, when aircraft made direct approaches over them (Frid, 2001; Stockwell *et al.,* 1991).

Several authors have established that long-term and intense disturbance stimuli can cause population declines by reducing the body condition of individuals that have been disturbed, followed by reduced reproductive success, reduced survival, or both (Daan *et al.,* 1996; Madsen, 1994; White, 1983). For example, Madsen (1994) reported that pink-footed geese in undisturbed habitat gained body mass and had about a 46-percent reproductive success rate compared with geese in disturbed habitat (being consistently scared off the fields on which they were foraging) which did not gain mass and had a 17 percent reproductive success rate. Similar reductions in reproductive success have been reported for mule deer (Odocoileus hemionus) disturbed by all-terrain vehicles (Yarmoloy *et al.,* 1988), caribou disturbed by seismic exploration blasts (Bradshaw *et al.,* 1998), caribou disturbed by low-elevation jet fights (Luick *et al.,* 1996; Harrington and Veitch, 1992. Similarly, a study of elk that were disturbed experimentally by pedestrians concluded that the ratio of young to mothers was inversely related to disturbance rate (Phillips and Alldredge, 2000).

The primary mechanism by which increased vigilance and disturbance appear to affect the fitness of individual animals is by disrupting an animal's time budget and, as a result, reducing the time they might spend foraging and resting (which increases an animal's activity rate and energy demand). For example, a study of grizzly bears reported that bears disturbed by hikers reduced their energy intake by an average of 12 kcal/minute (50.2×10^3kJ/minute), and spent energy fleeing or acting aggressively toward hikers (White *et al.* 1999). Alternately, Ridgway *et al.* (2006) reported that increased vigilance in bottlenose dolphins exposed to sound over a 5-day period did not cause any sleep deprivation or stress effects such as changes in cortisol or epinephrine levels.

On a related note, many animals perform vital functions, such as feeding, resting, traveling, and socializing, on a diel cycle (24-hour cycle). Substantive behavioral reactions to noise exposure (such as disruption of critical life functions, displacement, or avoidance of important habitat) are more likely to be significant if they last more than one diel cycle or recur on subsequent days (Southall *et al.,* 2007). Consequently, a behavioral response lasting less than one day and not recurring on subsequent days is not considered particularly severe unless it could directly affect reproduction or survival (Southall *et al.,* 2007).

In response to the National Research Council of the National Academies (2005) review, the Office of Naval Research founded a working group to formalize the Population Consequences of Acoustic Disturbance (PCAD) framework. The PCAD model connects observable data through a series of transfer functions using a case study approach. The long-term goal is to improve the understanding of how effects of sound on marine mammals transfer between behavior and life functions and between life functions and vital rates of individuals. Then, this understanding of how disturbance can affect the vital rates of individuals will facilitate the further assessment of the population level effects of anthropogenic sound on marine mammals by providing a quantitative approach to evaluate effects and the relationship between takes and possible changes to adult survival and/or annual recruitment.

Stranding and Mortality

When a live or dead marine mammal swims or floats onto shore and becomes ''beached'' or incapable of returning to sea, the event is termed a ''stranding'' (Geraci *et al.,* 1999; Perrin and Geraci, 2002; Geraci and Lounsbury, 2005; NMFS, 2007). The legal definition for a stranding within the United States is that (A) ''a marine mammal is dead and is (i) on a 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 is 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 need of apparent medical attention; or (iii) in the waters under the jurisdiction of the United States (including any navigable waters), but is unable to return to its natural habitat under its own power or without assistance.'' (16 U.S.C. 1421h).

Marine mammals are known to strand for a variety of reasons, such as 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. However, the cause or causes of most stranding are unknown (Geraci *et al.,* 1976; Eaton, 1979, Odell *et al.,* 1980; Best, 1982). Numerous studies suggest that the physiology, behavior, habitat relationships, age, or condition of cetaceans may cause them to strand or might pre-dispose them to strand when exposed to another phenomenon. These suggestions are consistent with the conclusions of numerous other studies that have demonstrated that combinations of dissimilar stressors commonly combine to kill an animal or dramatically reduce its fitness, even though one exposure without the other does not produce the same result (Chroussos, 2000; Creel, 2005; DeVries *et al.,* 2003; Fair and Becker, 2000; Foley *et al.,* 2001; Moberg, 2000; Relyea, 2005a; 2005b, Romero, 2004; Sih *et al.,* 2004). For reference, between 2001–2009, there was an annual average of approximately 1,400 cetacean strandings and 4,300 pinniped strandings along the coasts of the continental United States and Alaska (NMFS, 2011).

Several sources have published lists of mass stranding events of cetaceans during attempts to identify relationships between those stranding events and military sonar (Hildebrand, 2004; IWC, 2005; Taylor *et al.,* 2004). For example, based on a review of stranding records between 1960 and 1995, the International Whaling Commission (2005) identified ten mass stranding events of Cuvier's beaked whales had been reported and one mass stranding of four Baird's beaked whale. The IWC concluded that, out of eight stranding events reported from the mid-1980s to the summer of 2003, seven had been coincident with the use of tactical mid-frequency sonar, one of those seven had been associated with the use of tactical low-frequency sonar, and the remaining stranding event had been associated with the use of seismic airguns.

Most of the stranding events reviewed by the International Whaling Commission involved beaked whales. A mass stranding of Cuvier's beaked whales in the eastern Mediterranean Sea occurred in 1996 (Franzis, 1998) and mass stranding events involving Gervais' beaked whales, Blainville's beaked whales, and Cuvier's beaked whales occurred off the coast of the Canary Islands in the late 1980s (Simmonds and Lopez-Jurado, 1991). The stranding events that occurred in the Canary Islands and Kyparissiakos Gulf in the late 1990s and the Bahamas in 2000 have been the most intensively-studied mass stranding events and have been associated with naval maneuvers involving the use of tactical sonar.

Between 1960 and 2006, 48 strandings (68 percent) involved beaked whales, 3 (4 percent) involved dolphins, and 14 (20 percent) involved whale species. Cuvier's beaked whales were involved in the greatest number of these events (48 or 68 percent), followed by sperm whales (7 or 10 percent), and Blainville's and Gervais' beaked whales (4 each or 6 percent). Naval activities (not just activities conducted by the U.S. Navy) that might have involved active sonar are reported to have coincided with 9 (13 percent) or 10 (14 percent) of those stranding events. Between the mid-1980s and 2003 (the period reported by the International Whaling Commission), we identified reports of 44 mass cetacean stranding events of which at least seven were coincident with naval exercises that were using mid-frequency sonar.

Strandings Associated With Impulse Sound

During a Navy training event on March 4, 2011 at the Silver Strand Training Complex in San Diego, California, three or possibly four dolphins were killed in an explosion. During an underwater detonation training event, a pod of 100 to 150 long-beaked common dolphins were observed moving towards the 700-yd (640.1–m) exclusion zone around the explosive charge, monitored by personnel in a safety boat and participants in a dive boat. Approximately 5 minutes remained on a time-delay fuse connected to a single 8.76 lb. (3.97 kg) explosive charge (C–4 and detonation cord). Although the dive boat was placed between the pod and the explosive in an effort to guide the dolphins away from the area, that effort was unsuccessful and three long-beaked common dolphins near the explosion died. In addition to the three dolphins found dead on March 4, the remains of a fourth dolphin were discovered on March 7, 2011 near Ocean Beach, California (3 days later and approximately 11.8 mi. [19 km] from Silver Strand where the training event occurred), which might also have been related to this event. Association of the fourth stranding with the training event is uncertain because dolphins strand on a regular basis in the San Diego area. Details such as the dolphins' depth and distance from the explosive at the time of the detonation could not be estimated from the 250 yd (228.6 m) standoff point of the observers in the dive boat or the safety boat.

These dolphin mortalities are the only known occurrence of a U.S. Navy training or testing event involving impulse energy (underwater detonation) that caused mortality or injury to a marine mammal. Despite this being a rare occurrence, the Navy has reviewed training requirements, safety procedures, and possible mitigation measures and implemented changes to reduce the potential for this to occur in the future. Discussions of procedures associated with these and other training and testing events are presented in the Mitigation section.

Strandings Associated With MFAS

Over the past 16 years, there have been five stranding events coincident with military mid-frequency sonar use in which exposure to sonar is believed to have been a contributing factor: Greece (1996); the Bahamas (2000); Madeira (2000); Canary Islands (2002); and Spain (2006). Additionally, during the 2004 Rim of the Pacific (RIMPAC) exercises, between 150 and 200 usually pelagic melon-headed whales occupied the shallow waters of Hanalei Bay, Kaua'i, Hawaii for over 28 hours. NMFS determined that MFAS was a plausible, if not likely, contributing factor in what may have been a confluence of events that led to the stranding. A number of other stranding events coincident with the operation of mid-frequency sonar including the death of beaked whales or other species (minke whales, dwarf sperm whales, pilot whales) have been reported; however, the majority have not been investigated to the degree necessary to determine the cause of the stranding and only one of these stranding events, the Bahamas (2000), was associated with exercises conducted by the U.S. Navy.

Greece (1996)

Twelve Cuvier's beaked whales stranded atypically (in both time and space) along a 38.2-kilometer strand of the coast of the Kyparissiakos Gulf on May 12 and 13, 1996 (Frantzis, 1998). From May 11 through May 15, the NATO research vessel *Alliance* was conducting sonar tests with signals of 600 Hz and 3 kHz and source levels of 228 and 226 dB re: 1μPa, respectively (D'Amico and Verboom, 1998; D'Spain *et al.,* 2006). The timing and the location of the testing encompassed the time and location of the whale strandings (Frantzis, 1998).

Necropsies of eight of the animals were performed but were limited to basic external examination and sampling of stomach contents, blood, and skin. No ears or organs were collected, and no histological samples were preserved. No apparent abnormalities or wounds were found (Frantzis, 2004). Examination of photos of the animals, taken soon after their death, revealed that the eyes of at least four of the individuals were bleeding. Photos were taken soon after their death (Frantzis, 2004). Stomach contents contained the flesh of cephalopods, indicating that feeding had recently taken place (Frantzis, 1998).

All available information regarding the conditions associated with this stranding event were compiled, and many potential causes were examined including major pollution events, prominent tectonic activity, unusual physical or meteorological events, magnetic anomalies, epizootics, and conventional military activities (International Council for the Exploration of the Sea, 2005a). However, none of these potential causes coincided in time or space with the mass stranding, or could explain its characteristics (International Council for the Exploration of the Sea, 2005a). The robust condition of the animals, plus the recent stomach contents, is inconsistent with pathogenic causes (Frantzis, 2004). In addition, environmental causes can be ruled out as there were no unusual environmental circumstances or events before or during this time period and within the general proximity (Frantzis, 2004).

Because of the rarity of this mass stranding of Cuvier's beaked whales in the Kyparissiakos Gulf (first one in history), the probability for the two events (the military exercises and the strandings) to coincide in time and location, while being independent of each other, was extremely low (Frantzis, 1998). However, because full necropsies had not been conducted, and no abnormalities were noted, the cause of the strandings could not be precisely determined (Cox *et al.,* 2006). A Bioacoustics Panel convened by NATO concluded that the evidence available did not allow them to accept or reject sonar exposures as a causal agent in these stranding events. The analysis of this stranding event provided support for, but no clear evidence for, the cause-and-effect relationship of tactical sonar training activities and beaked whale strandings (Cox *et al.,* 2006).

Bahamas (2000)

NMFS and the Navy prepared a joint report addressing the multi-species stranding in the Bahamas in 2000, which took place within 24 hours of U.S. Navy ships using MFAS as they passed through the Northeast and Northwest Providence Channels on March 15–16, 2000. The ships, which operated both AN/SQS–53C and AN/SQS–56, moved through the channel while emitting sonar pings approximately every 24 seconds. Of the 17 cetaceans that stranded over a 36-hr period (Cuvier's beaked whales, Blainville's beaked whales, Minke whales, and a spotted dolphin), seven animals died on the beach (5 Cuvier's beaked whales, 1 Blainville's beaked whale, and the spotted dolphin), while the other 10 were returned to the water alive (though their ultimate fate is unknown). As discussed in the Bahamas report (DOC/DON, 2001), there is no likely association between the minke whale and spotted dolphin strandings and the operation of MFAS.

Necropsies were performed on five of the stranded beaked whales. All five necropsied beaked whales were in good body condition, showing no signs of infection, disease, ship strike, blunt trauma, or fishery related injuries, and three still had food remains in their stomachs. Auditory structural damage was discovered in four of the whales, specifically bloody effusions or hemorrhaging around the ears. Bilateral intracochlear and unilateral temporal region subarachnoid hemorrhage, with blood clots in the lateral ventricles, were found in two of the whales. Three of the whales had small hemorrhages in their acoustic fats (located along the jaw and in the melon).

A comprehensive investigation was conducted and all possible causes of the stranding event were considered, whether they seemed likely at the outset or not. Based on the way in which the strandings coincided with ongoing naval activity involving tactical MFAS use, in terms of both time and geography, the nature of the physiological effects experienced by the dead animals, and the absence of any other acoustic sources, the investigation team concluded that MFAS aboard U.S. Navy ships that were in use during the sonar exercise in question were the most plausible source of this acoustic or impulse trauma to beaked whales. This sound source was active in a complex environment that included the presence of a surface duct, unusual and steep bathymetry, a constricted channel with limited egress, intensive use of multiple, active sonar units over an extended period of time, and the presence of beaked whales that appear to be sensitive to the frequencies produced by these sonars. The investigation team concluded that the cause of this stranding event was the confluence of the Navy MFAS and these contributory factors working together, and further recommended that the Navy avoid operating MFAS in situations where these five factors would be likely to occur. This report does not conclude that all five of these factors must be present for a stranding to occur, nor that beaked whales are the only species that could potentially be affected by the confluence of the other factors. Based on this, NMFS believes that the operation of MFAS in situations where surface ducts exist, or in marine environments defined by steep bathymetry and/or constricted channels may increase the likelihood of producing a sound field with the potential to cause cetaceans (especially beaked whales) to strand, and therefore, suggests the need for increased vigilance while operating MFAS in these areas, especially when beaked whales (or potentially other deep divers) are likely present.

Madeira, Spain (2000)

From May 10–14, 2000, three Cuvier's beaked whales were found atypically stranded on two islands in the Madeira archipelago, Portugal (Cox *et al.,* 2006). A fourth animal was reported floating in the Madeiran waters by fisherman but did not come ashore (Woods Hole Oceanographic Institution, 2005). Joint NATO amphibious training peacekeeping exercises involving participants from 17 countries 80 warships, took place in Portugal during May 2–15, 2000.

The bodies of the three stranded whales were examined post mortem (Woods Hole Oceanographic Institution, 2005), though only one of the stranded whales was fresh enough (24 hours after stranding) to be necropsied (Cox *et al.,* 2006). Results from the necropsy revealed evidence of hemorrhage and congestion in the right lung and both kidneys (Cox *et al.,* 2006). There was also evidence of intercochlear and intracranial hemorrhage similar to that which was observed in the whales that stranded in the Bahamas event (Cox *et al.,* 2006). There were no signs of blunt trauma, and no major fractures (Woods Hole Oceanographic Institution, 2005). The cranial sinuses and airways were found to be clear with little or no fluid deposition, which may indicate good preservation of tissues (Woods Hole Oceanographic Institution, 2005).

Several observations on the Madeira stranded beaked whales, such as the pattern of injury to the auditory system, are the same as those observed in the Bahamas strandings. Blood in and around the eyes, kidney lesions, pleural hemorrhages, and congestion in the lungs are particularly consistent with the pathologies from the whales stranded in the Bahamas, and are consistent with stress and pressure related trauma. The similarities in pathology and stranding patterns between these two events suggest that a similar pressure event may have precipitated or contributed to the strandings at both sites (Woods Hole Oceanographic Institution, 2005).

Even though no definitive causal link can be made between the stranding event and naval exercises, certain conditions may have existed in the exercise area 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 a cross a relatively short horizontal distance (Freitas, 2004); multiple ships were operating around Madeira, though it is not known if MFA sonar was used, and the specifics of the sound sources used are unknown (Cox *et al.,* 2006, Freitas, 2004); and exercises took place in an area surrounded by landmasses separated by less than 35 nm (65 km) and at least 10 nm (19 km) in length, or in an embayment. Exercises involving multiple ships employing MFA near land may produce sound directed towards a channel or embayment that may cut off the lines of egress for marine mammals (Freitas, 2004).

Canary Islands, Spain (2002)

The southeastern area within the Canary Islands is well known for aggregations of beaked whales due to its ocean depths of greater than 547 fathoms (1,000 m) within a few hundred meters of the coastline (Fernandez *et al.,* 2005). On September 24, 2002, 14 beaked whales were found stranded on Fuerteventura and Lanzarote Islands in the Canary Islands (International Council for Exploration of the Sea, 2005a). Seven whales died, while the remaining seven live whales were returned to deeper waters (Fernandez *et al.,* 2005). Four beaked whales were found stranded dead over the next 3 days either on the coast or floating offshore. These strandings occurred within near proximity of an international naval exercise that utilized MFAS and involved numerous surface warships and several submarines. Strandings began about 4 hours after the onset of MFA sonar activity (International Council for Exploration of the Sea, 2005a; Fernandez *et al.,* 2005).

Eight Cuvier's beaked whales, one Blainville's beaked whale, and one Gervais' beaked whale were necropsied, six of them within 12 hours of stranding (Fernandez *et al.,* 2005). No pathogenic bacteria were isolated from the carcasses (Jepson *et al.,* 2003). The animals displayed severe vascular congestion and hemorrhage especially around the tissues in the jaw, ears, brain, and kidneys, displaying marked disseminated microvascular hemorrhages associated with widespread fat emboli (Jepson *et al.,* 2003; International Council for Exploration of the Sea, 2005a). Several organs contained intravascular bubbles, although definitive evidence of gas embolism in vivo is difficult to determine after death (Jepson *et al.,* 2003). The livers of the necropsied animals were the most consistently affected organ, which contained macroscopic gas-filled cavities and had variable degrees of fibrotic encapsulation. In some animals, cavitary lesions had extensively replaced the normal tissue (Jepson *et al.,* 2003). Stomachs contained a large amount of fresh and undigested contents, suggesting a rapid onset of disease and death (Fernandez *et al.,* 2005). Head and neck lymph nodes were enlarged and congested, and parasites were found in the kidneys of all animals (Fernandez *et al.,* 2005).

The association of NATO MFAS use close in space and time to the beaked whale strandings, and the similarity between this stranding event and previous beaked whale mass strandings coincident with sonar use, suggests that a similar scenario and causative mechanism of stranding may be shared between the events. Beaked whales stranded in this event demonstrated brain and auditory system injuries, hemorrhages, and congestion in multiple organs, similar to the pathological findings of the Bahamas and Madeira stranding events. In addition, the necropsy results of Canary Islands stranding event lead to the hypothesis that the presence of disseminated and widespread gas bubbles and fat emboli were indicative of nitrogen bubble formation, similar to what might be expected in decompression sickness (Jepson *et al.,* 2003; Fernández *et al.,* 2005).

Hanalei Bay (2004)

On July 3 and 4, 2004, approximately 150 to 200 melon-headed whales occupied the shallow waters of the Hanalei Bay, Kaua'i, Hawaii for over 28 hours. Attendees of a canoe blessing observed the animals entering the Bay in a single wave formation at 7 a.m. on July 3, 2004. The animals were observed moving back into the shore from the mouth of the Bay at 9 a.m. The usually pelagic animals milled in the shallow bay and were returned to deeper water with human assistance beginning at 9:30 a.m. on July 4, 2004, and were out of sight by 10:30 a.m.

Only one animal, a calf, was known to have died following this event. The animal was noted alive and alone in the Bay on the afternoon of July 4, 2004 and was found dead in the Bay the morning of July 5, 2004. A full necropsy, magnetic resonance imaging, and computerized tomography examination were performed on the calf to determine the manner and cause of death. The combination of imaging, necropsy and histological analyses found no evidence of infectious, internal traumatic, congenital, or toxic factors. Cause of death could not be definitively determined, but it is likely that maternal separation, poor nutritional condition, and dehydration contributed to the final demise of the animal. Although we do not know when the calf was separated from its mother, the animals' movement into the Bay and subsequent milling and re-grouping may have contributed to the separation or lack of nursing, especially if the maternal bond was weak or this was a primiparous calf.

Environmental factors, abiotic and biotic, were analyzed for any anomalous occurrences that would have contributed to the animals entering and remaining in Hanalei Bay. The Bay's bathymetry is similar to many other sites within the Hawaiian Island chain and dissimilar to sites that have been associated with mass strandings in other parts of the U.S. The weather conditions appeared to be normal for that time of year with no fronts or other significant features noted. There was no evidence of unusual distribution, occurrence of predator or prey species, or unusual harmful algal blooms, although Mobley *et al.,* 2007 suggested that the full moon cycle that occurred at that time may have influenced a run of squid into the Bay. Weather patterns and bathymetry that have been associated with mass strandings elsewhere were not found to occur in this instance.

The Hanalei event was spatially and temporally correlated with RIMPAC. Official sonar training and tracking exercises in the Pacific Missile Range Facility (PMRF) warning area did not commence until approximately 8 a.m. on July 3 and were thus ruled out as a possible trigger for the initial movement into the Bay. However, six naval surface vessels transiting to the operational area on July 2 intermittently transmitted active sonar (for approximately 9 hours total from 1:15 p.m. to 12:30 a.m.) as they approached from the south. The potential for these transmissions to have triggered the whales' movement into Hanalei Bay was investigated. Analyses with the information available indicated that animals to the south and east of Kaua'i could have detected active sonar transmissions on July 2, and reached Hanalei Bay on or before 7 a.m. on July 3. However, data limitations regarding the position of the whales prior to their arrival in the Bay, the magnitude of sonar exposure, behavioral responses of melon-headed whales to acoustic stimuli, and other possible relevant factors preclude a conclusive finding regarding the role of sonar in triggering this event. Propagation modeling suggest that transmissions from sonar use during the July 3 exercise in the PMRF warning area may have been detectable at the mouth of the Bay. If the animals responded negatively to these signals, it may have contributed to their continued presence in the Bay. The U.S. Navy ceased all active sonar transmissions during exercises in this range on the afternoon of July 3. Subsequent to the cessation of sonar use, the animals were herded out of the Bay.

While causation of this stranding event may never be unequivocally determined, we consider the active sonar transmissions of July 2–3, 2004, a plausible, if not likely, contributing factor in what may have been a confluence of events. This conclusion is based on the following: (1) The evidently anomalous nature of the stranding; (2) its close spatiotemporal correlation with wide-scale, sustained use of sonar systems previously associated with stranding of deep-diving marine mammals; (3) the directed movement of two groups of transmitting vessels toward the southeast and southwest coast of Kauai; (4) the results of acoustic propagation modeling and an analysis of possible animal transit times to the Bay; and (5) the absence of any other compelling causative explanation. The initiation and persistence of this event may have resulted from an interaction of biological and physical factors. The biological factors may have included the presence of an apparently uncommon, deep-diving cetacean species (and possibly an offshore, non-resident group), social interactions among the animals before or after they entered the Bay, and/or unknown predator or prey conditions. The physical factors may have included the presence of nearby deep water, multiple vessels transiting in a directed manner while transmitting active sonar over a sustained period, the presence of surface sound ducting conditions, and/or intermittent and random human interactions while the animals were in the Bay.

A separate event involving melon-headed whales and rough-toothed dolphins took place over the same period of time in the Northern Mariana Islands (Jefferson *et al.,* 2006), which is several thousand miles from Hawaii. Some 500 to 700 melon-headed whales came into Sasanhaya Bay on July 4, 2004 near the island of Rota and then left of their own accord after 5.5 hours; no known active sonar transmissions occurred in the vicinity of that event. The Rota incident led to scientific debate regarding what, if any, relationship the event had to the simultaneous events in Hawaii and whether they might be related by some common factor (e.g., there was a full moon on July 2, 2004 as well as during other melon-headed whale strandings and nearshore aggregations (Brownell *et al.,* 2009; Lignon *et al.,* 2007; Mobley *et al.,* 2007). Brownell *et al.* (2009) compared the two incidents, along with one other stranding incident at Nuka Hiva in French Polynesia and normal resting behaviors observed at Palmyra Island, in regard to physical features in the areas, melon-headed whale behavior, and lunar cycles. Brownell *et al.,* (2009) concluded that the rapid entry of the whales into Hanalei Bay, their movement into very shallow water far from the 100-m contour, their milling behavior (typical pre-stranding behavior), and their reluctance to leave the bay constituted an unusual event that was not similar to the events that occurred at Rota (but was similar to the events at Palmyra), which appear to be similar to observations of melon-headed whales resting normally at Palmyra Island. Additionally, there was no correlation between lunar cycle and the types of behaviors observed in the Brownell *et al.* (2009) examples.

Spain (2006)

The Spanish Cetacean Society reported an atypical mass stranding of four beaked whales that occurred January 26, 2006, on the southeast coast of Spain, near Mojacar (Gulf of Vera) in the Western Mediterranean Sea. According to the report, two of the whales were discovered the evening of January 26 and were found to be still alive. Two other whales were discovered during the day on January 27, but had already died. The first three animals were located near the town of Mojacar and the fourth animal was found dead, a few kilometers north of the first three animals. From January 25–26, 2006, Standing North Atlantic Treaty Organization (NATO) Response Force Maritime Group Two (five of seven ships including one U.S. ship under NATO Operational Control) had conducted active sonar training against a Spanish submarine within 50 nm (93 km) of the stranding site.

Veterinary pathologists necropsied the two male and two female Cuvier's beaked whales. According to the pathologists, the most likely primary cause of this type of beaked whale mass stranding event was anthropogenic acoustic activities, most probably anti-submarine MFAS used during the military naval exercises. However, no positive acoustic link was established as a direct cause of the stranding. Even though no causal link can be made between the stranding event and naval exercises, certain conditions may have existed in the exercise area that, in their aggregate, may have contributed to the marine mammal strandings (Freitas, 2004): Exercises were conducted in areas of at least 547 fathoms (1,000 m) depth near a shoreline where there is a rapid change in bathymetry on the order of 547 to 3,281 fathoms (1,000–6,000 m) occurring across a relatively short horizontal distance (Freitas, 2004); multiple ships (in this instance, five) were operating MFAS in the same area over extended periods of time (in this case, 20 hours) in close proximity; and exercises took place in an area surrounded by landmasses, or in an embayment. Exercises involving multiple ships employing MFAS 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).

Association Between Mass Stranding Events and Exposure to MFAS

Several authors have noted similarities between some of these stranding incidents: They occurred in islands or archipelagoes with deep water nearby, several appeared to have been associated with acoustic waveguides like surface ducting, and the sound fields created by ships transmitting MFAS (Cox *et al.,* 2006, D'Spain *et al.,* 2006). Although Cuvier's beaked whales have been the most common species involved in these stranding events (81 percent of the total number of stranded animals), other beaked whales (including *Mesoplodon europeaus, M. densirostris,* and *Hyperoodon ampullatus*) comprise 14 percent of the total. Other species (*Stenella coeruleoalba, Kogia breviceps* and *Balaenoptera acutorostrata*) have stranded, but in much lower numbers and less consistently than beaked whales.

Based on the evidence available, however, we cannot determine whether: (a) Cuvier's beaked whale is more prone to injury from high-intensity sound than other species; (b) their behavioral responses to sound makes them more likely to strand; or (c) they are more likely to be exposed to MFAS than other cetaceans (for reasons that remain unknown). Because the association between active sonar exposures and marine mammals mass stranding events is not consistent—some marine mammals strand without being exposed to sonar and some sonar transmissions are not associated with marine mammal stranding events despite their co-occurrence—other risk factors or a groupings of risk factors probably contribute to these stranding events.

Behaviorally Mediated Responses to MFAS That May Lead to Stranding

Although the confluence of Navy MFAS with the other contributory factors noted in the report was identified as the cause of the Bahamas (2000) stranding event, the specific mechanisms that led to that stranding (or the others) are not understood, and there is uncertainty regarding the ordering of effects that led to the stranding. It is unclear whether beaked whales were directly injured by sound (acoustically mediated bubble growth, addressed above) prior to stranding or whether a behavioral response to sound occurred that ultimately caused the beaked whales to be injured and strand.

Although causal relationships between beaked whale stranding events and active sonar remain unknown, several authors have hypothesized that stranding events involving these species in the Bahamas and Canary Islands may have been triggered when the whales changed their dive behavior in a startled response to exposure to active sonar or to further avoid exposure (Cox *et al.,* 2006, Rommel *et al.,* 2006). These authors proposed three mechanisms by which the behavioral responses of beaked whales upon being exposed to active sonar might result in a stranding event. These include the following: gas bubble formation caused by excessively fast surfacing; remaining at the surface too long when tissues are supersaturated with nitrogen; or diving prematurely when extended time at the surface is necessary to eliminate excess nitrogen. More specifically, beaked whales that occur in deep waters that are in close proximity to shallow waters (for example, the ''canyon areas'' that are cited in the Bahamas stranding event; see D'Spain and D'Amico, 2006), may respond to active sonar by swimming into shallow waters to avoid further exposures and strand if they were not able to swim back to deeper waters. Second, beaked whales exposed to active sonar might alter their dive behavior. Changes in their dive behavior might cause them to remain at the surface or at depth for extended periods of time which could lead to hypoxia directly by increasing their oxygen demands or indirectly by increasing their energy expenditures (to remain at depth) and increase their oxygen demands as a result. If beaked whales are at depth when they detect a ping from an active sonar transmission and change their dive profile, this could lead to the formation of significant gas bubbles, which could damage multiple organs or interfere with normal physiological function (Cox *et al.,* 2006; Rommel *et al.,* 2006; Zimmer and Tyack, 2007). Baird *et al.* (2005) found that slow ascent rates from deep dives and long periods of time spent within 50 m of the surface were typical for both Cuvier's and Blainville's beaked whales, the two species involved in mass strandings related to naval sonar. These two behavioral mechanisms may be necessary to purge excessive dissolved nitrogen concentrated in their tissues during their frequent long dives (Baird *et al.,* 2005). Baird *et al.* (2005) further suggests that abnormally rapid ascents or premature dives in response to high-intensity sonar could indirectly result in physical harm to the beaked whales, through the mechanisms described above (gas bubble formation or non-elimination of excess nitrogen).

Because many species of marine mammals make repetitive and prolonged dives to great depths, it has long been assumed that marine mammals have evolved physiological mechanisms to protect against the effects of rapid and repeated decompressions. Although several investigators have identified physiological adaptations that may protect marine mammals against nitrogen gas supersaturation (alveolar collapse and elective circulation; Kooyman *et al.,* 1972; Ridgway and Howard, 1979), Ridgway and Howard (1979) reported that bottlenose dolphins that were trained to dive repeatedly had muscle tissues that were substantially supersaturated with nitrogen gas. Houser *et al.* (2001) used these data to model the accumulation of nitrogen gas within the muscle tissue of other marine mammal species and concluded that cetaceans that dive deep and have slow ascent or descent speeds would have tissues that are more supersaturated with nitrogen gas than other marine mammals. Based on these data, Cox *et al.* (2006) hypothesized that a critical dive sequence might make beaked whales more prone to stranding in response to acoustic exposures. The sequence began with (1) very deep (to depths as deep as 2 kilometers) and long (as long as 90 minutes) foraging dives with (2) relatively slow, controlled ascents, followed by (3) a series of ''bounce'' dives between 100 and 400 meters in depth (also see Zimmer and Tyack, 2007). They concluded that acoustic exposures that disrupted any part of this dive sequence (for example, causing beaked whales to spend more time at surface without the bounce dives that are necessary to recover from the deep dive) could produce excessive levels of nitrogen supersaturation in their tissues, leading to gas bubble and emboli formation that produces pathologies similar to decompression sickness.

Zimmer and Tyack (2007) modeled nitrogen tension and bubble growth in several tissue compartments for several hypothetical dive profiles and concluded that repetitive shallow dives (defined as a dive where depth does not exceed the depth of alveolar collapse, approximately 72 m for Ziphius), perhaps as a consequence of an extended avoidance reaction to sonar sound, could pose a risk for decompression sickness and that this risk should increase with the duration of the response. Their models also suggested that unrealistically rapid ascent rates from normal dive behaviors are unlikely to result in supersaturation to the extent that bubble formation would be expected. Tyack *et al.* (2006) suggested that emboli observed in animals exposed to mid-frequency range sonar (Jepson *et al.,* 2003; Fernandez *et al.,* 2005) could stem from a behavioral response that involves repeated dives shallower than the depth of lung collapse. Given that nitrogen gas accumulation is a passive process (i.e. nitrogen is metabolically inert), a bottlenose dolphin was trained to repetitively dive a profile predicted to elevate nitrogen saturation to the point that nitrogen bubble formation was predicted to occur. However, inspection of the vascular system of the dolphin via ultrasound did not demonstrate the formation of asymptomatic nitrogen gas bubbles (Houser *et al.,* 2007). Baird *et al.* (2008), in a beaked whale tagging study off Hawaii, showed that deep dives are equally common during day or night, but ''bounce dives'' are typically a daytime behavior, possibly associated with visual predator avoidance. This may indicate that ''bounce dives'' are associated with something other than behavioral regulation of dissolved nitrogen levels, which would be necessary day and night.

If marine mammals respond to a Navy vessel that is transmitting active sonar in the same way that they might respond to a predator, their probability of flight responses should increase when they perceive that Navy vessels are approaching them directly, because a direct approach may convey detection and intent to capture (Burger and Gochfeld, 1981, 1990; Cooper, 1997, 1998). The probability of flight responses should also increase as received levels of active sonar increase (and the ship is, therefore, closer) and as ship speeds increase (that is, as approach speeds increase). For example, the probability of flight responses in Dall's sheep (*Ovis dalli dalli*) (Frid 2001a, b), ringed seals (*Phoca hispida*) (Born *et al.,* 1999), Pacific brant (*Branta bernic nigricans*) and Canada geese (*B. Canadensis*) increased as a helicopter or fixed-wing aircraft approached groups of these animals more directly (Ward *et al.,* 1999). Bald eagles (*Haliaeetus leucocephalus*) perched on trees alongside a river were also more likely to flee from a paddle raft when their perches were closer to the river or were closer to the ground (Steidl and Anthony, 1996).

Despite the many theories involving bubble formation (both as a direct cause of injury (see Acoustically Mediated Bubble Growth Section) and an indirect cause of stranding (See Behaviorally Mediated Bubble Growth Section), Southall *et al.,* (2007) summarizes that there is either scientific disagreement or a lack of information regarding each of the following important points: (1) Received acoustical exposure conditions for animals involved in stranding events; (2) pathological interpretation of observed lesions in stranded marine mammals; (3) acoustic exposure conditions required to induce such physical trauma directly; (4) whether noise exposure may cause behavioral reactions (such as atypical diving behavior) that secondarily cause bubble formation and tissue damage; and (5) the extent the post mortem artifacts introduced by decomposition before sampling, handling, freezing, or necropsy procedures affect interpretation of observed lesions.

During AFTT exercises there will be use of multiple sonar units in areas where six species of beaked whale species may be present. A surface duct may be present in a limited area for a limited period of time. Although most of the ASW training events will take place in the deep ocean, some will occur in areas of high bathymetric relief. However, none of the training events will take place in a location having a constricted channel with limited egress similar to the Bahamas (because none exist in the AFTT Study Area). None of the AFTT exercise areas will have a convergence of all five of the environmental factors believed to contribute to the Bahamas stranding (mid-frequency sonar, beaked whale presence, surface ducts, steep bathymetry, and constricted channels with limited egress). However, as mentioned previously, NMFS recommends caution when steep bathymetry, surface ducting conditions, or a constricted channel is present when mid-frequency tactical sonar is employed and cetaceans (especially beaked whales) are present.

Impulsive Sources

Underwater explosive detonations send a shock wave and sound energy through the water and can release gaseous by-products, create an oscillating bubble, or cause a plume of water to shoot up from the water surface. The shock wave and accompanying noise are of most concern to marine animals. Depending on the intensity of the shock wave and size, location, and depth of the animal, an animal can be injured, killed, suffer non-lethal physical effects, experience hearing related effects with or without behavioral responses, or exhibit temporary behavioral responses or tolerance from hearing the blast sound. Generally, exposures to higher levels of impulse and pressure levels would result in greater impacts on an individual animal.

Injuries resulting from a shock wave take place at boundaries between tissues of different densities. Different velocities are imparted to tissues of different densities, and this can lead to their physical disruption. Blast effects are greatest at the gas-liquid interface (Landsberg, 2000). Gas-containing organs, particularly the lungs and gastrointestinal tract, are especially susceptible (Goertner, 1982; Hill, 1978; Yelverton *et al.,* 1973). In addition, gas-containing organs including the 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). Intestinal walls can bruise or rupture, with subsequent hemorrhage and escape of gut contents into the body cavity. Less severe gastrointestinal tract injuries include contusions, petechiae (small red or purple spots caused by bleeding in the skin), and slight hemorrhaging (Yelverton *et al.,* 1973).

Because the ears are the most sensitive to pressure, they are the organs most sensitive to injury (Ketten, 2000). Sound-related damage associated with sound energy from detonations can be theoretically distinct from injury from the shock wave, particularly farther from the explosion. If an animal is able to hear a noise, at some level it can damage its hearing by causing decreased sensitivity (Ketten, 1995). Sound-related trauma can be lethal or sublethal. Lethal impacts are those that result in immediate death or serious debilitation in or near an intense source and are not, technically, pure acoustic trauma (Ketten, 1995). Sublethal impacts include hearing loss, which is caused by exposures to perceptible sounds. Severe damage (from the shock wave) to the ears includes tympanic membrane rupture, fracture of the ossicles, damage to the cochlea, hemorrhage, and cerebrospinal fluid leakage into the middle ear. Moderate injury implies partial hearing loss due to tympanic membrane rupture and blood in the middle ear. Permanent hearing loss also can occur when the hair cells are damaged by one very loud event, as well as by prolonged exposure to a loud noise or chronic exposure to noise. The level of impact from blasts depends on both an animal's location and, at outer zones, on its sensitivity to the residual noise (Ketten, 1995).

There have been fewer studies addressing the behavioral effects of explosives on marine mammals compared to sonar and other active acoustic sources. However, though the nature of the sound waves emitted from an explosion are different (in shape and rise time) from sonar and other active acoustic sources, we still anticipate the same sorts of behavioral responses to result from repeated explosive detonations (a smaller range of likely less severe responses (i.e., not rising to the level of MMPA harassment) would be expected to occur as a result of exposure to a single explosive detonation that was not powerful enough or close enough to the animal to cause TTS or injury).

Vessel Strike

Commercial and Navy ship strikes of cetaceans can cause major wounds, which may lead to the death of the animal. An animal at the surface could be struck directly by a vessel, a surfacing animal could hit the bottom of a vessel, or an animal just below the surface could be cut by a vessel's propeller. The severity of injuries typically depends on the size and speed of the vessel (Knowlton and Kraus, 2001; Laist *et al.,* 2001; Vanderlaan and Taggart, 2007).

The most vulnerable marine mammals are those that spend extended periods of time at the surface in order to restore oxygen levels within their tissues after deep dives (e.g., the sperm whale). In addition, some baleen whales, such as the North Atlantic right whale, seem generally unresponsive to vessel sound, making them more susceptible to vessel collisions (Nowacek *et al.,* 2004). These species are primarily large, slow moving whales. Smaller marine mammals (e.g., bottlenose dolphin) move quickly through the water column and are often seen riding the bow wave of large ships. Marine mammal responses to vessels may include avoidance and changes in dive pattern (NRC, 2003).

An examination of all known ship strikes from all shipping sources (civilian and military) indicates vessel speed is a principal factor in whether a vessel strike results in death (Knowlton and Kraus, 2001; Laist *et al.,* 2001; Jensen and Silber, 2003; Vanderlaan and Taggart, 2007). In assessing records in which vessel speed was known, Laist *et al.* (2001) found a direct relationship between the occurrence of a whale strike and the speed of the vessel involved in the collision. The authors concluded that most deaths occurred when a vessel was traveling in excess of 13 knots.

Jensen and Silber (2003) detailed 292 records of known or probable ship strikes of all large whale species from 1975 to 2002. Of these, vessel speed at the time of collision was reported for 58 cases. Of these cases, 39 (or 67 percent) resulted in serious injury or death (19 of those resulted in serious injury as determined by blood in the water, propeller gashes or severed tailstock, and fractured skull, jaw, vertebrae, hemorrhaging, massive bruising or other injuries noted during necropsy and 20 resulted in death). Operating speeds of vessels that struck various species of large whales ranged from 2 to 51 knots. The majority (79 percent) of these strikes occurred at speeds of 13 knots or greater. The average speed that resulted in serious injury or death was 18.6 knots. Pace and Silber (2005) found that the probability of death or serious injury increased rapidly with increasing vessel speed. Specifically, the predicted probability of serious injury or death increased from 45 to 75 percent as vessel speed increased from 10 to 14 knots, and exceeded 90 percent at 17 knots. Higher speeds during collisions result in greater force of impact, but higher speeds also appear to increase the chance of severe injuries or death by pulling whales toward the vessel. Computer simulation modeling showed that hydrodynamic forces pulling whales toward the vessel hull increase with increasing speed (Clyne, 1999; Knowlton *et al.,* 1995).

The Jensen and Silber (2003) report notes that the database represents a minimum number of collisions, because the vast majority probably goes undetected or unreported. In contrast, Navy vessels are likely to detect any strike that does occur, and they are required to report all ship strikes involving marine mammals. Overall, the percentages of Navy traffic relative to overall reported large shipping traffic are very small (on the order of 2 percent).

Over a period of 18 years from 1995 to 2012 there have been a total of 19 Navy vessel strikes in the Study Area. Eight of the strikes resulted in a confirmed death; but in 11 of the 19 strikes, the fate of the animal was unknown. It is possible that some of the 11 reported strikes resulted in recoverable injury or were not marine mammals at all, but another large marine species (e.g., basking shark). However, it is prudent to consider that all of the strikes could have resulted in the death of a marine mammal. The maximum number of strikes in any given year was three strikes, which occurred in 2001 and 2004. The highest average number of strikes over any five year period was two strikes per year from 2001 to 2005. The average number of strikes for the entire 18-year period is 1.055 strikes per year. Since the implementation of the Navy's Marine Species Awareness Training in 2007, strikes in the Study Area have decreased to an average of 0.5 per year. Over the last five years on the east coast, the Navy was involved in two strikes, with no confirmed marine mammal deaths as a result of the vessel strike.

Mitigation

In order to issue an incidental take authorization (ITA) 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 NDAA of 2004 amended the MMPA as it relates to military-readiness activities and the incidental take authorization process such 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 training and testing activities described in the AFTT application are considered military readiness activities.

NMFS reviewed the proposed activities and the proposed mitigation measures as described in the Navy's LOA application to determine if they would result in the least practicable adverse effect on marine mammals, which includes a careful balancing of the likely benefit of any particular measure to the marine mammals with the likely effect of that measure on personnel safety, practicality of implementation, and impact on the effectiveness of the ''military readiness activity.'' Included below are the mitigation measures the Navy proposed in its LOA application.

Proposed Mitigation Measures

In general, mitigation measures are modifications to the proposed activities that are implemented for the sole purpose of reducing a specific potential environmental impact on a particular resource. These do not include standard operating procedures, which are established for reasons other than environmental benefit. Most of the following proposed mitigation measures are currently implemented, and the remainder were developed where there was no mitigation for new systems. The Navy's overall approach to assessing potential mitigation measures is provided in Section 5.2.2 of the AFTT DEIS/OEIS. It may be necessary for NMFS to require additional mitigation or monitoring beyond those presented below based on information and comments received during the public comment period as well as through the consultation process required under section 7 of the ESA.

Lookouts

The use of lookouts is a critical component of Navy procedural measures and implementation of mitigation zones. Navy lookouts are highly qualified and experienced observers of the marine environment. Their duties require that they report all objects sighted in the water to the Officer of the Deck (OOD) (e.g., trash, a periscope, marine mammals, sea turtles) and all disturbances (e.g., surface disturbance, discoloration) that may be indicative of a threat to the vessel and its crew. There are personnel standing watch on station at all times (day and night) when a ship or surfaced submarine is moving through the water.

The Navy would have two types of lookouts for purposes of conducting visual observations: (1) Those positioned on surface ships, and (2) those positioned in aircraft or on boats. Lookouts positioned on surface ships would be dedicated solely to diligent observation of the air and surface of the water. They would have multiple observation objectives, which include but are not limited to detecting the presence of biological resources and recreational or fishing boats, observing mitigation zones, and monitoring for vessel and personnel safety concerns.

Due to aircraft and boat manning and space restrictions, lookouts positioned in aircraft or on boats would consist of the aircraft crew, pilot, or boat crew. Lookouts positioned in aircraft and boats may necessarily be responsible for tasks in addition to observing the air or surface of the water (for example, navigation of a helicopter or rigid hull inflatable boat). However, aircraft and boat lookouts would, to the maximum extent practicable and consistent with aircraft and boat safety and training and testing requirements, comply with the observation objectives described above for lookouts positioned on surface ships.

The Navy proposes to use at least one lookout during the training and testing activities provided in Table 10. Additional details on lookout procedures are provided in Chapter 11 of the Navy's LOA application (*http://www.nmfs.noaa.gov/pr/permits/incidental.htm#applications*).

TABLE 10—LOOKOUT MITIGATION MEASURES FOR TRAINING AND TESTING ACTIVITIES WITHIN THE AFTT STUDY AREA

Number of lookouts	Training and testing activities	Benefit
2 to 4	Mine countermeasure and neutralization activities using time delay would use 4 lookouts. If applicable, aircrew and divers would report sightings of marine mammals. Ship shock trials would have a minimum of 2–4 lookouts depending on the size of the charge.	Lookouts can visually detect marine mammals so that potentially harmful impacts from explosives use can be avoided. Trained lookouts can more quickly and effectively relay sighting information so that corrective action can be taken. Support from aircrew and divers, if they are involved, would increase the probability of sightings, reducing the potential for impacts.
1 to 2	Vessels using low-frequency active sonar or hull-mounted mid-frequency active sonar associated with ASW activities would have either one or two lookouts, depending on the size of the vessel and the status/location of the vessel.	Lookouts can visually detect marine mammals so that potentially harmful impacts from Navy sonar and explosives use can be avoided. Trained lookouts can more quickly and effectively relay sighting information so that corrective action can be taken. Support from aircrew and divers, if they are involved, would increase the probability of sightings, reducing the potential for impacts. Mine countermeasure and neutralization activities with positive control would use one or two lookouts (depending on net explosive weight), with at least one on each support vessel. If applicable, aircrew and divers would also report the presence of marine mammals. Mine neutralization activities involving diver placed charges of up to 100 lb (45 kg) net explosive weight detonation would use two lookouts. Sinking exercises would use two lookouts (one in an aircraft and one on a vessel). At sea explosives testing would have at least one lookout.
1	Surface ships and aircraft conducting ASW, ASUW, or MIW activities using high-frequency active sonar; non-hull mounted mid-frequency active sonar; helicopter dipping mid-frequency active sonar; anti-swimmer grenades; IEER sonobuoys; line charge testing; surface gunnery activities using a surface target; surface missile activities using a surface target; bombing activities; explosive torpedo testing; elevated causeway system pile driving; towed in-water devices; full power propulsion testing of surface vessels; vessel movements; and activities using non-explosive practice munitions, would have one lookout.	Lookouts can visually detect marine mammals so that potentially harmful impacts from Navy sonar; explosives; sonobuoys; gunnery rounds and missiles using a surface target; explosive torpedoes; pile driving; towed systems; surface vessel propulsion; vessel movements; and non-explosive munitions can be avoided. A trained lookout can more quickly and effectively relay sighting information so that corrective action can be taken.

Personnel standing watch on the bridge, Commanding Officers, Executive Officers, maritime patrol aircraft aircrews, anti-submarine warfare helicopter crews, civilian equivalents, and lookouts would complete the NMFS-approved Marine Species Awareness Training (MSAT) prior to standing watch or serving as a lookout. Additional details on the Navy's MSAT program are provided in Chapter 5 of the AFTT Draft EIS/OEIS.

Mitigation Zones

The Navy proposes to use mitigation zones to reduce the potential impacts on marine mammals from training and testing activities. Mitigation zones are measured as the radius from a source and represent a distance that the Navy would monitor. Mitigation zones are applied to acoustic stressors (i.e., non-impulsive and impulsive sound), and physical strike and disturbance (e.g., vessel movement and bombing exercises). In each instance, visual detections of marine mammals would be communicated immediately to a watch station for information dissemination and appropriate action. Acoustic detections would be communicated to lookouts posted in aircraft and on surface vessels.

Most of the current mitigation zones for activities that involve the use of impulsive and non-impulsive sources were originally designed to reduce the potential for onset of TTS. The Navy updated their acoustic modeling to incorporate new hearing threshold metrics (i.e., upper and lower frequency limits), new marine mammal density data, and factors such as an animal's likely presence at various depths. An explanation of the acoustic modeling process can be found in the Marine Species Modeling Team Technical Report (U.S. Department of the Navy, 2012a).

As a result of updates to the acoustic modeling, some of the ranges to effects are larger than previous model outputs. Due to the ineffectiveness associated with mitigating such large areas, the Navy is unable to mitigate for onset of TTS during every activity. However, some ranges to effects are smaller than previous models estimated, and the mitigation zones were adjusted accordingly to provide consistency across the measures. The Navy developed each proposed mitigation zone to avoid or reduce the potential for onset of the lowest level of injury, permanent threshold shift (PTS), out to the predicted maximum range (except for shock trials; a detailed discussion of how shock trial mitigation zones were developed is presented in Chapter 6.1.7.1 of the Navy's LOA application). Mitigating to the predicted maximum range to PTS also mitigates to the predicted maximum range to onset mortality (1 percent mortality), onset slight lung injury, and onset slight gastrointestinal tract injury, since the maximum range to effects for these criteria are shorter than for PTS. Furthermore, in most cases, the predicted maximum range to PTS also covers the predicted average range to

TTS. Tables 11 and 12 summarize the predicted average range to TTS, average range to PTS, maximum range to PTS, and recommended mitigation zone for each activity category, based on the Navy's acoustic propagation modeling results. It is important for the Navy to have standardized mitigation zones wherever training and testing may be conducted. The information in Tables 11 and 12 was developed in consideration of both Atlantic and Pacific Ocean conditions, marine mammal species, environmental factors, effectiveness, and operational assessments. Therefore, the ranges to effects in Tables 11 and 12 provide effective values that ensure appropriate mitigation ranges for both Atlantic Fleet and Pacific Fleet activities, and may not align with range to effects values found in other tables of the Navy's LOA application.

The Navy's proposed mitigation zones are based on the longest range for all the marine mammal and sea turtle functional hearing groups. Most mitigation zones were driven by the high-frequency cetaceans or sea turtles functional hearing group. Therefore, the mitigation zones are more conservative for the remaining functional hearing groups (low-frequency and mid-frequency cetaceans, and pinnipeds), and likely cover a larger portion of the potential range to onset of TTS. Additional information on the estimated range to effects for each acoustic stressor is detailed in Chapter 11 of the Navy's LOA application (*http://www.nmfs.noaa.gov/pr/permits/incidental.htm#applications*).

TABLE 11—PREDICTED AVERAGE RANGE TO TTS AND AVERAGE AND MAXIMUM RANGE TO PTS AND RECOMMENDED MITIGATION ZONES

Activity category	Representative source (bin) *	Predicted average range to TTS	Predicted average range to PTS	Predicted maximum range to PTS	Recommended mitigation zone
Non-Impulsive Sound					
Low-Frequency and Hull-Mounted Mid-Frequency Active Sonar.	SQS–53 ASW hull-mounted sonar (MF1).	4,251 yd. (3,887 m)	281 yd. (257 m)	<292 yd. (<267 m)	6 dB power down at 1,000 yd. (914 m); 4 dB power down at 500 yd. (457 m); and shutdown at 200 yd. (183 m).
High-Frequency and Non-Hull Mounted Mid-Frequency Active Sonar.	AQS–22 ASW dipping sonar (MF4).	226 yd. (207 m)	<55 yd. (<50 m)	<55 yd. (<50 m)	200 yd. (183 m).
Explosive and Impulsive Sound					
Improved Extended Echo Ranging Sonobuoys.	Explosive sonobuoy (E4).	434 yd. (397 m)	156 yd. (143 m)	563 yd. (515 m)	600 yd. (549 m).
Explosive Sonobuoys using 0.6–2.5 lb. NEW.	Explosive sonobuoy (E3).	290 yd. (265 m)	113 yd. (103 m)	309 yd. (283 m)	350 yd. (320 m).
Anti-Swimmer Grenades.	Up to 0.5 lb. NEW (E2).	190 yd. (174 m)	83 yd. (76 m)	182 yd. (167 m)	200 yd. (183 m).
Mine Countermeasure and Neutralization Activities Using Positive Control Firing Devices.	Dependent on charge size (see Table 12)				
Mine Neutralization Diver Placed Mines Using Time-Delay Firing Devices.	Up to 20 lb. NEW (E6).	647 yd. (592 m)	232 yd. (212 m)	469 yd. (429 m)	1,000 yd. (915 m).
Ordnance Testing (Line Charge Testing).	Numerous 5 lb. charges (E4).	434 yd. (397 m)	156 yd. (143 m)	563 yd. (515 m)	900 yd. (823 m).**
Gunnery Exercises—Small- and Medium-Caliber (Surface Target).	40 mm projectile (E2)	190 yd. (174 m)	83 yd. (76 m)	182 yd. (167 m)	200 yd. (183 m).
Gunnery Exercises—Large-Caliber (Surface Target).	5 in. projectiles (E5 at the surface ***).	453 yd. (414 m)	186 yd. (170 m)	526 yd. (481 m)	600 yd. (549 m).
Missile Exercises up to 250 lb. NEW (Surface Target).	Maverick missile (E9)	949 yd. (868 m)	398 yd. (364 m)	699 yd. (639 m)	900 yd. (823 m).
Missile Exercises up to 500 lb. NEW (Surface Target).	Harpoon missile (E10).	1,832 yd. (1,675 m)	731 yd. (668 m)	1,883 yd. (1,721 m)	2,000 yd. (1.8 km).
Bombing Exercises	MK–84 2,000 lb. bomb (E12).	2,513 yd. (2.3 km)	991 yd. (906 m)	2,474 yd. (2.3 km)	2,500 yd. (2.3 km).**

TABLE 11—PREDICTED AVERAGE RANGE TO TTS AND AVERAGE AND MAXIMUM RANGE TO PTS AND RECOMMENDED MITIGATION ZONES—Continued

Activity category	Representative source (bin) *	Predicted average range to TTS	Predicted average range to PTS	Predicted maximum range to PTS	Recommended mitigation zone
Torpedo (Explosive) Testing.	MK–48 torpedo (E11)	1,632 yd. (1.5 km)	697 yd. (637 m)	2,021 yd. (1.8 km)	2,100 yd. (1.9 km).
Sinking Exercises	Various sources up to the MK–84 2,000 lb. bomb (E12).	2,513 yd. (2.3 km)	991 yd. (906 m)	2,474 yd. (2.3 km)	2.5 nm (4.6 km).**
Ship Shock Trials in JAX Range Complex.	10,000 lb. charge (HBX).	5.8 nm (10.8 km)	2.7 nm (4.9 km)	4.8 nm (8.9 km)	3.5 nm (6.5 km).
	40,000 lb. charge (HBX).	9.2 nm (17 km)	3.6 nm (6.6 km)	6.4 nm (11.9 km)	3.5 nm (6.5 km).
Ship Shock Trials in VACAPES Range Complex.	10,000 lb. charge (HBX).	9 nm (16.7 km)	2 nm (3.6 km)	4.7 nm (8.7 km)	3.5 nm (6.5 km).
	40,000 lb. charge (HBX).	10.3 nm (19.2 km)	3.7 nm (6.8 km)	7.6 nm (14 km)	3.5 nm (6.5 km).
At-Sea Explosive Testing.	Various sources less than 10 lb. NEW (E5 at various depths***).	525 yd. (480 m)	204 yd. (187 m)	649 yd. (593 m)	1,600 yd. (1.4 km).**
Elevated Causeway System—Pile Driving.	24 in. steel impact hammer.	1,094 yd. (1,000 m)	51 yd. (46 m)	51 yd. (46 m)	60 yd. (55 m).

ASW: Anti-submarine warfare; JAX: Jacksonville; NEW: Net explosive weight; PTS: Permanent threshold shift; TTS: Temporary threshold shift;
* This table does not provide an inclusive list of source bins; bins presented here represent the source bin with the largest range to effects within the given activity category.
** Recommended mitigation zones are larger than the modeled injury zones to account for multiple types of sources or charges being used.
*** The representative source bin E5 has different range to effects depending on the depth of activity occurrence (at the surface or at various depths).

TABLE 12—PREDICTED RANGE TO EFFECTS AND MITIGATION ZONE RADIUS FOR MINE COUNTERMEASURE AND NEUTRALIZATION ACTIVITIES USING POSITIVE CONTROL FIRING DEVICES

Charge size net explosive weight (bins)	General mine countermeasure and neutralization activities using positive control firing devices*				Mine countermeasure and neutralization activities using diver placed charges under positive control **			
	Predicted average range to TTS	Predicted average range to PTS	Predicted maximum range to PTS	Recommended mitigation zone	Predicted average range to TTS	Predicted average range to PTS	Predicted maximum range to PTS	Recommended mitigation zone
2.6–5 lb. (E4)	434 yd. (474 m).	197 yd. (180 m).	563 yd. (515 m).	600 yd. (549 m).	545 yd. (498 m).	169 yd. (155 m).	301 yd. (275 m).	350 yd. (320 m).
6–10 lb. (E5)	525 yd. (480 m).	204 yd. (187 m).	649 yd. (593 m).	800 yd. (732 m).	587 yd. (537 m).	203 yd. (185 m).	464 yd. (424 m).	500 yd. (457 m).
11–20 lb. (E6)	766 yd. (700 m).	288 yd. (263 m).	648 yd. (593 m).	800 yd. (732 m).	647 yd. (592 m).	232 yd. (212 m).	469 yd. (429 m).	500 yd. (457 m).
21–60 lb. (E7) ***.	1,670 yd. (1,527 m).	581 yd. (531 m).	964 yd. (882 m).	1,200 yd. (1.1 km).	1,532 yd. (1,401 m).	473 yd. (432 m).	789 yd. (721 m).	800 yd. (732 m).
61–100 lb. (E8) ****.	878 yd. (802 m).	383 yd. (351 m).	996 yd. (911 m).	1,600 yd. (1.4 m).	969 yd. (886 m).	438 yd. (400 m).	850 yd. (777 m).	850 yd. (777 m).
250–500 lb. (E10).	1,832 yd. (1,675 m).	731 yd. (668 m).	1,883 yd. (1,721 m).	2,000 yd. (1.8 km).				Not Applicable.
501–650 lb. (E11).	1,632 yd. (1,492 m).	697 yd. (637 m).	2,021 yd. (1,848 m).	2,100 yd. (1.9 km).				Not Applicable.

PTS: Permanent threshold shift; TTS: Temporary threshold shift.
* These mitigation zones are applicable to all mine countermeasure and neutralization activities conducted in all locations that Tables 2.8–1 through 2.8–5 in the AFTT DEIS/OEIS specifies.
** These mitigation zones are only applicable to mine countermeasure and neutralization activities involving the use of diver placed charges. These activities are conducted in shallow-water and the mitigation zones are based only on the functional hearing groups with species that occur in these areas (mid-frequency cetaceans and sea turtles).
*** The E7 bin was only modeled in shallow-water locations so there is no difference for the diver placed charges category.
**** The E8 bin was only modeled for surface explosions, so some of the ranges are shorter than for sources modeled in the E7 bin which occur at depth.

When mine neutralization activities using diver placed charges (up to a 20 lb. NEW) are conducted with a time-delay firing device, the detonation is fused with a specified time-delay by the personnel conducting the activity and is not authorized until the area is clear at the time the fuse is initiated. During these activities, the detonation cannot be terminated once the fuse is initiated due to human safety concerns. The Navy is proposing to modify the number of lookouts currently used for mine neutralization activities using diver-placed time-delay firing devices. As a reference, the current mitigation involves the use of six lookouts and three small rigid hull inflatable boats (two lookouts positioned in each of the three boats) for mitigation zones equal to or larger than 1,400 yd. (1,280 m), or four lookouts and two boats for mitigation zones smaller than 1,400 yd. (1,280 m), which was incorporated into the current Silver Strand Training Complex IHA to minimize the possibility of take by serious injury or mortality (which is not authorized under an IHA). The Navy has determined that using six lookouts and three boats in the long-term is impracticable to implement from an operational standpoint due to the impact that it is causing on resource requirements (i.e., limited personnel resources and boat availability). During activities using up to a 20 lb. NEW (bin E6) detonation, the Navy is proposing to have four lookouts and two small rigid hull inflatable boats (two lookouts positioned in each of the two boats). In addition, when aircraft are used, the pilot or member of the aircrew will serve as an additional lookout.

NMFS believes that the Navy's proposed modification to this mitigation measure will still reduce the potential for injury or mortality for several reasons: (1) The Navy's acoustic propagation modeling results show that the predicted ranges to TTS and PTS for mine neutralization diver place mines using time-delay firing devices do not exceed 647 yd (592 m), which is well within the proposed 1,000-yd (915-m) mitigation zone; (2) the number of lookouts for a 1,000-yd (915-m) mitigation zone would not change; (3) the maximum net explosive weight would decrease from 29 lb (currently) to 20 lb (proposed); (4) the Navy would continue to monitor the mitigation zone for 30 minutes before, during, and 30 after the activity to ensure that the area is clear of marine mammals; and (5) time-delay firing device activities are only conducted during daylight hours.

Mitigation Areas

The Navy proposes to implement several mitigation measures within pre-defined habitat areas in the AFTT Study Area. NMFS and the Navy refer to these areas as ''mitigation areas.'' It is important to note that the mitigation measures proposed for implementation only apply within each area as described.

North Atlantic Right Whale Mitigation Area Off the Southeast United States

Several mitigation measures are proposed for implementation within pre-defined boundaries of a North Atlantic right whale mitigation area off the southeast United States annually during calving season between November 15 and April 15. The southeast United States mitigation area is defined as follows (and depicted in Figure 4–1 of the LOA application): A 5 nm (9.3 km) buffer around the coastal waters between 31°15′ North and 30°15′ North from the coast out 15 nm (27.8 km); and the coastal waters between 30°15′ North and 28°00′ North from the coast out 5 nm (9.3 km).

The Navy would not conduct the following activities within the mitigation area:

- High-frequency and non-hull mounted mid-frequency active sonar (excluding helicopter dipping)
- Missile activities (explosive and non-explosive)
- Bombing exercises (explosive and non-explosive)
- Underwater detonations
- Improved extended echo ranging sonobuoy exercises
- Torpedo exercises (explosive)
- Small-, medium-, and large-caliber gunnery exercises

The Navy would minimize, to the maximum extent practicable, the use of the following systems within the mitigation area:

- Helicopter dipping using active sonar
- Low-frequency and hull-mounted mid-frequency active sonar used for navigation training
- Low-frequency and hull-mounted mid-frequency active sonar used for object detection exercises

Before transiting through or conducting any training or testing activities within the mitigation area, the Navy would communicate with the Fleet Area Control and Surveillance Facility, Jacksonville to obtain Early Warning System North Atlantic right whale sightings data. The Fleet Area Control and Surveillance Facility, Jacksonville, would advise ships of all reported whale sightings in the vicinity of the mitigation area to help ships and aircraft reduce potential interactions with North Atlantic right whales. Commander Submarine Force United States Atlantic Fleet would coordinate any submarine operations that may require approval from the Fleet Area Control and Surveillance Facility, Jacksonville. When transiting within the mitigation area, all Navy vessels would exercise extreme caution and proceed at the slowest speed that is consistent with safety, mission, training, and operations. Vessels would implement speed reductions under any of the following conditions: (1) After they observe a North Atlantic right whale; (2) if they are within 5 nm (9 km) of a sighting reported within the past 12 hours.; or (3) when operating at night or during periods of poor visibility. The Navy would minimize to the maximum extent practicable north-south transits through the mitigation area. The Navy may periodically travel in a north-south direction during training and testing activities due to operational requirements. If north-south directional travel is required during training or testing activities, the Navy would implement the increased caution and speed reductions described above when applicable.

North Atlantic Right Whale Mitigation Area Off the Northeast United States

Two important North Atlantic right whale foraging habitats, the Great South Channel and Cape Cod Bay, are located off the northeast United States. These two areas comprise the northeast United States mitigation area, which apply year-round and are defined as follows:

- Great South Channel: The area bounded by 41°40′ North/69°45′ West; 41°00′ North/69°05′ West; 41°38′ North/68°13′ West; and 42°10′ North/68°31′ West
- Cape Cod Bay: The area bounded by 42°04.8′ North/70°10′ West; 42°12′ North/70°15′ West; 42°12′ North/70°30′ West; 41°46.8′ North/70°30′ West and on the south and east by the interior shoreline of Cape Cod, Massachusetts

The Navy would not conduct the following activities within the boundaries of the mitigation area or within additional specified distances from the mitigation area:

- Improved extended echo ranging sonobuoy exercises in or within 3 nm (5.6 km) of the mitigation area
- Bombing exercises (explosive and non-explosive)
- Underwater detonations
- Torpedo exercises (explosive)

The Navy would minimize to the maximum extent practicable the use of the following systems within the boundaries of the mitigation area:

- Low-frequency and hull-mounted active sonar
- High-frequency and non-hull mounted mid-frequency active sonar, including helicopter dipping

Before transiting the mitigation area with a surface vessel, the Navy would conduct a prior web query or email inquiry to the NMFS Northeast U.S.

Right Whale Sighting Advisory System in order to obtain the latest North Atlantic right whale sighting information. When transiting within the mitigation area, Navy vessels would exercise extreme caution and proceed at the slowest speed that is consistent with safety, mission, training, and operations. Vessels would implement speed reductions under the following conditions: (1) After they observe a North Atlantic right whale; (2) if they are within 5 nm (9 km) of a sighting reported within the past week; or (3) when operating at night or during periods of poor visibility. These additional speed reductions shall be implemented according to Rule 6 of the International Navigation Rules ((COLREGS, 1972).

Additional mitigation would be required when conducting Torpedo Exercises (TORPEXs) in the Northeast Right Whale Mitigation Area. Surface vessels and submarines would maintain a speed of no more than 10 knots (19 km/hr.) during transit; and torpedo exercise firing vessel speeds would range from 10 knots (19 km/hr.) during normal firing, 18 knots (33.3 km/hr.) during submarine target firing, and in excess of 18 knots (33.3 km/hr.) during surface vessel target firing (speeds in excess of 18 knots would occur for a short time [e.g., 10–15 min.]).

The Navy would conduct all non-explosive torpedo testing during daylight hours in Beaufort sea states of 3 or less to increase the probability of marine mammal detection. Mitigation would include visual observation immediately before and during the exercise within the immediate vicinity of the activity. During the conduct of the test, visual surveys of the test area would be conducted by all vessels and aircraft involved in the exercise to detect the presence of marine mammals. The test scenario would not commence if concentrations of floating vegetation (*Sargassum* or kelp patties) are observed in the immediate vicinity of the activity. The test scenario would cease if a North Atlantic right whale is visually detected within the immediate vicinity of the activity. The test scenario would re-commence if any one of the following conditions are met: (1) The animal is observed exiting the immediate vicinity of the activity, (2) the animal is thought to have exited the immediate vicinity of the activity based on its course and speed, or (3) the immediate vicinity of the activity has been clear from any additional sightings for a period of 30 minutes.

North Atlantic Right Whale Mid-Atlantic Mitigation Area

A North Atlantic right whale migratory route is located off the mid-Atlantic coast of the United States. When transiting within the mitigation area, the Navy would practice increased vigilance, exercise extreme caution, and proceed at the slowest speed that is consistent with safety, mission, and training and testing objectives. This mitigation area would apply from November 1 through April 30 and would be defined as follows:

- Block Island Sound: The area bounded by 40°51′53.7″ North/070°36′44.9″ West; 41°20′14.1″ North/070°49′44.1″ West
- New York and New Jersey: 20 nm (37 km) seaward of the line between 40°29′42.2″ North/073°55′57.6″ West
- Delaware Bay: 38°52′27.4″ North/075°01′32.1″ West
- Chesapeake Bay: 37°00′36.9″ North/075°57″50.5″ West
- Morehead City, North Carolina: 34°41′32.0″ North/076°40′08.3″ West
- Wilmington, North Carolina, through South Carolina, and to Brunswick, Georgia: Within a continuous area 20 nm from shore and west back to shore bounded by 34°10′30″ North/077°49′12″ West; 33°56′42″ North/077°31′30″ West; 33°36′30″ North/077°47′06″ West; 33°28′24″ North/078°32′30″ West; 32°59′06″ North/078°50′18″ West; 31°50′00″North/080°33′12″ West; 31°27′00″ North/080°51′36″ West

Planning Awareness Areas

The Navy has designated several planning awareness areas (PAAs) based on locations of high productivity that have been correlated with high concentrations of marine mammals (such as persistent oceanographic features like upwellings associated with the Gulf Stream front where it is deflected off the east coast near the Outer Banks), and areas of steep bathymetric contours that are frequented by deep diving marine mammals such as beaked whales and sperm whales.

For events involving active sonar, the Navy would avoid planning major exercises in planning awareness areas (Figure 11–1 in the LOA application) when feasible. To the extent operationally feasible, the Navy would not conduct more than one of the five major exercises or similar scale events per year in the Gulf of Mexico planning awareness area. If national security needs require the conduct of more than five major exercises or similar scale events in the planning awareness areas per year, or more than one within the Gulf of Mexico planning awareness area per year, the Navy would provide NMFS with prior notification and include the information in any associated after-action or monitoring reports.

Cetacean and Sound Mapping

NMFS Office of Protected Resources standardly considers available information about marine mammal habitat use to inform discussions with applicants regarding potential spatio-temporal limitations of their activities that might help effect the least practicable adverse impact (e.g., Planning Awareness Areas). Through the Cetacean and Sound Mapping effort (*www.cetsound.noaa.gov*), NOAA's Cetacean Density and Distribution Mapping Working Group (CetMap) is currently involved in a process to compile available literature and solicit expert review to identify areas and times where species are known to concentrate for specific behaviors (e.g., feeding, breeding/calving, or migration) or be range-limited (e.g., small resident populations). These areas, called Biologically Important Areas (BIAs), are useful tools for planning and impact assessments and are being provided to the public via the CetSound Web site, along with a summary of the supporting information. While these BIAs are useful tools for analysts, any decisions regarding protective measures based on these areas must go through the normal MMPA evaluation process (or any other statutory process that the BIAs are used to inform)—the designation of a BIA does not pre-suppose any specific management decision associated with those areas. Additionally, the BIA process is iterative and the areas will be updated as new information becomes available. Currently, NMFS has published BIAs for the Arctic Slope and some in Hawaii. The BIAs in other regions, such as the Atlantic and West Coast of the continental U.S. are still in development. We have indicated to the Navy that once these BIAs are complete and put on the Web site, we may need to discuss whether (in the context of the nature and scope of any Navy activities planned in and around the BIAs, what impacts might be anticipated, and practicability) additional protective measures might be appropriate.

Stranding Response Plan

NMFS and the Navy developed Stranding Response Plans for the Study Areas and Range Complexes that make up the AFTT Study Area in 2009 as part of the previous incidental take authorization process. The Stranding Response Plans are specifically intended to outline the applicable requirements the authorizations are conditioned upon in the event that a marine mammal stranding is reported in the east coast Range Complexes and AFAST Study Area during a major training exercise. NMFS considers all plausible causes within the course of a stranding investigation and these plans in no way presume that any strandings in a Navy range complex are related to, or caused by, Navy training and testing activities, absent a determination made during investigation. The plans are designed to address mitigation, monitoring, and compliance. The Navy is currently working with NMFS to refine these plans for the new AFTT Study Area. The current Stranding Response Plans are available for review here: *http://www.nmfs.noaa.gov/pr/permits/incidental.htm#applications*.

Mitigation Conclusions

NMFS has carefully evaluated the Navy's proposed mitigation measures and considered a broad range of other measures in the context of ensuring that NMFS prescribes the means of effecting the least practicable adverse impact on the affected marine mammal species and stocks and their habitat. Our evaluation of potential measures included consideration of the following factors in relation to one another: the manner in which, and the degree to which, the successful implementation of the measure is expected to minimize adverse impacts on marine mammals; the proven or likely efficacy of the specific measure to minimize adverse impacts as planned; and the practicability of the measure for applicant implementation, including consideration of personnel safety, practicality of implementation, and impact on the effectiveness of the military readiness activity.

In some cases, additional mitigation measures are required beyond those that the applicant proposes. Any mitigation measure(s) prescribed by NMFS should be able 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 of marine mammals 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 sonar and other active acoustic sources, 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 sonar and other active acoustic sources, 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 sonar and other active acoustic sources, 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) Avoidance or minimization of 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.).

Based on our evaluation of the Navy's proposed measures, as well as other measures considered by NMFS or recommended by the public, NMFS has determined preliminarily that the Navy's proposed mitigation measures (especially when the adaptive management component is taken into consideration (see Adaptive Management, below)) are adequate means of effecting the least practicable adverse impacts on marine mammals species or stocks and their habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance, while also considering personnel safety, practicality of implementation, and impact on the effectiveness of the military readiness activity. Further detail is included below.

The proposed rule comment period will afford the public an opportunity to submit recommendations, views, and/or concerns regarding this action and the proposed mitigation measures. While NMFS has determined preliminarily that the Navy's proposed mitigation measures would effect the least practicable adverse impact on the affected species or stocks and their habitat, NMFS will consider all public comments to help inform our final decision. Consequently, the proposed mitigation measures may be refined, modified, removed, or added to prior to the issuance of the final rule based on public comments received, and where appropriate, further analysis of any additional mitigation measures.

Monitoring

In order to issue an ITA for an activity, Section 101(a)(5)(A) of the MMPA states that NMFS must set forth ''requirements pertaining to the monitoring and reporting of such taking.'' The MMPA implementing regulations at 50 CFR 216.104 (a)(13) indicate that requests for LOAs must include the suggested means of accomplishing the necessary monitoring and reporting that will result in increased knowledge of the species and of the level of taking or impacts on populations of marine mammals that are expected to be present.

Monitoring measures prescribed by NMFS should accomplish one or more of the following general goals:

(1) An increase in the probability of detecting marine mammals, both within the safety zone (thus allowing for more effective implementation of the mitigation) and in general to generate more data to contribute to the analyses mentioned below

(2) An increase in our understanding of how many marine mammals are likely to be exposed to levels of sonar and other active acoustic sources (or explosives or other stimuli) that we associate with specific adverse effects, such as behavioral harassment, TTS, or PTS.

(3) An increase in our understanding of how marine mammals respond to sonar and other active acoustic sources (at specific received levels), explosives, or other stimuli expected to result in take and how anticipated adverse effects on individuals (in different ways and to varying degrees) may impact the population, species, or stock (specifically through effects on annual rates of recruitment or survival) through any of the following methods:

- Behavioral observations in the presence of sonar and other active acoustic sources compared to observations in the absence of sonar (need to be able to accurately predict received level and report bathymetric conditions, distance from source, and other pertinent information)
- Physiological measurements in the presence of sonar and other active acoustic sources compared to observations in the absence of tactical sonar (need to be able to accurately predict received level and report

bathymetric conditions, distance from source, and other pertinent information)

- Pre-planned and thorough investigation of stranding events that occur coincident to naval activities
- Distribution and/or abundance comparisons in times or areas with concentrated sonar and other active acoustic sources versus times or areas without sonar and other active acoustic sources
- An increased knowledge of the affected species
- An increase in our understanding of the effectiveness of certain mitigation and monitoring measures.

Overview of Navy Monitoring Program

The current Navy monitoring program is composed of a collection of ''range-specific'' monitoring plans, each developed individually as part of the previous MMPA/ESA authorization processes. These individual plans established specific monitoring requirements for each range complex based on a set of effort-based metrics (e.g., 20 days of aerial survey). Concurrent with implementation of the initial range-specific monitoring plans, the Navy and NMFS began development of the Integrated Comprehensive Monitoring Program (ICMP). The ICMP has been developed in direct response to Navy permitting requirements established in various MMPA final rules, ESA consultations, Biological Opinions, and applicable regulations. The ICMP is intended to coordinate monitoring efforts across all regions and to allocate the most appropriate level and type of effort for each range complex based on a set of standardized objectives, and in acknowledgement of regional expertise and resource availability. The ICMP is designed to be flexible, scalable, and adaptable plan, through the adaptive management and strategic planning processes to periodically assess progress, and re-evaluate objectives.

Although the ICMP does not specify actual monitoring field work or projects, it does establish top-level goals that have been developed in coordination with NMFS. As the ICMP is implemented, detailed and specific studies will be developed which support the Navy's top-level monitoring goals. In essence, the ICMP directs that monitoring activities relating to the effects of Navy training and testing activities on marine species should be designed to accomplish one or more of the following top-level goals:

- An increase in our understanding of the likely occurrence of marine mammals and/or ESA-listed marine species in the vicinity of the action (i.e., presence, abundance, distribution, and/or density of species);
- An increase in our understanding of the nature, scope, or context of the likely exposure of marine mammals and/or ESA-listed species to any of the potential stressor(s) associated with the action (e.g., tonal and impulsive sound), through better understanding of one or more of the following: (1) The action and the environment in which it occurs (e.g., sound source characterization, propagation, and ambient noise levels); (2) the affected species (e.g., life history or dive patterns); (3) the likely co-occurrence of marine mammals and/or ESA-listed marine species with the action (in whole or part) associated with specific adverse effects, and/or; (4) the likely biological or behavioral context of exposure to the stressor for the marine mammal and/or ESA-listed marine species (e.g., age class of exposed animals or known pupping, calving or feeding areas);
- An increase in our understanding of how individual marine mammals or ESA-listed marine species respond (behaviorally or physiologically) to the specific stressors associated with the action (in specific contexts, where possible, e.g., at what distance or received level);
- An increase in our understanding of how anticipated individual responses, to individual stressors or anticipated combinations of stressors, may impact either: (1) The long-term fitness and survival of an individual; or (2) the population, species, or stock (e.g., through effects on annual rates of recruitment or survival);
- An increase in our understanding of the effectiveness of mitigation and monitoring measures;
- A better understanding and record of the manner in which the authorized entity complies with the ITA and Incidental Take Statement;
- An increase in the probability of detecting marine mammals (through improved technology or methods), both specifically within the safety zone (thus allowing for more effective implementation of the mitigation) and in general, to better achieve the above goals; and
- A reduction in the adverse impact of activities to the least practicable level, as defined in the MMPA.

While the ICMP only directly applies to monitoring activities under applicable MMPA and ESA authorizations, it also serves to facilitate coordination among the Navy's marine species monitoring program and the basic and applied research programs discussed in the Research Section of this document.

An October 2010 Navy monitoring meeting initiated a process to critically evaluate current Navy monitoring plans and begin development of revisions to existing range-specific monitoring plans and associated updates to the ICMP. Discussions at that meeting and through the Navy/NMFS adaptive management process established a way ahead for continued refinement of the Navy's monitoring program. This process included establishing a Scientific Advisory Group (SAG) composed of technical experts to provide objective scientific guidance for Navy consideration. The Navy established the SAG in early 2011 with the initial task of evaluating current Navy monitoring approaches under the ICMP and existing LOAs and developing objective scientific recommendations that would serve as the basis for a Strategic Planning Process for Navy monitoring to be incorporated as a major component of the ICMP. The SAG convened in March 2011, composed of leading academic and civilian scientists with significant expertise in marine species monitoring, acoustics, ecology, and modeling. The SAG's final report laid out both over-arching and range-specific recommendations for the Navy's Marine Species Monitoring program and is available through the US Navy Marine Species Monitoring web portal at *http://www.navymarinespeciesmonitoring.us/*. Adaptive management discussions between the Navy and NMFS established a way ahead for continued refinement of the Navy's monitoring program. Consensus was that the ICMP and associated implementation components would continue the evolution of Navy marine species monitoring towards a single integrated program, incorporate SAG recommendations when appropriate and logistically feasible, and establish a more collaborative framework for evaluating, selecting, and implementing future monitoring across the all Navy range complexes through the adaptive management and strategic planning process.

Past and Current Monitoring in the AFTT Study Area

NMFS has received multiple years' worth of annual exercise and monitoring reports addressing active sonar use and explosive detonations within the AFTT Study Area. The data and information contained in these reports have been considered in developing mitigation and monitoring measures for the proposed training and testing activities within the AFTT Study Area. The Navy's annual exercise and monitoring reports may be viewed at: *http://www.nmfs.noaa.gov/pr/permits/incidental.htm#applications*; or at the Navy's marine species monitoring Web site: *http://www.navymarinespeciesmonitoring.us/*.

NMFS has reviewed these reports and summarized the results, as related to marine mammal monitoring, below.

(1) The Navy has shown significant initiative in developing its marine species monitoring program and made considerable progress toward reaching goals and objectives of the ICMP.

(2) Observation data from watchstanders aboard Navy vessels is generally useful to indicate the presence or absence of marine mammals within the mitigation zones (and sometimes without) and to document the implementation of mitigation measures, but does not provide useful species-specific information or behavioral data.

(3) Data gathered by experienced marine mammal observers can provide very valuable information at a level of detail not possible with watchstanders.

(4) Though it is by no means conclusive, it is worth noting that no instances of obvious behavioral disturbance have been observed by Navy watchstanders or experienced marine mammal observers conducting visual monitoring.

(5) Visual surveys generally provide suitable data for addressing questions of distribution and abundance of marine mammals but are much less effective at providing information on movements and behavior, with a few notable exceptions where sightings are most frequent.

(6) Passive acoustics and animal tagging have significant potential for applications addressing animal movements and behavioral response to Navy training activities but require a longer time horizon and heavy investment in analysis to produce relevant results.

(7) NMFS and the Navy should more carefully consider what and how information should be gathered during training exercises and monitoring events, as some reports contain different information, making cross-report comparisons difficult.

The Navy has invested over $10M in monitoring activities in the AFAST and east coast range complex portions of AFTT Study Area since 2009 and has accomplished the following:

• Covered over 150,000 km of visual survey effort;
• Sighted over 30,000 individual marine mammals;
• Monitored 20 individual training exercise events;
• Taken over 23,000 digital photos;
• Collected over 100 biopsy samples;
• Deployed 11 DTags and conducted 6 playback exposures on short finned pilot whales;
• Made 23 HARP deployments and collected over 28,000 hours of passive acoustic recordings;
• Deployed 3 temporary bottom-mounted passive acoustic arrays during training exercises.

In addition, 518 sightings for an estimated 2,645 marine mammals were reported by watchstanders aboard navy ships within the AFTT Study Area from 2009 to 2012. These observations were mainly during major at-sea training events and there were no reported observations of adverse reactions by marine mammals and no dead or injured animals reported associated with navy training activities.

Proposed Monitoring for the AFTT Study Area

Based on discussions between the Navy and NMFS, future monitoring would address the ICMP top-level goals through a collection of specific regional and ocean basin studies based on scientific objectives. Quantitative metrics of monitoring effort (e.g., 20 days of aerial survey) would not be a specific requirement. The adaptive management process and reporting requirements would serve as the basis for evaluating performance and compliance, primarily considering the quality of the work and results produced as well as peer review and publications, and public dissemination of information, reports, and data. The strategic planning process (see below) would be used to set intermediate scientific objectives, identify potential species of interest at a regional scale, and evaluate and select specific monitoring projects to fund or continue supporting for a given fiscal year. The strategic planning process would also address relative investments to different range complexes based on goals across all range complexes, and monitoring would leverage multiple techniques for data acquisition and analysis whenever possible.

Research

Overview

The Navy is working towards a better understanding of marine mammals and sound in ways that are not directly related to the MMPA process. The Navy highlights some of those ways in the section below. Further, NMFS is working on a long-term stranding study that will be supported by the Navy by way of a funding and information sharing component (see below).

Navy Research

The Navy is one of the world's leading organizations in assessing the effects of human activities on the marine environment, and provides a significant amount of funding and support to marine research. They also develop approaches to ensure that these resources are minimally impacted by current and future Navy operations. Navy scientists work cooperatively with other government researchers and scientists, universities, industry, and non-governmental conservation organizations in collecting, evaluating, and modeling information on marine resources, including working towards a better understanding of marine mammals and sound. From 2004 to 2012, the Navy has provided over $230 million for marine species research. The U.S. Navy sponsors 70 percent of all U.S. research concerning the effects of human-generated sound on marine mammals and 50 percent of such research conducted worldwide. Major topics of Navy-supported marine species research directly applicable to AFTT activities include the following:

• Better understanding of marine species distribution and important habitat areas;
• Developing methods to detect and monitor marine species before and during training;
• Understanding the impacts of sound on marine mammals, sea turtles, fish, and birds;
• Developing tools to model and estimate potential impacts of sound.

It is imperative that the Navy's research and development (R&D) efforts related to marine mammals are conducted in an open, transparent manner with validated study needs and requirements. The goal of the Navy's R&D program is to enable collection and publication of scientifically valid research as well as development of techniques and tools for Navy, academic, and commercial use. The two Navy organizations that account for most funding and oversight of the Navy marine mammal research program are the Office of Naval Research (ONR) Marine Mammals and Biology (MMB) Program, and the Office of the Chief of Naval Operations (CNO) Energy and Environmental Readiness Division (N45) Living Marine Resources (LMR) Program. The primary focus of these programs has been on understanding the effects of sound on marine mammals, including physiological, behavioral and ecological effects.

The ONR Marine Mammals and Biology program supports basic and applied research and technology development related to understanding the effects of sound on marine mammals, including physiological, behavioral, ecological effects and population-level effects. Current program thrusts include, but are not limited to:

- Monitoring and detection;
- Integrated ecosystem research including sensor and tag development;
- Effects of sound on marine life [including hearing, behavioral response studies, diving and stress, physiology, and Population Consequences of Acoustic Disturbance (PCAD); and
- Models and databases for environmental compliance.

The mission of the LMR program is to develop, demonstrate, and assess information and technology solutions to protect living marine resources by minimizing the environmental risks of Navy at-sea training and testing activities while preserving core Navy readiness capabilities. This mission is accomplished by:

- Providing science-based information to support Navy environmental effects assessments for research, development, acquisition, testing and evaluation (RDAT&E) as well as Fleet at-sea training, exercises, maintenance and support activities;
- Improving knowledge of the status and trends of marine species of concern and the ecosystems of which they are a part;
- Developing the scientific basis for the criteria and thresholds to measure the effects of Navy generated sound;
- Improving understanding of underwater sound and sound field characterization unique to assessing the biological consequences resulting from underwater sound (as opposed to tactical applications of underwater sound or propagation loss modeling for military communications or tactical applications); and
- Developing technologies and methods to monitor and, where possible, mitigate biologically significant consequences to living marine resources resulting from naval activities, emphasizing those consequences that are most likely to be biologically significant.

The program is focused on three primary objectives that influence program management priorities and directly affect the program's success in accomplishing its mission:

(1) Collect, Validate and Rank R&D Needs: Expand awareness of R&D program opportunities within the Navy marine resource community to encourage and facilitate the submittal of well-defined and appropriate needs statements.

(2) Address High Priority Needs: Ensure that program investments and the resulting projects maintain a direct and consistent link to the defined user needs.

(3) Transition Solutions and Validate Benefits: Maximize the number of program-derived solutions that are successfully transitioned to the Fleet and system commands (SYSCOMs). The LMR program primarily invests in the following areas:

- Developing Data to Support Risk Threshold Criteria;
- Improved Data Collection on Protected Species, Critical Habitat within Navy Ranges;
- New Monitoring and Mitigation Technology Demonstrations;
- Database and Model Development;
- Education and Outreach, Emergent Opportunities.

The Navy has also developed the technical reports and supporting data referenced used for analysis in the AFTT EIS/OEIS and this proposed rule, which include the Navy Marine Species Density Database (NMSDD), Acoustic Criteria and Thresholds, and Determination of Acoustic Effects on Marine Mammals and Sea Turtles. Furthermore, research cruises by the NMFS and by academic institutions have received funding from the U.S. Navy. For instance, the ONR contributed financially to the Sperm Whale Seismic Study (SWSS) in the Gulf of Mexico, and CNO–N45 currently supports the Atlantic Marine Assessment Program for Protected Species (AMAPPS). Both the ONR and CNO–N45 programs are partners in the multi-year Southern California Behavioral Response Study (SOCAL–BRS). All of this research helps in understanding the marine environment and the effects that may arise from underwater noise in the oceans. Further, NMFS is working on a long-term stranding study that will be supported by the Navy by way of a funding and information sharing component (see below).

Adaptive Management and Strategic Planning Process

The final regulations governing the take of marine mammals incidental to Navy training and testing exercises in the AFTT Study Area would continue to contain an adaptive management component carried over from previous authorizations. Although better than five years ago, our understanding of the effects of Navy training and testing (e.g., sonar and other active acoustic sources and explosives) on marine mammals is still relatively limited, and yet the science in this field is evolving fairly quickly. 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 AFTT Study Area). The proposed reporting requirements are designed to provide NMFS with monitoring data from the previous year, which allows NMFS to consider whether any changes are appropriate. NMFS and the Navy would meet to discuss the monitoring reports, Navy R&D developments, and current science and whether mitigation or monitoring modifications are appropriate. The use of adaptive management would allow the Navy and NMFS to consider new data from different sources to determine if modified mitigation or monitoring measures are warranted (including possible additions or deletions). Mitigation and monitoring measures could be modified, added, or deleted if new data suggests that such modifications would have a reasonable likelihood of reducing adverse effects on marine mammals and if the measures are practicable.

The following are some of the possible sources of applicable data to be considered through the adaptive management process: (1) Results from monitoring and exercises reports; (2) compiled results of Navy funded research and development (R&D) studies; (3) results from specific stranding investigations; (4) results from general marine mammal and sound research; and (5) any information which reveals that marine mammals may have been taken in a manner, extent or number not authorized by these regulations or subsequent LOAs.

The Navy is currently establishing a strategic planning process under the ICMP in coordination with NMFS. The objective of the strategic planning process is to guide the continued evolution of Navy marine species monitoring towards a single integrated program, incorporating expert review and recommendations, and establishing a more structured and collaborative framework for evaluating, selecting, and implementing future monitoring across the all Navy range complexes. The Strategic Plan is intended to be a primary component of the ICMP and provide a ''vision'' for Navy monitoring across geographic regions—serving as guidance for determining how to most efficiently and effectively invest the marine species monitoring resources to address ICMP top-level goals and satisfy MMPA monitoring requirements.

This process is being designed to integrate various elements including:

- Integrated Comprehensive monitoring Program top-level goals;
- Scientific Advisory Group recommendations;
- Integration of regional scientific expert input;
- Ongoing adaptive management review dialog between NMFS and Navy;
- Lessons learned from past and future monitoring at Navy training and testing ranges;
- Leveraged research and lessons learned from other Navy funded marine science programs

NMFS and the Navy continue to coordinate on the strategic planning process through the regulatory process of this proposed rule; however, these discussions are still ongoing and we anticipate that more specific details will be available by the time it is finalized in advance of the issuance of the final rule. Additionally, the process and associated monitoring requirements may be modified or supplemented based on comments or new information received from the public during the public comment period.

Reporting

In order to issue an ITA for an activity, Section 101(a)(5)(A) of the MMPA states that NMFS must set forth ''requirements pertaining to the monitoring and reporting of such taking.'' Effective reporting is critical both to compliance as well as ensuring that the most value is obtained from the required monitoring. Some of the reporting requirements are still in development and the final rule may contain additional details not contained in the proposed rule. Additionally, proposed reporting requirements may be modified, eliminated, or added based on information or comments received during the public comment period. Reports from individual monitoring events, results of analyses, publications, and periodic progress reports for specific monitoring projects will be posted to the U.S. Navy Marine Species Monitoring web portal as they become available. Currently, there are several specific reporting requirements pursuant to these proposed regulations:

General Notification of Injured or Dead Marine Mammals

Navy personnel would ensure that NMFS (regional stranding coordinator) is notified immediately (or as soon as clearance procedures allow) if an injured or dead marine mammal is found during or shortly after, and in the vicinity of, any Navy training exercise utilizing MFAS, HFAS, or underwater explosive detonations. The Navy would provide NMFS with species identification or description of the animal(s), the condition of the animal(s) (including carcass condition if the animal is dead), location, time of first discovery, observed behaviors (if alive), and photographs or video (if available). The AFTT Stranding Response Plan would contain more specific reporting requirements for specific circumstances.

Annual Monitoring and Exercise Report

As noted above, reports from individual monitoring events, results of analyses, publications, and periodic progress reports for specific monitoring projects would be posted to the Navy's Marine Species Monitoring web portal as they become available. Progress and results from all monitoring activity conducted within the AFTT Study Area, as well as required Major Training Event exercise activity, would be summarized in an annual report. A draft of this report would be submitted to NMFS for review by April 15 of each year. NMFS would review the report and provide comments for incorporation within 3 months.

Comprehensive Monitoring and Exercise Summary Report

The Navy would submit to NMFS a draft report that analyzes, compares, and summarizes all multi-year marine mammal data gathered during training and testing exercises for which individual annual reports are required under the proposed regulations. This report would be submitted at the end of the fourth year of the rule (December 2018), covering activities that have occurred through June 1, 2018. The Navy would respond to NMFS comments on the draft comprehensive report if submitted within 3 months of receipt. The report will be considered final after the Navy has addressed NMFS' comments, or 3 months after the submittal of the draft if NMFS does not provide comments.

Estimated Take of Marine Mammals

In the potential effects section, NMFS' analysis identified the lethal responses, physical trauma, sensory impairment (PTS, TTS, and acoustic masking), physiological responses (particular stress responses), and behavioral responses that could potentially result from exposure to sonar and other active acoustic sources and explosives and other impulsive sources. In this section, we will relate the potential effects to marine mammals from these sound sources to the MMPA regulatory definitions of Level A and Level B Harassment and attempt to quantify the effects that might occur from the specific training and testing activities that the Navy proposes in the AFTT Study Area.

As mentioned previously, behavioral responses are context-dependent, complex, and influenced to varying degrees by a number of factors other than just received level. For example, an animal may respond differently to a sound emanating from a ship that is moving towards the animal than it would to an identical received level coming from a vessel that is moving away, or to a ship traveling at a different speed or at a different distance from the animal. At greater distances, though, the nature of vessel movements could also potentially not have any effect on the animal's response to the sound. In any case, a full description of the suite of factors that elicited a behavioral response would require a mention of the vicinity, speed and movement of the vessel, or other factors. So, while sound sources and the received levels are the primary focus of the analysis and those that are laid out quantitatively in the regulatory text, it is with the understanding that other factors related to the training are sometimes contributing to the behavioral responses of marine mammals, although they cannot be quantified.

Definition of Harassment

As mentioned previously, 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].

Level B Harassment

Of the potential effects that were described in the Potential Effects of Exposure of Marine Mammal to Non-Impulsive and Impulsive Sound Sources Section, the following are the types of effects that fall into the Level B Harassment category:

Behavioral Harassment—Behavioral disturbance that rises to the level described in the definition above, when resulting from exposures to non-impulsive or impulsive sound, is considered Level B Harassment. Some of the lower level physiological stress responses discussed earlier would also likely co-occur with the predicted harassments, although these responses are more difficult to detect and fewer data exist relating these responses to specific received levels of sound. When Level B Harassment is predicted based on estimated behavioral responses, those takes may have a stress-related physiological component as well.

Earlier in this document, we described the Southall *et al.,* (2007) severity scaling system and listed some examples of the three broad categories of behaviors: 0–3 (Minor and/or brief behaviors); 4–6 (Behaviors with higher potential to affect foraging, reproduction, or survival); 7–9 (Behaviors considered likely to affect the aforementioned vital rates). Generally speaking, MMPA Level B Harassment, as defined in this document, would include the behaviors described in the 7–9 category, and a subset, dependent on context and other considerations, of the behaviors described in the 4–6 categories. Behavioral harassment does not generally include behaviors ranked 0–3 in Southall *et al.,* (2007).

Acoustic Masking and Communication Impairment—Acoustic masking is considered Level B Harassment as it can disrupt natural behavioral patterns by interrupting or limiting the marine mammal's receipt or transmittal of important information or environmental cues.

TTS—As discussed previously, TTS can affect how an animal behaves in response to the environment, including conspecifics, predators, and prey. The following physiological mechanisms are thought to play a role in inducing auditory fatigue: Effects to sensory hair cells in the inner ear that reduce their sensitivity, modification of the chemical environment within the sensory cells, residual muscular activity in the middle ear, displacement of certain inner ear membranes, increased blood flow, and post-stimulatory reduction in both efferent and sensory neural output. Ward (1997) suggested that when these effects result in TTS rather than PTS, they are within the normal bounds of physiological variability and tolerance and do not represent a physical injury. Additionally, Southall *et al.* (2007) indicate that although PTS is a tissue injury, TTS is not because the reduced hearing sensitivity following exposure to intense sound results primarily from fatigue, not loss, of cochlear hair cells and supporting structures and is reversible. Accordingly, NMFS classifies TTS (when resulting from exposure sonar and other active acoustic sources and explosives and other impulsive sources) as Level B Harassment, not Level A Harassment (injury).

Level A Harassment

Of the potential effects that were described earlier, following are the types of effects that fall into the Level A Harassment category:

PTS—PTS (resulting either from exposure to sonar and other active acoustic sources or explosive detonations) is irreversible and 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.

Tissue Damage due to Acoustically Mediated Bubble Growth—A few theories suggest ways in which gas bubbles become enlarged through exposure to intense sounds (sonar and other active acoustic sources) to the point where tissue damage results. In rectified diffusion, exposure to a sound field would cause bubbles to increase in size. A short duration of sonar pings (such as that which an animal exposed to MFAS would be most likely to encounter) would not likely be long enough to drive bubble growth to any substantial 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. The degree of supersaturation and exposure levels observed to cause microbubble destabilization are unlikely to occur, either alone or in concert because of how close an animal would need to be to the sound source to be exposed to high enough levels, especially considering the likely avoidance of the sound source and the required mitigation. Still, possible tissue damage from either of these processes would be considered an injury.

Tissue Damage due to Behaviorally Mediated Bubble Growth—Several authors suggest mechanisms in which marine mammals could behaviorally respond to exposure to sonar and other active acoustic sources 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.) In this scenario, the rate of ascent would need to be sufficiently rapid to compromise behavioral or physiological protections against nitrogen bubble formation.

There is considerable disagreement among scientists as to the likelihood of this phenomenon (Piantadosi and Thalmann, 2004; Evans and Miller, 2003). Although it has been argued that traumas from recent beaked whale strandings are consistent with gas emboli and bubble-induced tissue separations (Jepson *et al.,* 2003; Fernandez *et al.,* 2005), nitrogen bubble formation as the cause of the traumas has not been verified. If tissue damage does occur by this phenomenon, it would be considered an injury.

Physical Disruption of Tissues Resulting from Explosive Shock Wave—Physical damage of tissues resulting from a shock wave (from an explosive detonation) 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.

Vessel or Ordnance Strike—Vessel strike or ordnance strike associated with the specified activities would be considered Level A harassment, serious injury, or mortality.

Take Criteria

For the purposes of an MMPA authorization, three types of take are identified: Level B Harassment; Level A Harassment; and mortality (or serious injury leading to mortality). The categories of marine mammal responses (physiological and behavioral) that fall into the two harassment categories were described in the previous section.

Because the physiological and behavioral responses of the majority of the marine mammals exposed to non-impulse and impulse sounds cannot be detected or measured (not all responses visible external to animal, portion of exposed animals underwater (so not visible), many animals located many miles from observers and covering very large area, etc.) and because NMFS must authorize take prior to the impacts on marine mammals, a method is needed to estimate the number of individuals that will be taken, pursuant to the MMPA, based on the proposed action. To this end, the Navy's application and the AFTT DEIS/OEIS contain proposed acoustic criteria and thresholds that would, in some instances, represent changes from what NMFS has used to evaluate the Navy's proposed activities for past incidental take authorizations. The revised thresholds are based on evaluations of recent scientific studies; a detailed explanation of how they were derived is provided in the AFTT DEIS/OEIS Criteria and Thresholds Technical Report. NMFS is currently updating and revising all of its acoustic criteria and thresholds. Until that process is complete, NMFS will continue its long-standing practice of considering specific modifications to the acoustic criteria and thresholds currently employed for incidental take authorizations only after providing the public with an opportunity for review and comment. NMFS is requesting comments on all aspects of the proposed rule, and specifically requests comment on the proposed acoustic criteria and thresholds. The acoustic criteria for non-impulse and impulse sounds are discussed below.

Non-Impulse Acoustic Criteria

NMFS utilizes three acoustic criteria for non-impulse sounds: PTS (injury—Level A Harassment), TTS (Level B Harassment), and behavioral harassment (Level B Harassment). Because the TTS and PTS criteria are derived similarly and the PTS criteria were extrapolated from the TTS data, the TTS and PTS acoustic criteria will be presented first, before the behavioral criteria.

For more information regarding these criteria, please see the Navy's DEIS/OEIS for AFTT.

Level B Harassment Threshold (TTS)

Behavioral disturbance, acoustic masking, and TTS are all considered Level B Harassment. Marine mammals would usually be behaviorally disturbed at lower received levels than those at which they would likely sustain TTS, so the levels at which behavioral disturbance are likely to occur is considered the onset of Level B Harassment. The behavioral responses of marine mammals to sound are variable, context specific, and, therefore, difficult to quantify (see Risk Function section, below). Alternately, TTS is a physiological effect that has been studied and quantified in laboratory conditions. Because data exist to support an estimate of the received levels at which marine mammals will incur TTS, NMFS uses an acoustic criteria to estimate the number of marine mammals that might sustain TTS. TTS is a subset of Level B Harassment (along with sub-TTS behavioral harassment) and we are not specifically required to estimate those numbers; however, the more specifically we can estimate the affected marine mammal responses, the better the analysis.

Level A Harassment Threshold (PTS)

For acoustic effects, because the tissues of the ear appear to be the most susceptible to the physiological effects of sound, and because threshold shifts tend to occur at lower exposures than other more serious auditory effects, NMFS has determined that PTS is the best indicator for the smallest degree of injury that can be measured. Therefore, the acoustic exposure associated with onset-PTS is used to define the lower limit of Level A harassment.

PTS data do not currently exist for marine mammals and are unlikely to be obtained due to ethical concerns. However, PTS levels for these animals may be estimated using TTS data from marine mammals and relationships between TTS and PTS that have been discovered through study of terrestrial mammals.

We note here that behaviorally mediated injuries (such as those that have been hypothesized as the cause of some beaked whale strandings) could potentially occur in response to received levels lower than those believed to directly result in tissue damage. As mentioned previously, data to support a quantitative estimate of these potential effects (for which the exact mechanism is not known and in which factors other than received level may play a significant role) does not exist. However, based on the number of years (more than 60) and number of hours of MFAS per year that the U.S. (and other countries) has operated compared to the reported (and verified) cases of associated marine mammal strandings, NMFS believes that the probability of these types of injuries is very low. Tables 13 and 14 provide a summary of non-impulsive and impulsive thresholds to TTS and PTS for marine mammals. A detailed explanation of how these thresholds were derived is provided in the AFTT DEIS/OEIS Criteria and Thresholds Technical Report (*http://aftteis.com/DocumentsandReferences/AFTTDocuments/SupportingTechnicalDocuments.aspx*) and summarized in Chapter 6 of the Navy's LOA application (*http://www.nmfs.noaa.gov/pr/permits/incidental.htm#applications*).

TABLE 13—ONSET TTS AND PTS THRESHOLDS FOR NON-IMPULSE SOUND

Group	Species	Onset TTS	Onset PTS
Low-Frequency Cetaceans	All mysticetes	178 dB re 1μPa^2-sec(LF_{II})	198 dB re 1μPa^2-sec(LF_{II}).
Mid-Frequency Cetaceans	Most delphinids, beaked whales, medium and large toothed whales.	178 dB re 1μPa^2-sec(MF_{II})	198 dB re 1μPa^2-sec(MF_{II}).
High-Frequency Cetaceans	Porpoises, Kogia spp.	152 dB re 1μPa^2-sec(HF_{II})	172 dB re 1μPa^2-secSEL (HF_{II}).
Phocidae In-water	Harbor, Gray, Bearded, Harp, Hooded, and Ringed seals.	183 dB re 1μPa^2-sec(P_{WI})	197 dB re 1μPa^2-sec(P_{WI}).

TABLE 14—IMPULSIVE SOUND EXPLOSIVE CRITERIA AND THRESHOLDS FOR PREDICTING ONSET INJURY AND MORTALITY

Group	Species	Onset TTS	Onset PTS	Onset GI tract injury	Onset slight lung	Onset mortality (1% mortality)
Low-frequency Cetaceans.	All mysticetes	172 dB SEL (LF_{II}) or 224 dB Peak SPL.	187 dB SEL (LF_{II}) or 230 dB Peak SPL.	237 dB SPL (unweighted)	Equation 1.	Equation 2.
Mid-frequency Cetaceans.	Most delphinids, medium and large toothed whales.	172 dB SEL (MF_{II}) or 224 dB Peak SPL.	187 dB SEL (MF_{II}) or 230 dB Peak SPL.			
High-frequency Cetaceans.	Porpoises and *Kogia* spp..	146 dB SEL (HF_{II}) or 195 dB Peak SPL.	161 dB SEL (HF_{II}) or 201dB Peak SPL.			

TABLE 14—IMPULSIVE SOUND EXPLOSIVE CRITERIA AND THRESHOLDS FOR PREDICTING ONSET INJURY AND MORTALITY—Continued

Group	Species	Onset TTS	Onset PTS	Onset GI tract injury	Onset slight lung	Onset mortality (1% mortality)
Phocidae	Harbor, Gray, Bearded, Harp, Hooded, and Ringed seals.	177 dB SEL (P_{WI}) or 212 dB Peak SPL.	192 dB SEL (P_{WI}) or 218 dB Peak SPL.			

Equation 1:

$= 39.1M^{1/3} (1+[D_{Rm}/10.081])^{1/2}$ Pa-sec

Equation 2:

$= 91.4M^{1/3} (1+[D_{Rm}/10.081])^{1/2}$ Pa-sec

Where:

M = mass of the animals in kg.

D_{Rm} = depth of the receiver (animal) in meters.

SPL = sound pressure level.

Level B Harassment Risk Function (Behavioral Harassment)

In 2006, NMFS issued the first MMPA authorization to allow the take of marine mammals incidental to MFAS (to the Navy for RIMPAC). For that authorization, NMFS used 173 dB SEL as the criterion for the onset of behavioral harassment (Level B Harassment). This type of single number criterion is referred to as a step function, in which (in this example) all animals estimated to be exposed to received levels above 173 dB SEL would be predicted to be taken by Level B Harassment and all animals exposed to less than 173 dB SEL would not be taken by Level B Harassment. As mentioned previously, marine mammal behavioral responses to sound are highly variable and context specific (affected by differences in acoustic conditions; differences between species and populations; differences in gender, age, reproductive status, or social behavior; or the prior experience of the individuals), which does not support the use of a step function to estimate behavioral harassment.

Unlike step functions, acoustic risk continuum functions (which are also called ''exposure-response functions,'' ''dose-response functions,'' or ''stress-response functions'' in other risk assessment contexts) allow for probability of a response that NMFS would classify as harassment to occur over a range of possible received levels (instead of one number) and assume that the probability of a response depends first on the ''dose'' (in this case, the received level of sound) and that the probability of a response increases as the ''dose'' increases (see Figures 6–5 and 6–6 in the LOA application). In January 2009, NMFS issued three final rules governing the incidental take of marine mammals (within Navy's HRC, SOCAL, and Atlantic Fleet Active Sonar Training (AFAST)) that used a risk continuum to estimate the percent of marine mammals exposed to various levels of MFAS that would respond in a manner NMFS considers harassment.

The Navy and NMFS have previously used acoustic risk functions to estimate the probable responses of marine mammals to acoustic exposures for other training and research programs. Examples of previous application include the Navy FEISs on the SURTASS LFA sonar (U.S. Department of the Navy, 2001c); the North Pacific Acoustic Laboratory experiments conducted off the Island of Kauai (Office of Naval Research, 2001), and the Supplemental EIS for SURTASS LFA sonar (U.S. Department of the Navy, 2007d). As discussed earlier, factors other than received level (such as distance from or bearing to the sound source) can affect the way that marine mammals respond; however, data to support a quantitative analysis of those (and other factors) do not currently exist. NMFS will continue to modify these criteria as new data that meet NMFS standards of quality become available and can be appropriately and effectively incorporated.

The particular acoustic risk functions developed by NMFS and the Navy (see Figures 6–5 and 6–6 in the LOA application) estimate the probability of behavioral responses to MFAS/HFAS (interpreted as the percentage of the exposed population) that NMFS would classify as harassment for the purposes of the MMPA given exposure to specific received levels of MFAS/HFAS. The mathematical function (below) underlying this curve is a cumulative probability distribution adapted from a solution in Feller (1968) and was also used in predicting risk for the Navy's SURTASS LFA MMPA authorization as well.

$$R = \frac{1 - \left(\frac{L-B}{K}\right)^{-A}}{1 - \left(\frac{L-B}{K}\right)^{-2A}}$$

Where:

R = Risk (0–1.0)

L = Received level (dB re: 1 μPa)

B = Basement received level = 120 dB re: 1 μPa

K = Received level increment above B where 50-percent risk = 45 dB re: 1 μPa

A = Risk transition sharpness parameter = 10 (odontocetes and pinnipeds) or 8 mysticetes)

Detailed information on the above equation and its parameters is available in the AFTT DEIS/OEIS and previous Navy documents listed above.

The inclusion of a special behavioral response criterion for beaked whales of the family Ziphiidae is new to these criteria. It has been speculated for some time that beaked whales might have unusual sensitivities to sonar sound due to their likelihood of stranding in conjunction with MFAS use, even in areas where other species were more abundant (D'Amico *et al.* 2009), but there were not sufficient data to support a separate treatment for beaked whales until recently. With the recent publication of results from Blainville's beaked whale monitoring and experimental exposure studies on the instrumented Atlantic Undersea Test and Evaluation Center range in the Bahamas (McCarthy *et al.* 2011; Tyack *et al.* 2011), there are now statistically strong data suggesting that beaked whales tend to avoid both actual naval MFAS in real anti-submarine training scenarios as well as sonar-like signals and other signals used during controlled sound exposure studies in the same area. An unweighted 140 dB re 1 μPa sound pressure level threshold has been adopted by the Navy for takes of all beaked whales (family: Ziphiidae).

If more than one impulsive event involving explosives (i.e., not pile driving) occurs within any given 24-hour period within a training or testing event, criteria are applied to predict the number of animals that may be taken by

Level B Harassment. For multiple impulsive events (with the exception of pile driving) the behavioral threshold used in this analysis is 5 dB less than the TTS onset threshold (in sound exposure level). This value is derived from observed onsets of behavioral response by test subjects (bottlenose dolphins) during non-impulse TTS testing (Schlundt *et al.* 2000). Some multiple impulsive events, such as certain naval gunnery exercises, may be treated as a single impulsive event because a few explosions occur closely spaced within a very short period of time (a few seconds). For single impulses at received sound levels below hearing loss thresholds, the most likely behavioral response is a brief alerting or orienting response. Since no further sounds follow the initial brief impulses, Level B take in the form of behavioral harassment beyond that associated with potential TTS would not be expected to occur. This reasoning was applied to previous shock trials (63 FR 66069; 66 FR 22450; 73 FR 43130). Explosive criteria and thresholds are summarized in Table 6–3 in the LOA application.

Since impulse events can be quite short, it may be possible to accumulate multiple received impulses at sound pressure levels considerably above the energy-based criterion and still not be considered a behavioral take. The Navy treats all individual received impulses as if they were one second long for the purposes of calculating cumulative sound exposure level for multiple impulse events. For example, five air gun impulses, each 0.1 second long, received at 178 dB sound pressure level would equal a 175 dB sound exposure level, and would not be predicted as leading to a take. However, if the five 0.1 second pulses are treated as a 5 second exposure, it would yield an adjusted value of approximately 180 dB, exceeding the threshold. For impulses associated with explosions that have durations of a few microseconds, this assumption greatly overestimates effects based on sound exposure level metrics such as TTS and PTS and behavioral responses. Appropriate weighting values will be applied to the received impulse in one-third octave bands and the energy summed to produce a total weighted sound exposure level value. For impulsive behavioral criteria, the Navy's new weighting functions (detailed in the LOA application) are applied to the received sound level before being compared to the threshold.

TABLE 15—BEHAVIORAL THRESHOLDS FOR IMPULSIVE SOUND

Hearing group	Impulsive behavioral threshold for >2 pulses/24 hrs
Low-Frequency Cetaceans	167 dB SEL (LF_{II}).
Mid-Frequency Cetaceans	167 dB SEL (MF_{II}).
High-Frequency Cetaceans	141 dB SEL (HF_{II}).
Phocid Seals (in water)	172 dB SEL (P_{WI}).

Existing NMFS criteria was applied to sounds generated by pile driving and airguns (Table 16).

TABLE 16—THRESHOLDS FOR PILE DRIVING AND AIRGUNS

Species groups	Underwater vibratory pile driving criteria (sound pressure level, dB re 1 μPa)		Underwater impact pile driving and airgun criteria (sound pressure level, dB re 1 μPa)	
	Level A injury threshold	Level B disturbance threshold	Level A injury threshold	Level B disturbance threshold
Cetaceans (whales, dolphins, porpoises)	180 dB rms	120 dB rms	180 dB rms	160 dB rms.
Pinnipeds (seals)	190 dB rms	120 dB rms	190 dB rms	160 dB rms.

Quantitative Modeling for Impulsive and Non-Impulsive Sound

The Navy performed a quantitative analysis to estimate the number of marine mammals that could be harassed by acoustic sources or explosives used during Navy training and testing activities. Inputs to the quantitative analysis included marine mammal density estimates; marine mammal depth occurrence distributions; oceanographic and environmental data; marine mammal hearing data; and criteria and thresholds for levels of potential effects. The quantitative analysis consists of computer-modeled estimates and a post-model analysis to determine the number of potential mortalities and harassments. The model calculates sound energy propagation from sonars, other active acoustic sources, and explosives during naval activities; the sound or impulse received by animat dosimeters representing marine mammals distributed in the area around the modeled activity; and whether the sound or impulse received by a marine mammal exceeds the thresholds for effects. The model estimates are then further analyzed to consider animal avoidance and implementation of mitigation measures, resulting in final estimates of effects due to Navy training and testing. This process results in a reduction of take numbers and is detailed in Chapter 6 (section 6.1.5) of the Navy's LOA application.

A number of computer models and mathematical equations can be used to predict how energy spreads from a sound source (e.g., sonar or underwater detonation) to a receiver (e.g., dolphin or sea turtle). Basic underwater sound models calculate the overlap of energy and marine life using assumptions that account for the many variables, and often unknown factors that can greatly influence the result. Assumptions in previous and current Navy models have intentionally erred on the side of overestimation when there are unknowns or when the addition of other variables was not likely to substantively change the final analysis. For example, because the ocean environment is extremely dynamic and information is often limited to a synthesis of data gathered over wide areas and requiring many years of research, known information tends to be an average of a seasonal or annual variation. The Equatorial Pacific El Nino disruption of the ocean-atmosphere system is an example of dynamic change where unusually warm ocean temperatures are likely to redistribute marine life and alter the propagation of underwater sound energy. Previous Navy modeling therefore made some assumptions indicative of a maximum theoretical propagation for sound energy (such as a perfectly reflective ocean surface and a flat seafloor). More complex computer models build upon basic modeling by factoring in additional variables in an effort to be more accurate by accounting for such things as bathymetry and an animal's likely presence at various depths.

The Navy has developed a set of data and new software tools for quantification of estimated marine mammal impacts from Navy activities. This new approach is the resulting evolution of the basic model previously used by the Navy and reflects a more complex modeling approach as described below. Although this more complex computer modeling approach accounts for various environmental factors affecting acoustic propagation, the current software tools do not consider the likelihood that a marine mammal would attempt to avoid repeated exposures to a sound or avoid an area of intense activity where a training or testing event may be focused. Additionally, the software tools do not consider the implementation of mitigation (e.g., stopping sonar transmissions when a marine mammal is within a certain distance of a ship or range clearance prior to detonations). In both of these situations, naval activities are modeled as though an activity would occur regardless of proximity to marine mammals and without any horizontal movement by the animal away from the sound source or human activities (e.g., without accounting for likely animal avoidance). Therefore, the final step of the quantitative analysis of acoustic effects is to consider the implementation of mitigation and the possibility that marine mammals would avoid continued or repeated sound exposures.

The quantified results of the marine mammal acoustic effects analysis presented in the Navy's LOA application differ from the quantified results presented in the AFTT DEIS/OEIS. Presentation of the results in this new manner for MMPA, ESA, and other regulatory analyses is well within the framework of the previous NEPA analyses presented in the DEIS. The differences are due to three main factors: (1) Changes to the tempo or location of certain proposed activities; (2) refinement to the modeling inputs for training and testing; and (3) additional post-model analysis of acoustic effects to include animal avoidance of repeated sound sources, avoidance of areas of activity before use of a sound source or explosive by sensitive species, and implementation of mitigation. The Navy's tempo and location of certain proposed activities has been modified in response to new training and testing requirements developed in response to the ever-evolving security environment requiring an increased use of high frequency mine detection sonar for training and testing, an increased use of mid-frequency ASW sonobuoys for testing, relocation of countermeasure testing from NSWC Panama City to GOMEX, and the elimination of the Submarine Navigation Training at Kings Bay, GA. The proposal also includes refinement of the modeling inputs, including the addition of modeling results for Surface to Surface MISSILEX, which was analyzed but not modeled in the DEIS, and the elimination of over-calculation for several activities which occur only once every five years. This additional post-model analysis of acoustic effects was performed to clarify potential misunderstandings of the numbers presented as modeling results in the AFTT DEIS/OEIS. Some comments indicated that the readers believed the acoustic effects to marine mammals presented in the DEIS/OEIS were representative of the actual expected effects, although the AFTT DEIS/OEIS did not account for animal avoidance of an area prior to commencing sound-producing activities, animal avoidance of repeated explosive noise exposures, and the protections due to standard Navy mitigations. Therefore, the numbers presented in Navy's LOA application, which will be reflected in the AFTT FEIS/OEIS, have been refined to better quantify the expected effects by fully accounting for animal avoidance or movement and implementation of standard Navy mitigations. With the application of the post-modeling assessment process, the net result of these changes is an overall decrease in takes by mortality and Level A takes within the LOA application compared with the DEIS, a net reduction in Level B takes for training, and a net increase in Level B takes for testing. The Navy has advised NMFS that all comments received on the proposed rule that address (1) changes to the tempo or location of certain proposed activities; (2) refinement to the modeling inputs for training and testing; and (3) additional post-model analysis of acoustic effects and implementation of mitigation, will be reviewed and addressed by the Navy in its FEIS/OEIS for AFTT.

The steps of the quantitative analysis of acoustic effects, the values that went into the Navy's model, and the resulting ranges to effects are detailed in Chapter 6 of the Navy's LOA application (*http://www.nmfs.noaa.gov/pr/permits/incidental.htm#applications*).

Take Request

The AFTT DEIS/OEIS considered all training and testing activities proposed to occur in the Study Area that have the potential to result in the MMPA defined take of marine mammals. The stressors associated with these activities included the following:

- Acoustic (sonar and other active non-impulse sources, explosives, pile driving, swimmer defense airguns, weapons firing, launch and impact noise, vessel noise, aircraft noise)
- Energy (electromagnetic devices)
- Physical disturbance or strikes (vessels, in-water devices, military expended materials, seafloor devices)
- Entanglement (fiber optic cables, guidance wires, parachutes)
- Ingestion (munitions, military expended materials other than munitions)

The Navy determined, and NMFS agrees, that three stressors could potentially result in the incidental taking of marine mammals from training and testing activities within the Study Area: (1) Non-impulsive stressors (sonar and other active acoustic sources), (2) impulsive stressors (explosives, pile driving and removal), and (3) vessel strikes. Non-impulsive and impulsive stressors have the potential to result in incidental takes of marine mammals by harassment, injury, or mortality (explosives only). Vessel strikes have the potential to result in incidental take from direct injury and/or mortality.

Training Activities—Based on the Navy's model and post-model analysis (described in detail in Chapter 6 of its LOA application), Table 17 summarizes the Navy's take request for training activities for an annual maximum year (a notional 12-month period when all annual and non-annual events would occur) and the summation over a 5-year period (with consideration of the varying schedule of non-annual activities). Table 18 summarizes the

Navy's take request (Level A and Level B harassment) for training activities by species.

While the Navy does not anticipate any mortalities would occur from training activities involving explosives, the Navy requests annual authorization for take by mortality of up to 17 small odontocetes (i.e., dolphins) to include any combination of such species that may be present in the Study Area. In addition, the Navy does not anticipate any beaked whale strandings or mortalities from sonar and other active sources, but in order to account for unforeseen circumstances that could lead to such effects the Navy requests the annual take, by mortality, of up to 10 beaked whales in any given year, and no more than 10 beaked whales over the 5-year LOA period, as part of training activities.

Vessel strike to marine mammals is not associated with any specific training activity but rather a limited, sporadic, and accidental result of Navy vessel movement within the Study Area. In order to account for the accidental nature of vessel strikes to large whales in general, and the potential risk from any vessel movement within the Study Area, the Navy requests take authorization in the event a Navy vessel strike does occur while conducting training. The Navy's take authorization request is based on the probabilities of whale strikes suggested by the data from NMFS Northeast Science Center, NMFS Southeast Science Center, the Navy, and the calculations detailed in Chapter 6 of the Navy's LOA application. The number of Navy and commercial whale strikes for which the species has been positively identified suggests that the probability of striking a humpback whale in the Study Area is greater than striking other species. However, since species identification has not been possible in most vessel strike cases, the Navy cannot quantifiably predict what species may be taken. Therefore, the Navy seeks take authorization by mortality from vessel strike for any combined number of marine mammal species to include fin whale, blue whale, humpback whale, Bryde's whale, sei whale, minke whale, sperm whale, Blainville's beaked whale, Cuvier's beaked whale, Gervais' beaked whale, and unidentified whale species. The Navy requests takes of large marine mammals over the course of the 5-year regulations from training activities as discussed below:

- The take by vessel strike during training activities in any given year of no more than three marine mammals total of any combination of species including fin whale, blue whale, humpback whale, Bryde's whale, sei whale, minke whale, sperm whale, Blainville's beaked whale, Cuvier's beaked whale, Gervais' beaked whale, and unidentified whale species.
- The take by vessel strike of no more than 10 marine mammals from training activities over the course of the five years of the AFTT regulations.

Over a period of 18 years from 1995 to 2012 there have been a total of 19 Navy vessel strikes in the Study Area. Eight of the strikes resulted in a confirmed death; but in 11 of the 19 strikes, the fate of the animal was unknown. It is possible that some of the 11 reported strikes resulted in recoverable injury or were not marine mammals at all, but another large marine species (e.g., basking shark). However, it is prudent to consider that all of the strikes could have resulted in the death of a marine mammal. The maximum number of strikes in any given year was three strikes, which occurred in 2001 and 2004. The highest average number of strikes over any five year period was two strikes per year from 2001 to 2005. The average number of strikes for the entire 18-year period is 1.055 strikes per year. Since the implementation of the Navy's Marine Species Awareness Training in 2007, strikes in the Study Area have decreased to an average of 0.5 per year. Over the last five years on the east coast, the Navy was involved in two strikes, with no confirmed marine mammal deaths as a result of the vessel strike. Also as discussed in Chapter 6 of the Navy's LOA application, the probability of striking as many as two large whales in a single year in the AFTT Study Area is only 19 percent.

TABLE 17—SUMMARY OF ANNUAL AND 5-YEAR TAKE REQUESTS FOR TRAINING ACTIVITIES

MMPA category	Source	Annual authorization sought	5-Year authorization sought
		Training activities [4]	Training activities
Mortality	Impulsive	17 mortalities applicable to any small odontocete in any given year.	85 mortalities applicable to any small odontocete over 5 years.
	Unspecified	10 mortalities to beaked whales in any given year. [1]	10 mortalities to beaked whales over 5 years. [1]
	Vessel strike	No more than three large whale mortalities in any given year. [2]	No more than 10 large whale mortalities over 5 years. [2]
Level A	Impulsive and Non-Impulsive.	351	1,753.
Level B	Impulsive and Non-Impulsive.	2,053,473	10,263,631.

[1] Ten Ziphiidae beaked whale to include any combination of Blainville's beaked whale, Cuvier's beaked whale, Gervais' beaked whale, northern bottlenose whale, and Sowerby's beaked whale, and True's beaked whale (not to exceed 10 beaked whales total over the 5-year length of requested authorization).

[2] *For Training:* Because of the number of incidents in which the species of the stricken animal has remained unidentified, Navy cannot predict that proposed takes (either 3 per year or the 10 over the course of 5 years) will be of any particular species, and therefore seeks take authorization for any combination of large whale species (e.g., fin whale, humpback whale, minke whale, sei whale, Bryde's whale, sperm whale, blue whale, Blainville's beaked whale, Cuvier's beaked whale, Gervais' beaked whale, and unidentified whale species), excluding the North Atlantic right whale.

TABLE 18—SPECIES-SPECIFIC TAKE REQUESTS FROM IMPULSIVE AND NON-IMPULSIVE SOURCE EFFECTS FOR ALL TRAINING ACTIVITIES

Species	Annual [1]		Total over 5-year period	
	Level B	Level A	Level B	Level A
Mysticetes:				

TABLE 18—SPECIES-SPECIFIC TAKE REQUESTS FROM IMPULSIVE AND NON-IMPULSIVE SOURCE EFFECTS FOR ALL TRAINING ACTIVITIES—Continued

Species	Annual[1]		Total over 5-year period	
	Level B	Level A	Level B	Level A
Blue Whale*	147	0	735	0
Bryde's Whale	955	0	4,775	0
Minke Whale	60,402	16	302,010	80
Fin Whale*	4,490	1	22,450	5
Humpback Whale*	1,643	1	8,215	5
North Atlantic Right Whale*	112	0	560	0
Sei Whale*	10,188	1	50,940	5
Odontocetes—Delphinids:				
Atlantic Spotted Dolphin	177,570	12	887,550	60
Atlantic White-Sided Dolphin	31,228	3	156,100	15
Bottlenose Dolphin	284,728	8	1,422,938	40
Clymene Dolphin	19,588	1	97,938	5
Common Dolphin	465,014	17	2,325,022	85
False Killer Whale	713	0	3,565	0
Fraser's Dolphin	2,205	0	11,025	0
Killer Whale	14,055	0	70,273	0
Melon-Headed Whale	20,876	0	104,380	0
Pantropical Spotted Dolphin	70,968	1	354,834	5
Pilot Whale	101,252	3	506,240	15
Pygmy Killer Whale	1,487	0	7,435	0
Risso's Dolphin	238,528	3	1,192,618	15
Rough Toothed Dolphin	1,059	0	5,293	0
Spinner Dolphin	20,414	0	102,068	0
Striped Dolphin	224,305	7	1,121,511	35
White-Beaked Dolphin	1,613	0	8,027	0
Odontocetes—Sperm Whales:				
Sperm Whale*	14,749	0	73,743	0
Odontocetes—Beaked Whales:				
Blainville's Beaked Whale	28,179	0	140,893	0
Cuvier's Beaked Whale	34,895	0	174,473	0
Gervais' Beaked Whale	28,255	0	141,271	0
Northern Bottlenose Whale	18,358	0	91,786	0
Sowerby's Beaked Whale	9,964	0	49,818	0
True's Beaked Whale	16,711	0	83,553	0
Odontocetes—Kogia Species and Porpoises:				
Kogia spp.	5,090	15	25,448	75
Harbor Porpoise	142,811	262	711,727	1,308
Phocid Seals:				
Bearded Seal	0	0	0	0
Gray Seal	82	0	316	0
Harbor Seal	83	0	329	0
Harp Seal	4	0	12	0
Hooded Seal	5	0	25	0
Ringed Seal**	0	0	0	0

[1] Predictions shown are for the theoretical maximum year, which would consist of all annual training and one Civilian Port Defense activity. Civilian Port Defense training would occur biennially.
* ESA-Listed Species; ** ESA-proposed; PTS: Permanent threshold shift; TTS: Temporary threshold shift.

Testing Activities

Based on the Navy's model and post-model analysis (described in detail in Chapter 6 of its LOA application), Table 19 summarizes the Navy's take request for testing activities for an annual maximum year (a notional 12-month period when all annual and non-annual events would occur) and the summation over a 5-year period (with consideration of the varying schedule of non-annual activities). Table 20 summarizes the Navy's take request (Level A and Level B harassment) for testing activities by species.

The Navy requests annual authorization for take by mortality of up to 11 small odontocetes (i.e., dolphins) to include any combination of such species with potential presence in the Study Area as part of testing activities using impulsive sources (excluding ship shock trials). Over the 5-year periods of the rule, the Navy requests authorization for take by mortality of up to 25 marine mammals incidental to ship shock trials (10 for aircraft carrier trials and 15 for guided missile destroyer and Littoral Combat Ship trials).

The Navy does not anticipate vessel strikes of marine mammals would occur during testing activities in the Study Area in any given year. Most testing conducted in the Study Area that involves surface ships is conducted on Navy ships during training exercises. Therefore, the vessel strike take request for training activities covers those activities. For the smaller number of testing activities not conducted in conjunction with fleet training, the Navy requests a smaller number of takes resulting incidental to vessel strike. However, in order to account for the accidental nature of vessel strikes to large whales in general, and potential risk from any vessel movement within the Study Area, the Navy is seeking take authorization in the event a Navy vessel strike does occur while conducting testing during the five year period of NMFS' final authorization as follows:

• The take by vessel strike during testing activities in any given year of no more than one marine mammal of any of the following species including fin whale, blue whale, humpback whale, Bryde's whale, sei whale, minke whale, sperm whale Blainville's beaked whale, Cuvier's beaked whale, Gervais' beaked whale, and unidentified whale species.

• The take by vessel strike of no more than one large whale from testing activities over the course of the 5-year regulations.

TABLE 19—SUMMARY OF ANNUAL AND 5-YEAR TAKE REQUESTS FOR TESTING ACTIVITIES

[Excluding ship shock trials]

MMPA category	Source	Annual authorization sought	5-Year authorization sought
		Testing activities[3]	Testing activities[3]
Mortality	Impulsive	11 mortalities applicable to any small odontocete in any given year[3].	55 mortalities applicable to any small odontocete over 5 years.
	Unspecified	None	None.
	Vessel strike	No more than one large whale mortality in any given year.[2]	No more than one large whale mortality over 5 years.[2]
Level A	Impulsive and non-Impulsive.	375	1,735.
Level B	Impulsive and non-Impulsive.	2,441,640	11,559,236.

[1] Ten Ziphiidae beaked whale to include any combination of Blainville's beaked whale, Cuvier's beaked whale, Gervais' beaked whale, northern bottlenose whale, and Sowerby's beaked whale, and True's beaked whale (not to exceed 10 beaked whales total over the 5-year length of requested authorization).

[2] *For Testing:* Because of the number of incidents in which the species of the stricken animal has remained unidentified, the Navy cannot predict that the proposed takes (one over the course of 5 years) will be of any particular species, and therefore seeks take authorization for any large whale species (e.g., fin whale, humpback whale, minke whale, sei whale, Bryde's whale, sperm whale, blue whale, Blainville's beaked whale, Cuvier's beaked whale, Gervais' beaked whale, and unidentified whale species), excluding the North Atlantic right whale.

[3] Excluding ship shock trials.

TABLE 20—SPECIES-SPECIFIC TAKE REQUESTS FROM IMPULSIVE AND NON-IMPULSIVE SOURCE EFFECTS FOR ALL TESTING ACTIVITIES

Species	Annual[1,2]		Total over 5-year period	
	Level B	Level A	Level B	Level A
Mysticetes:				
Blue Whale*	18	0	82	0
Bryde's Whale	64	0	304	0
Minke Whale	7,756	15	34,505	28
Fin Whale*	599	0	2,784	0
Humpback Whale*	200	0	976	0
North Atlantic Right Whale*	87	0	395	0
Sei Whale*	796	0	3,821	0
Odontocetes—Delphinids:				
Atlantic Spotted Dolphin	24,429	1,854	104,647	1,964
Atlantic White-Sided Dolphin	10,330	147	50,133	166
Bottlenose Dolphin	33,708	149	146,863	190
Clymene Dolphin	2,173	80	10,169	87
Common Dolphin	52,173	2,203	235,493	2,369
False Killer Whale	109	0	497	0
Fraser's Dolphin	171	0	791	0
Killer Whale	1,540	2	7,173	2
Melon-Headed Whale	1,512	28	6,950	30
Pantropical Spotted Dolphin	7,985	71	38,385	92
Pilot Whale	15,701	153	74,614	163
Pygmy Killer Whale	135	3	603	3
Risso's Dolphin	24,356	70	113,682	89
Rough Toothed Dolphin	138	0	618	0
Spinner Dolphin	2,862	28	13,208	34
Striped Dolphin	21,738	2,599	97,852	2,751
White-Beaked Dolphin	1,818	3	8,370	3
Odontocetes—Sperm Whales:				
Sperm Whale*	1,786	5	8,533	6
Odontocetes—Beaked Whales:				
Blainville's Beaked Whale	4,753	3	23,561	3
Cuvier's Beaked Whale	6,144	1	30,472	1
Gervais' Beaked Whale	4,764	4	23,388	4
Northern Bottlenose Whale	12,096	5	60,409	6
Sowerby's Beaked Whale	2,698	0	13,338	0
True's Beaked Whale	3,133	1	15,569	1
Odontocetes—Kogia Species and Porpoises:				

TABLE 20—SPECIES-SPECIFIC TAKE REQUESTS FROM IMPULSIVE AND NON-IMPULSIVE SOURCE EFFECTS FOR ALL TESTING ACTIVITIES—Continued

Species	Annual [1,2]		Total over 5-year period	
	Level B	Level A	Level B	Level A
Kogia spp.	1,163	12	5,536	36
Harbor Porpoise	2,182,872	216	10,358,300	1,080
Phocid Seals:				
Bearded Seal	33	0	161	0
Gray Seal	3,293	14	14,149	46
Harbor Seal	8,668	78	38,860	330
Harp Seal	3,997	14	16,277	30
Hooded Seal	295	0	1,447	0
Ringed Seal **	359	0	1,795	0

[1] Predictions shown are for the theoretical maximum year, which would consist of all annual testing; one CVN ship shock trial and two other ship shock trials (DDG or LCS); and Unmanned Underwater Vehicle (UUV) Demonstrations at each of three possible sites. One CVN, one DDG, and two LCS ship shock trials could occur within the 5-year period. Typically, one UUV Demonstration would occur annually at one of the possible sites.

[2] Ship shock trials could occur in either the VACAPES (year-round, except a CVN ship shock trial would not occur in the winter) or JAX (spring, summer, and fall only) Range Complexes. Actual location and time of year of a ship shock trial would depend on platform development, site availability, and availability of ship shock trial support facilities and personnel. For the purpose of requesting takes, the maximum predicted effects to a species for either location in any possible season are included in the species' total predicted effects.

* ESA-Listed Species; ** ESA-proposed; PTS: Permanent threshold shift; TTS: Temporary threshold shift.

For one aircraft carrier (CVN) ship shock trial, the Navy requests a maximum of 6,591 takes by Level A harassment and 4,607 takes by Level B harassment over the 5-year LOA period. Based on no observed mortalities during previous ship shock trials, the Navy does not anticipate the mortalities predicted by the acoustic analysis, but requests authorization for take by mortality of up to 10 small odontocetes (any combination of species known to be present in the Study Area).

For the guided missile destroyer (DDG) and two Littoral Combat Ship (LCS) ship shock trials (three events total), the Navy requests a maximum of 1,188 takes by Level A harassment and 867 takes by Level B harassment over the course of the 5-year LOA period. Based on no observed mortalities during previous ship shock trials, the Navy does not anticipate the mortalities predicted by the acoustic analysis, but requests authorization for take by mortality of up to 15 small odontocetes (any combination of species known to be present in the Study Area).

TABLE 21—SUMMARY OF ANNUAL AND 5-YEAR TAKE REQUEST FOR AFTT SHIP SHOCK TRIALS

MMPA category	Annual authorization sought [1]	5-Year authorization sought
Mortality	20 mortalities applicable to any small odontocete in any given year.	25 mortalities applicable to any small odontocete over 5 years.
Level A	7,383	7,779.
Level B	5,185	5,474.

[1] Up to three ship shock trials could occur in any one year (one CVN and two DDG/LCS ship shock trials), with one CVN, one DDG, and two LCS ship shock trials over the 5-year period. Ship shock trials could occur in either the VACAPES (year-round, except a CVN ship shock trial would not occur in the winter) or JAX (spring, summer, and fall only) Range Complexes. Actual location and time of year of a ship shock trial would depend on platform development, site availability, and availability of ship shock trial support facilities and personnel. For the purpose of requesting Level A and Level B takes, the maximum predicted effects to a species for either location in any possible season are included in the species' total predicted effects.

Marine Mammal Habitat

The Navy's proposed training and testing activities could potentially affect marine mammal habitat through the introduction of sound into the water column, impacts to the prey species of marine mammals, bottom disturbance, or changes in water quality. Each of these components was considered in the AFTT DEIS/OEIS and was determined by the Navy to have no effect on marine mammal habitat. Based on the information below and the supporting information included in the AFTT DEIS/OEIS, NMFS has preliminarily determined that the proposed training and testing activities would not have adverse or long-term impacts on marine mammal habitat.

Important Marine Mammal Habitat

The only ESA-listed marine mammal with designated critical habitat within the AFTT Study Area is for the North Atlantic right whale. Three critical habitats—Cape Cod Bay, Great South Channel, and the coastal waters of Georgia and Florida—were designated by NMFS in 1994 (59 FR 28805, June 3, 1994). Recently, in a response to a 2009 petition to revise North Atlantic right whale critical habitat, NMFS stated that the revision is appropriate and the ongoing rulemaking process would continue (75 FR 61690, October 6, 2010).

New England waters (where the Cape Cod Bay and Great South Channel critical habitats are located) are an important feeding habitat for right whales, which feed primarily on copepods in this area (largely of the genera *Calanus* and *Pseudocalanus*). Research suggests that right whales must locate and exploit extremely dense patches of zooplankton to feed efficiently (Mayo and Marx, 1990). These dense zooplankton patches are likely a primary characteristic of the spring, summer and fall right whale habitats (Kenney *et al.,* 1986; Kenney *et al.,* 1995). While feeding in the coastal waters off Massachusetts has been better studied than in other areas, right whale feeding has also been observed on the margins of Georges Bank, in the Great South Channel, in the Gulf of Maine, in the Bay of Fundy, and over the Scotian Shelf. The characteristics of acceptable prey distribution in these areas are beginning to emerge (Baumgartner and Mate, 2003; Baumgartner and Mate, 2005). NMFS and Provincetown Center for Coastal Studies aerial surveys during springs of 1999–2006 found right whales along the northern edge of Georges Bank, in the Great South Channel, in Georges Basin, and in various locations in the Gulf of Maine including Cashes Ledge, Platts Bank and Wilkinson Basin. The consistency with which right whales occur in such locations is relatively high, but these studies also highlight the high interannual variability in right whale use of some habitats.

Since 2004, consistent aerial survey efforts have been conducted during the migration and calving season (15 November to 15 April) in coastal areas of Georgia and South Carolina, to the north of currently defined critical habitat (Glass and Taylor, 2006; Khan and Taylor, 2007; Sayre and Taylor, 2008; Schulte and Taylor, 2010). Results suggest that this region may not only be part of the migratory route but also a seasonal residency area. Results from an analysis by Schick *et al.* (2009) suggest that the migratory corridor of North Atlantic right whales is broader than initially estimated and that suitable habitat exists beyond the 20 nm coastal buffer presumed to represent the primary migratory pathway (NMFS, 2008b). Results were based on data modeled from two females tagged with satellite-monitored radio tags as part of a previous study.

Three right whale observations (four individuals) were recorded during aerial surveys sponsored by the Navy in the vicinity of the planned Undersea Warfare Training Range approximately 50 mi. (80 km) offshore of Jacksonville, Florida in 2009 and 2010, including a female that was observed giving birth (Foley *et al.,* 2011). These sightings occurred well outside existing critical habitat for the right whale and suggest that the calving area may be broader than currently assumed (Foley *et al.,* 2011; U.S. Department of the Navy, 2010). Offshore (greater than 30 mi. [48.3 km]) surveys flown off the coast of northeastern Florida and southeastern Georgia from 1996 to 2001 documented 3 sightings in 1996, 1 in 1997, 13 in 1998, 6 in 1999, 11 in 2000 and 6 in 2001 (within each year, some were repeat sightings of previously recorded individuals). Several of the years that offshore surveys were flown were some of the lowest count years for calves and for numbers of right whales in the southeast recorded since comprehensive surveys in the calving grounds were initiated. Therefore, the frequency with which right whales occur in offshore waters in the southeastern United States remains unclear.

Activities involving sound or energy from sonar and other active acoustic sources will not occur or will be minimized to the maximum extent practicable in designated North Atlantic right whale critical habitat and would have no effect on the primary constituent elements (i.e., water temperature and depth in the southeast and copepods in the northeast).

Expected Effects on Habitat

Training and testing activities may introduce water quality constituents into the water column. Based on the analysis of the AFTT EIS/OEIS, military expended materials (e.g., undetonated explosive materials) would be released in quantities and at rates that would not result in a violation of any water quality standard or criteria. High-order explosions consume most of the explosive material, creating typical combustion products. For example, in the case of Royal Demolition Explosive, 98 percent of the products are common seawater constituents and the remainder is rapidly diluted below threshold effect level. Explosion by-products associated with high order detonations present no secondary stressors to marine mammals through sediment or water. However, low order detonations and unexploded ordnance present elevated likelihood of impacts on marine mammals.

Indirect effects of explosives and unexploded ordnance to marine mammals via sediment is possible in the immediate vicinity of the ordnance. Degradation products of Royal Demolition Explosive are not toxic to marine organisms at realistic exposure levels (Rosen and Lotufo 2010). Relatively low solubility of most explosives and their degradation products means that concentrations of these contaminants in the marine environment are relatively low and readily diluted. Furthermore, while explosives and their degradation products were detectable in marine sediment approximately 6–12 in. (0.15–0.3 m) away from degrading ordnance, the concentrations of these compounds were not statistically distinguishable from background beyond 3–6 ft. (1–2 m) from the degrading ordnance. Taken together, it is possible that marine mammals could be exposed to degrading explosives, but it would be within a very small radius of the explosive (1–6 ft. [0.3–2 m]).

Anthropogenic noise attributable to training and testing activities in the Study Area emanates from multiple sources including low-frequency and hull-mounted mid-frequency active sonar, high-frequency and non-hull mounted mid-frequency active sonar, and explosives and other impulsive sounds. Such sound sources include improved extended echo ranging sonobuoys; anti-swimmer grenades; mine countermeasure and neutralization activities; ordnance testing; gunnery, missile, and bombing exercises; torpedo testing, sinking exercises; ship shock trials; vessels; and aircraft. Sound produced from training and testing activities in the Study Area is temporary and transitory. The sounds produced during training and testing activities can be widely dispersed or concentrated in small areas for varying periods. Any anthropogenic noise attributed to training and testing activities in the Study Area would be temporary and the affected area would be expected to immediately return to the original state when these activities cease. Military expended materials resulting from training and testing activities could potentially result in minor long-term changes to benthic habitat. Military expended materials may be colonized over time by benthic organisms that prefer hard substrate and would provide structure that could attract some species of fish or invertebrates. Overall, the combined impacts of sound exposure, explosions, vessel strikes, and military expended materials resulting from the proposed activities would not be expected to have measurable effects on populations of marine mammal prey species.

Equipment used by the Navy within the Study Area, including ships and other marine vessels, aircraft, and other equipment, may also introduce materials into the marine environment. All equipment is properly maintained in accordance with applicable Navy or legal requirements. All such operating equipment meets federal water quality standards, where applicable.

Effects on Marine Mammal Prey

Invertebrates—Prey sources such as marine invertebrates could potentially be impacted by sound stressors as a result of the proposed activities. However, most marine invertebrates' ability to sense sounds is very limited. In most cases, marine invertebrates would not respond to impulsive and non-impulsive sounds, although they may detect and briefly respond to nearby low-frequency sounds. These short-term responses would likely be inconsequential to invertebrate populations. Explosions and pile driving would likely kill or injure nearby marine invertebrates. Vessels also have the potential to impact marine invertebrates by disturbing the water column or sediments, or directly striking organisms (Bishop, 2008). The propeller wash (water displaced by propellers used for propulsion) from vessel movement and water displaced from vessel hulls can potentially disturb marine invertebrates in the water column and is a likely cause of zooplankton mortality (Bickel et al., 2011). The localized and short-term exposure to explosions or vessels could displace, injure, or kill zooplankton, invertebrate eggs or larvae, and macro-invertebrates. Therefore, mortality or long-term consequences for a few animals is unlikely to have measurable effects on overall stocks or populations. Long-term consequences to marine invertebrate populations would not be expected as a result of exposure to sounds or vessels in the Study Area.

Fish—If fish are exposed to explosions and impulsive sound sources, they may show no response at all or may have a behavioral reaction. Occasional behavioral reactions to intermittent explosions and impulsive sound sources are unlikely to cause long-term consequences for individual fish or populations. Animals that experience hearing loss (PTS or TTS) as a result of exposure to explosions and impulsive sound sources may have a reduced ability to detect relevant sounds such as predators, prey, or social vocalizations. It is uncertain whether some permanent hearing loss over a part of a fish's hearing range would have long-term consequences for that individual. It is possible for fish to be injured or killed by an explosion. Physical effects from pressure waves generated by underwater sounds (e.g., underwater explosions) could potentially affect fish within proximity of training or testing activities. The shock wave from an underwater explosion is lethal to fish at close range, causing massive organ and tissue damage and internal bleeding (Keevin and Hempen, 1997). At greater distance from the detonation point, the extent of mortality or injury depends on a number of factors including fish size, body shape, orientation, and species (Keevin and Hempen, 1997; Wright, 1982). At the same distance from the source, larger fish are generally less susceptible to death or injury, elongated forms that are round in cross-section are less at risk than deep-bodied forms, and fish oriented sideways to the blast suffer the greatest impact (Edds-Walton and Finneran, 2006; O'Keeffe, 1984; O'Keeffe and Young, 1984; Wiley *et al.,* 1981; Yelverton *et al.,* 1975). Species with gas-filled organs have higher mortality than those without them (Continental Shelf Associates Inc., 2004; Goertner *et al.,* 1994).

Fish not killed or driven from a location by an explosion might change their behavior, feeding pattern, or distribution. Changes in behavior of fish have been observed as a result of sound produced by explosives, with effect intensified in areas of hard substrate (Wright, 1982). Stunning from pressure waves could also temporarily immobilize fish, making them more susceptible to predation. The abundances of various fish and invertebrates near the detonation point could be altered for a few hours before animals from surrounding areas repopulate the area; however these populations would likely be replenished as waters near the detonation point are mixed with adjacent waters. Repeated exposure of individual fish to sounds from underwater explosions is not likely and most acoustic effects are expected to be short-term and localized. Long-term consequences for fish populations would not be expected.

Vessels and in-water devices do not normally collide with adult fish, most of which can detect and avoid them. Exposure of fishes is to vessel strike stressors is limited to those fish groups that are large, slow-moving, and may occur near the surface, such as sturgeon, ocean sunfish, whale sharks, basking sharks, and manta rays. With the exception of sturgeon, these species are distributed widely in offshore portions of the Study Area. Any isolated cases of a Navy vessel striking an individual could injure that individual, impacting the fitness of an individual fish. Vessel strikes would not pose a risk to most of the other marine fish groups, because many fish can detect and avoid vessel movements, making strikes rare and allowing the fish to return to their normal behavior after the ship or device passes. As a vessel approaches a fish, they could have a detectable behavioral or physiological response (e.g., swimming away and increased heart rate) as the passing vessel displaces them. However, such reactions are not expected to have lasting effects on the survival, growth, recruitment, or reproduction of these marine fish groups at the population level.

Marine Mammal Avoidance

Marine mammals may be temporarily displaced from areas where Navy training is occurring, but the area should be utilized again after the activities have ceased. Avoidance of an area can help the animal avoid further acoustic effects by avoiding or reducing further exposure. The intermittent or short duration of many activities should prevent animals from being exposed to stressors on a continuous basis. In areas of repeated and frequent acoustic disturbance, some animals may habituate or learn to tolerate the new baseline or fluctuations in noise level. While some animals may not return to an area, or may begin using an area differently due to training and testing activities, most animals are expected to return to their usual locations and behavior.

Other Expected Effects

Other sources that may affect marine mammal habitat were considered and potentially include the introduction of fuel, debris, ordnance, and chemical residues into the water column. The effects of each of these components were considered in the Navy's AFTT DEIS/OEIS. Based on the detailed review within the AFTT EIS/OEIS, there would be no effects to marine mammals resulting from loss or modification of marine mammal habitat including water and sediment quality, food resources, vessel movement, and expendable material.

Analysis and Negligible Impact Preliminary Determination

NMFS has defined ''negligible impact'' in 50 CFR 216.103 as ''* * * an impact resulting from the specified activity that cannot be reasonably expected to, and is not reasonably likely to, adversely affect the species or stock through effects on annual rates of recruitment or survival.'' In making a negligible impact determination, NMFS considers:

(1) The number of anticipated mortalities;

(2) The number and nature of anticipated injuries;

(3) The number, nature, and intensity, and duration of Level B harassment; and

(4) The context in which the takes occur.

As mentioned previously, NMFS estimates that 42 species of marine mammals could be potentially affected by Level A or Level B harassment over the course of the five-year period. In addition, 16 species could potentially be lethally taken over the course of the five-year period from explosives and 11 species could potentially be lethally taken from ship strikes over the course of the five-year period.

Pursuant to NMFS' regulations implementing the MMPA, an applicant is required to estimate the number of animals that will be ''taken'' by the specified activities (i.e., takes by harassment only, or takes by harassment, injury, and/or death). This estimate informs the analysis that NMFS must perform to determine whether the activity will have a ''negligible impact'' on the affected species or stock. Level B (behavioral) harassment occurs at the level of the individual(s) and does not assume any resulting population-level consequences, though there are known avenues through which behavioral disturbance of individuals can result in population-level effects (e.g., pink-footed geese (*Anser brachyrhynchus*) in undisturbed habitat gained body mass and had about a 46-percent reproductive success compared with geese in disturbed habitat (being consistently scared off the fields on which they were foraging) which did not gain mass and has a 17-percent reproductive success). A negligible impact finding is based on the lack of likely adverse effects on annual rates of recruitment or survival (i.e., population-level effects). An estimate of the number of Level B harassment takes, alone, is not enough information on which to base an impact determination. In addition to considering estimates of the number of marine mammals that might be ''taken'' through behavioral harassment, NMFS must consider other factors, such as the likely nature of any responses (their intensity, duration, etc.), the context of any responses (critical reproductive time or location, migration, etc.), as well as the number and nature of estimated Level A harassment takes, the number of estimated mortalities, and effects on habitat. Generally speaking, and especially with other factors being equal, the Navy and NMFS anticipate more severe effects from takes resulting from exposure to higher received levels (though this is in no way a strictly linear relationship throughout species, individuals, or circumstances) and less severe effects from takes resulting from exposure to lower received levels.

The Navy's specified activities have been described based on best estimates of the number of activity hours, items, or detonations that the Navy would conduct. There may be some flexibility in the exact number of hours, items, or detonations may vary from year to year, but totals would not exceed the 5-year totals. Furthermore, the Navy's take request is based on their model and post-model analysis. The requested number of Level B takes does not equate to the number of individual animals the Navy expects to harass (which is lower), but rather to the instances of take (i.e., exposures) that may occur. Depending on the location, duration, and frequency of activities, along with the distribution and movement of marine mammals, individual animals may be exposed multiple times to impulse or non-impulse sounds at or above the Level B harassment threshold. However, the Navy is currently unable to estimate the number of individuals that may be taken during training and testing activities. The model results are over- estimates of the number of takes that may occur to a smaller number of individuals. While the model shows that an increased number of takes may occur (compared to the 2009 rulemakings for AFAST and the east coast range complexes), the types and severity of individual responses to training and testing activities are not expected to change.

Taking the above into account, considering the sections discussed below, and dependent upon the implementation of the proposed mitigation measures, NMFS has preliminarily determined that Navy's proposed training and testing exercises would have a negligible impact on the marine mammal species and stocks present in the Study Area.

Behavioral Harassment

As discussed previously in this document, marine mammals can respond to sound in many different ways, a subset of which qualifies as harassment (see Behavioral Harassment Section). As also discussed earlier, the take estimates do take into account the fact that marine mammals will likely avoid strong sound sources to one extent or another. Although an animal that avoids the sound source will likely still be taken in some instances (such as if the avoidance results in a missed opportunity to feed, interruption of reproductive behaviors, etc.) in other cases avoidance may result in fewer instances of take than were estimated or in the takes resulting from exposure to a lower received level than was estimated, which could result in a less severe response. For sonar and other active acoustic sources, the Navy provided information (Tables 22 and 23) estimating the percentage of behavioral harassment that would occur within the 6-dB bins (without considering mitigation or avoidance). As mentioned above, an animal's exposure to a higher received level is more likely to result in a behavioral response that is more likely to adversely affect the health of the animal. As the table illustrates, the vast majority (~79%, at least for hull-mounted sonar, which is responsible for most of the sonar takes) of calculated takes for mid-frequency sonar result from exposures between 150dB and 162dB. Less than 0.5% of the takes are expected to result from exposures above 180dB.

TABLE 22—NON-IMPULSIVE RANGES IN 6 dB BINS AND PERCENTAGE OF BEHAVIORAL HARASSMENT

[Low-frequency cetaceans]

Received level in 6-dB Bins	Sonar Bin MF1 (e.g., SQS–53; ASW Hull-mounted Sonar)		Sonar Bin MF4 (e.g., AQS–22; ASW Dipping Sonar)		Sonar Bin MF5 (e.g., SSQ–62; ASW Sonobuoy)		Sonar Bin HF4 (e.g., SQQ–32; MIW Sonar)	
	Distance over which levels occur (m)	Percentage of behavioral harassments occurring at given levels (percent)	Distance over which levels occur (m)	Percentage of behavioral harassments occurring at given levels (percent)	Distance over which levels occur (m)	Percentage of behavioral harassments occurring at given levels (percent)	Distance over which levels occur (m)	Percentage of behavioral harassments occurring at given levels (percent)
120 ≤ SPL<126	179,213–147,800	0.00	60,983–48,317	0.00	19,750–15,275	0.00	3,338–2,438	0.00
126 ≤ SPL<132	147,800–136,575	0.00	48,317–18,300	0.09	15,275–9,825	0.11	2,438–1,463	0.04
132 ≤ SPL<138	136,575–115,575	0.12	18,300–16,113	0.20	9,825–5,925	2.81	1,463–1,013	0.78
138 ≤ SPL<144	115,575–74,913	2.60	16,113–11,617	4.95	5,925–2,700	18.73	1,013–788	4.16
144 ≤ SPL<150	74,913–66,475	2.94	11,617–5,300	31.26	2,700–1,375	26.76	788–300	40.13
150 ≤ SPL<156	66,475–37,313	34.91	5,300–2,575	29.33	1,375–388	40.31	300–150	23.87
156 ≤ SPL<162	37,313–13,325	43.82	2,575–1,113	23.06	388–100	10.15	150–100	13.83
162 ≤ SPL<168	13,325–7,575	8.98	1,113–200	10.60	100–<50	1.13	100–<50	17.18
168 ≤ SPL<174	7,575–3,925	4.59	200–100	0.39	<50	0.00	<50	0.00
174 ≤ SPL<180	3,925–1,888	1.54	100–<50	0.12	<50	0.00	<50	0.00
180 ≤ SPL<186	1,888–400	0.48	<50	0.00	<50	0.00	<50	0.00

TABLE 22—NON-IMPULSIVE RANGES IN 6 DB BINS AND PERCENTAGE OF BEHAVIORAL HARASSMENT—Continued

[Low-frequency cetaceans]

Received level in 6-dB Bins	Sonar Bin MF1 (e.g., SQS–53; ASW Hull-mounted Sonar)		Sonar Bin MF4 (e.g., AQS–22; ASW Dipping Sonar)		Sonar Bin MF5 (e.g., SSQ–62; ASW Sonobuoy)		Sonar Bin HF4 (e.g., SQQ–32; MIW Sonar)	
	Distance over which levels occur (m)	Percentage of behavioral harassments occurring at given levels (percent)	Distance over which levels occur (m)	Percentage of behavioral harassments occurring at given levels (percent)	Distance over which levels occur (m)	Percentage of behavioral harassments occurring at given levels (percent)	Distance over which levels occur (m)	Percentage of behavioral harassments occurring at given levels (percent)
186 ≤ SPL<192	400–200	0.02	<50	0.00	<50	0.00	<50	0.00
192 ≤ SPL<198	200–100	0.00	<50	0.00	<50	0.00	<50	0.00

TABLE 23—NON-IMPULSIVE RANGES IN 6 DB BINS AND PERCENTAGE OF BEHAVIORAL HARASSMENT

[Mid-frequency cetaceans]

Received level in 6-dB Bins	Sonar Bin MF1 (e.g., SQS–53; ASW Hull-mounted Sonar)		Sonar Bin MF4 (e.g., AQS–22; ASW Dipping Sonar)		Sonar Bin MF5 (e.g., SSQ–62; ASW Sonobuoy)		Sonar Bin HF4 (e.g., SQQ–32; MIW Sonar)	
	Distance over which levels occur (m)	Percentage of behavioral harassments occurring at given levels (percent)	Distance over which levels occur (m)	Percentage of behavioral harassments occurring at given levels (percent)	Distance over which levels occur (m)	Percentage of behavioral harassments occurring at given levels (percent)	Distance over which levels occur (m)	Percentage of behavioral harassments occurring at given levels (percent)
120 <= SPL < 126	179,525–147,875	0.00	61,433–48,325	0.00	20,638–16,350	0.00	4,388–4,050	0.00
126 <= SPL < 132	147,875–136,625	0.00	48,325–18,350	0.09	16,350–10,883	0.07	4,050–3,150	0.01
132 <= SPL < 138	136,625–115,575	0.12	18,350–16,338	0.18	10,883–7,600	1.68	3,150–2,163	0.38
138 <= SPL < 144	115,575–74,938	2.58	16,338–11,617	5.11	7,600–3,683	18.02	2,163–1,388	2.97
144 <= SPL < 150	74,938–66,525	2.92	11,617–5,425	30.08	3,683–1,738	31.66	1,388–1,013	7.15
150 <= SPL < 156	66,525–37,325	34.71	5,425–2,625	30.03	1,738–425	39.81	1,013–725	18.55
156 <= SPL < 162	37,325–13,850	43.02	2,625–1,125	23.44	425–150	6.94	725–250	53.79
162 <= SPL < 168	13,850–7,750	9.77	1,125–200	10.58	150–<50	1.82	250–150	9.62
168 <= SPL < 174	7,750–4,088	4.70	200–100	0.38	<50	0.00	150–100	4.40
174 <= SPL < 180	4,088–1,888	1.69	100–<50	0.11	<50	0.00	100–<50	3.13
180 <= SPL < 186	1,888–450	0.47	<50	0.00	<50	0.00	<50	0.00
186 <= SPL < 192	450–200	0.02	<50	0.00	<50	0.00	<50	0.00
192 <= SPL < 198	200–100	0.00	<50	0.00	<50	0.00	<50	0.00

ASW: anti-submarine warfare; MIW: mine warfare; m: meter; SPL: sound pressure level.

Although the Navy has been monitoring to discern the effects of sonar and other active acoustic sources on marine mammals since approximately 2006, and research on the effects of sonar and other active acoustic sources is advancing, our understanding of exactly how marine mammals in the Study Area will respond to sonar and other active acoustic sources is still limited. The Navy has submitted reports from more than 60 major exercises conducted in the HRC and SOCAL, and off the Atlantic Coast, that indicate no behavioral disturbance was observed. One cannot conclude from these results that marine mammals were not harassed from sonar and other active acoustic sources, as a portion of animals within the area of concern were not seen (especially those more cryptic, deep-diving species, such as beaked whales or *Kogia* spp.) and the full series of behaviors that would more accurately show an important change is not typically seen (i.e., only the surface behaviors are observed). Plus, some of the non-biologist lookouts might not be well-qualified to characterize behaviors. However, one can say that the animals that were observed did not respond in any of the obviously more severe ways, such as panic, aggression, or anti-predator response.

Diel Cycle

As noted previously, many animals perform vital functions, such as feeding, resting, traveling, and socializing on a diel cycle (24-hr cycle). Behavioral reactions to noise exposure (when taking place in a biologically important context, such as disruption of critical life functions, displacement, or avoidance of important habitat) are more likely to be significant if they last more than one diel cycle or recur on subsequent days (Southall *et al.,* 2007). Consequently, a behavioral response lasting less than one day and not recurring on subsequent days is not considered severe unless it could directly affect reproduction or survival (Southall *et al.,* 2007).

In the previous section, we discussed the fact that potential behavioral responses to sonar and other active acoustic sources that fall into the category of harassment could range in severity. By definition, for military readiness activities, takes by behavioral harassment involve the disturbance or likely disturbance of a marine mammal or marine mammal stock in the wild by causing disruption of natural behavioral patterns (such as migration, surfacing, nursing, breeding, feeding, or sheltering) to a point where such behavioral patterns are abandoned or significantly altered. These reactions would, however, be more of a concern if they were expected to last over 24 hours or be repeated in subsequent days. However, vessels with hull-mounted active sonar are typically moving at speeds of 10–15 knots, which would make it unlikely that the same animal would remain in the immediate vicinity of the ship for the entire duration of the exercise. Animals may be exposed to sonar and other active acoustic sources for more than one day or on successive days. However, because neither the vessels nor the animals are stationary, significant long-term effects are not expected.

Most planned explosive exercises are of a short duration (1–6 hours). Although explosive exercises may sometimes be conducted in the same general areas repeatedly, because of their short duration and the fact that they are in the open ocean and animals can easily move away, it is similarly unlikely that animals would be exposed for long, continuous amounts of time.

TTS

As mentioned previously, TTS can last from a few minutes to days, be of varying degree, and occur across various frequency bandwidths, all of which determine the severity of the impacts on the affected individual, which can range from minor to more severe. The TTS sustained by an animal is primarily classified by three characteristics:

(1) Frequency—Available data (of mid-frequency hearing specialists exposed to mid- or high-frequency sounds; Southall *et al.,* 2007) suggest that most TTS occurs in the frequency range of the source up to one octave higher than the source (with the maximum TTS at ½ octave above). The more powerful MF sources used have center frequencies between 3.5 and 8 kHz and the other unidentified MF sources are, by definition, less than 10 kHz, which suggests that TTS induced by any of these MF sources would be in a frequency band somewhere between approximately 2 and 20 kHz. There are fewer hours of HF source use and the sounds would attenuate more quickly, plus they have lower source levels, but if an animal were to incur TTS from these sources, it would cover a higher frequency range (sources are between 10 and 100 kHz, which means that TTS could range up to 200 kHz; however, HF systems are typically used less frequently and for shorter time periods than surface ship and aircraft MF systems, so TTS from these sources is even less likely). TTS from explosives would be broadband. Vocalization data for each species was provided in the Navy's LOA application.

(2) Degree of the shift (i.e., how many dB is the sensitivity of the hearing reduced by)—Generally, both the degree of TTS and the duration of TTS will be greater if the marine mammal is exposed to a higher level of energy (which would occur when the peak dB level is higher or the duration is longer). The threshold for the onset of TTS was discussed previously in this document. An animal would have to approach closer to the source or remain in the vicinity of the sound source appreciably longer to increase the received SEL, which would be difficult considering the lookouts and the nominal speed of an active sonar vessel (10–15 knots). In the TTS studies, some using exposures of almost an hour in duration or up to 217 SEL re 1 μPa^2sec, most of the TTS induced was 15 dB or less, though Finneran *et al.* (2007) induced 43 dB of TTS with a 64-sec exposure to a 20 kHz source. However, MFAS emits a 1-second ping 2 times/minute and incurring those levels of TTS is highly unlikely.

(3) Duration of TTS (recovery time)—In the TTS laboratory studies, some using exposures of almost an hour in duration or up to 217 SEL re 1 μPa^2sec, almost all individuals recovered within 1 day (or less, often in minutes), though in one study (Finneran *et al.,* 2007), recovery took 4 days.

Based on the range of degree and duration of TTS reportedly induced by exposures to non-pulse sounds of energy higher than that to which free-swimming marine mammals in the field are likely to be exposed during training exercises using sonar and other active acoustic sources in the Study Area, it is unlikely that marine mammals would ever sustain a TTS from MFAS that alters their sensitivity by more than 20 dB for more than a few days (and any incident of TTS would likely be far less severe due to the short duration of the majority of the exercises and the speed of a typical vessel), if that. Also, for the same reasons discussed in the Diel Cycle section, and because of the short distance within which animals would need to approach the sound source, it is unlikely that animals would be exposed to the levels necessary to induce TTS in subsequent time periods such that their recovery is impeded. Additionally, though the frequency range of TTS that marine mammals might sustain would overlap with some of the frequency ranges of their vocalization types, the frequency range of TTS from MFAS (the source from which TTS would most likely be sustained because the higher source level make it more likely that an animal would be exposed to a higher received level) would not usually span the entire frequency range of one vocalization type, much less span all types of vocalizations. If impaired, marine mammals would implement behaviors to compensate (see Acoustic Masking or Communication Impairment Section), though these compensations may incur energetic costs.

Acoustic Masking or Communication Impairment

Masking only occurs during the time of the signal (and potential secondary arrivals of indirect rays), versus TTS, which continues beyond the duration of the signal. Standard MFAS nominally pings every 50 seconds for hull-mounted sources. For the sources for which we know the pulse length, most are significantly shorter than hull-mounted active sonar, on the order of several microseconds to tens of microseconds. For hull-mounted active sonar, though some of the vocalizations that marine mammals make are less than one second long, there is only a 1 in 50 chance that they would occur exactly when the ping was received, and when vocalizations are longer than one second, only parts of them are masked. Alternately, when the pulses are only several microseconds long, the majority of most animals' vocalizations would not be masked. Masking effects from sonar and other active acoustic sources are expected to be minimal. If masking or communication impairment were to occur briefly, it would be in the frequency range of MFAS, which overlaps with some marine mammal vocalizations; however, it would likely not mask the entirety of any particular vocalization or communication series because the signal length, frequency, and duty cycle of the sonar signal does not perfectly mimic the characteristics of any marine mammal's vocalizations.

PTS, Injury, or Mortality

NMFS believes that many marine mammals would deliberately avoid exposing themselves to the received levels of sound necessary to induce injury by moving away from or at least modifying their path to avoid a close approach. Additionally, in the unlikely event that an animal approaches the sound source at a close distance, NMFS believes that the mitigation measures (i.e., shutdown/powerdown zones for sonar and other active acoustic sources) would typically ensure that animals would not be exposed to injurious levels of sound. As discussed previously, the Navy utilizes both aerial (when available) and passive acoustic monitoring (during all ASW exercises) in addition to Lookouts on vessels to detect marine mammals for mitigation implementation.

If a marine mammal is able to approach a surface vessel within the distance necessary to incur PTS, the likely speed of the vessel (nominal 10–15 knots) would make it very difficult for the animal to remain in range long enough to accumulate enough energy to result in more than a mild case of PTS. As mentioned previously and in relation to TTS, the likely consequences to the health of an individual that incurs PTS can range from mild to more serious dependent upon the degree of PTS and the frequency band it is in, and many animals are able to compensate for the shift, although it may include energetic costs.

Recovery from a threshold shift (i.e., partial hearing loss) can take a few minutes to a few days, depending on the severity of the initial shift. PTS would not fully recover. Threshold shifts do not necessarily affect all hearing frequencies equally, so some threshold shifts may not interfere with an animal hearing biologically relevant sounds. It is uncertain whether some permanent hearing loss over a part of a marine mammal's hearing range would have long-term consequences for that individual, although many mammals lose hearing ability as they age. Mitigation measures would further reduce the predicted impacts. Long-term consequences to populations would not be expected.

As discussed previously, marine mammals (especially beaked whales) could potentially respond to MFAS at a received level lower than the injury threshold in a manner that indirectly results in the animals stranding. The exact mechanisms of this potential response, behavioral or physiological, are not known. When naval exercises have been associated with strandings in the past, it has typically been when three or more vessels are operating simultaneously, in the presence of a strong surface duct, and in areas of constricted channels, semi-enclosed areas, and/or steep bathymetry. Based on the number of occurrences where strandings have been definitively associated with military active sonar versus the number of hours of active sonar training that have been conducted, we suggest that the probability is small that this will occur. Lastly, an active sonar shutdown protocol for strandings involving live animals milling in the water minimizes the chances that these types of events turn into mortalities.

Onset mortality and onset slight lung injury criteria use conservative thresholds to predict the onset of effect as discussed section ''Take Criteria.'' The thresholds are based upon newborn calf masses, and therefore these effects are over-estimated by the acoustic model assuming most animals within the population are larger than a newborn calf. The threshold for onset mortality and onset slight lung injury is the impulse at which one percent of animals exposed would be expected to actually be injured or killed, with the likelihood of the effect increasing with proximity to the explosion. Considering these factors, these impacts would rarely be expected to actually occur. Nevertheless, it is possible for marine mammals to be injured or killed by an explosion. Small odontocetes are the marine mammal group most likely to be injured or killed by explosives (although mitigation measures are in place to prevent this, and only 3 deaths have been documented from explosives and these occurred prior to a modification in mitigation to improve protection during the use of time-delay firing devices). Most odontocete species have populations in the tens of thousands, so that even if a few individuals in the population were removed, long-term consequences for the population would not be expected.

While NMFS does not expect any mortalities from impulsive sources to occur, we propose to authorize takes by mortality of a limited number of small odontocetes from training and testing activities. Based on previous vessel strikes in the Study Area, NMFS also proposes to authorize takes by mortality of a limited number of marine mammals from vessel strikes. As described previously, although we have a good sense of how many marine mammals the Navy may strike over the course of five years (and it is much smaller than 10 large marine mammals and one large marine mammal as a result of training and testing, respectively), the species distribution is unpredicatable. Thus, we have analyzed the possibility that all the large whale takes requested in one year may be of the same species. However, if this happened to any given species in a given year—the number of takes authorized of that same species over the other 4 years of the rule is highly limited (for example, no more than the following number of ESA-listed marine mammals in any given year: three humpback whales, two fin whales, one sei whale, one blue whale, and one sperm whale from training activities). Over the last five years on the east coast, the Navy was involved in two ship strikes, with no confirmed marine mammal deaths as a result. The number of mortalities from vessel strikes are not expected to be an increase over the past decade, but are being addressed under this proposed incidental take authorization for the first time.

Species Specific Analysis

In the discussions below, the ''acoustic analysis'' refers to the Navy's model results and post-model analysis. The Navy performed a quantitative analysis to estimate the number of marine mammals that could be harassed by acoustic sources or explosives used during Navy training and testing activities. Inputs to the quantitative analysis included marine mammal density estimates; marine mammal depth occurrence distributions; oceanographic and environmental data; marine mammal hearing data; and criteria and thresholds for levels of potential effects. Marine mammal densities used in the model may overestimate actual densities when species data is limited and for species with seasonal migrations (e.g., North Atlantic right whales, humpbacks, blue whales, fin whales, sei whales). The quantitative analysis consists of computer modeled estimates and a post-model analysis to determine the number of potential mortalities and harassments. The model calculates sound energy propagation from sonars, other active acoustic sources, and explosives during naval activities; the sound or impulse received by animat dosimeters representing marine mammals distributed in the area around the modeled activity; and whether the sound or impulse received by a marine mammal exceeds the thresholds for effects. The model estimates are then further analyzed to consider animal avoidance and implementation of mitigation measures, resulting in final estimates of effects due to Navy training and testing. It is important to note that the Navy's take estimates represent the total number of takes and not the number of individuals taken, as a single individual may be taken multiple times over the course of a year.

Although this more complex computer modeling approach accounts for various environmental factors affecting acoustic propagation, the current software tools do not consider the likelihood that a marine mammal would attempt to avoid repeated exposures to a sound or avoid an area of intense activity where a training or testing event may be focused. Additionally, the software tools do not consider the implementation of mitigation (e.g., stopping sonar transmissions when a marine mammal is within a certain distance of a ship or range clearance prior to detonations). In both of these situations, naval activities are modeled as though an activity would occur regardless of proximity to marine mammals and without any horizontal movement by the animal away from the sound source or human activities (e.g., without accounting for likely animal avoidance). The initial model results overestimate the number of takes (as described previously), primarily by behavioral disturbance. The final step of the quantitative analysis of acoustic effects is to consider the implementation of mitigation and the possibility that marine mammals would avoid continued or repeated sound exposures. NMFS provided input to the Navy on this process and the Navy's qualitative analysis is described in detail in Chapter 6 of their LOA application (*http://www.nmfs.noaa.gov/pr/permits/incidental.htm#applications*).

North Atlantic Right Whale

North Atlantic right whales may be exposed to sonar or other active acoustic stressors associated with training and testing activities throughout the year. Exposures may occur in feeding grounds off the New England coast, on migration routes along the east coast, and on calving grounds in the southeast off the coast of Florida and Georgia; however, mitigation areas would be established in these areas with specific measures to further reduce impacts to North Atlantic right whales. Acoustic modeling predicts that North Atlantic right whales could be exposed to sound that may result in 60 TTS and 51 behavioral reactions per year from annually recurring training activities. The majority of these impacts are predicted within the JAX Range Complex where animals spend winter months calving. Annually recurring testing activities could expose North Atlantic right whales to sound that may result in 11 TTS and 66 behavioral reactions per year. These impacts are predicted in Rhode Island inland waters and within the Northeast Range Complexes. North Atlantic right whales may be exposed to sound or energy from explosions associated with training activities throughout the year. The acoustic analysis predicts one TTS exposure to a North Atlantic right whale annually from recurring training activities, but no impacts on North Atlantic right whales due to annually recurring testing activities or ship shock trials. Testing activities that use explosives would not occur in the North Atlantic right whale mitigation areas, although the sound and energy from explosions associated with testing activities may be detectable within the mitigation areas.

The Navy and NMFS do not anticipate that a North Atlantic right whale would be struck by a vessel during training or testing activities because of the extensive measures in place to reduce the risk of a vessel strike to the species. For example, the Navy would receive information about recent North Atlantic right whale sightings before transiting through or conducting training or testing activities in the mitigation areas. During transits, vessels would exercise extreme caution and proceed at the slowest speed that is consistent with safety, mission, training, and operations. In the southeast North Atlantic right whale mitigation area, vessels will reduce speed when the observe a North Atlantic right whale, when they are within 5 nm (9 km) of a sighting reported in the past 12 hours, or when operating at night or during periods of poor visibility. The Navy would also minimize to the maximum extent practicable north-south transits through the southeast North Atlantic right whale mitigation area. Similar measures to reduce the risk of ship strikes would be implemented in the northeast and mid-Atlantic mitigation areas.

Due to the importance of North Atlantic right whale critical habitat for feeding and reproductive activities, takes that occur in those areas may have more severe effects than takes that occur while whales are just transiting and not involved in feeding or reproductive behaviors. To address these potentially more severe effects, NMFS and the Navy have included mitigation measures to minimize impacts (both number and severity) in both the northeast and southeast designated right whale critical habitat as well as the migratory corridor which connects them. Additional mitigation measures pertaining to training and testing activities within the mitigation areas are described below.

In the southeast North Atlantic right whale mitigation area, no training activities using sonar or other active acoustic sources would occur with the exception of object detection/navigational sonar training and maintenance activities for surface ships and submarines while entering/exiting Mayport, Florida. Training activities involving helicopter dipping sonar would occur off of Mayport, Florida within the right whale mitigation area; however, the majority of active sonar activities would occur outside the southeast mitigation area. In the northeast North Atlantic right whale mitigation area, hull-mounted sonar would not be used. However, a limited number of torpedo exercises would be conducted in August and September when many North Atlantic right whales have migrated south out of the area. Of course, North Atlantic right whales can be found outside of designated mitigation areas and sound from nearby activities may be detectable within the mitigation areas. Acoustic modeling predictions consider these potential circumstances.

Training activities that use explosives, with the exception of training with explosive sonobuoys, are not conducted in the southeast North Atlantic right whale mitigation area. Training activities that use explosives would not occur in the northeast North Atlantic right whale mitigation area. Although, the sound and energy from explosions associated with training activities may be detectable within the mitigation areas.

The western North Atlantic minimum stock size is based on a census of individual whales identified using photo-identification techniques. Review of the photo-identification recapture database in July 2010 indicated that 396 individually recognized whales in the catalogue were known to be alive in 2007. This value is a minimum and does not include animals alive prior to 2007, but not recorded in the individual sightings database as seen during December 1, 2004 to July 6, 2010 (note that matching of photos taken during 2008–2010 was not complete at the time the data were received). It also does not include some calves known to be born during 2007, or any other individual whales seen during 2007, but not yet entered into the catalogue. In addition, this estimate has no associated coefficient of variation.

Acoustic analysis indicates that no North Atlantic right whales will be exposed to sound levels likely to result in Level A harassment. In addition, modeling predicts no potential for serious injury or mortality to North Atlantic right whales. Moreover, NMFS believes that Navy Lookouts would detect right whales and implement the appropriate mitigation measure before an animal could approach to within a distance necessary to result in injury. Any takes that do occur would likely be short term and at a lower received level and would likely not affect annual rates of recruitment or survival.

Humpback Whale

The acoustic analysis predicts that humpback whales could be exposed to sound associated with training activities that may result in 1 PTS, 1,128 TTS and 514 behavioral reactions per year. The majority of these impacts are predicted in the JAX, Navy Cherry Point, VACAPES, and Northeast Range Complexes. Further, the analysis predicts that humpback whales could be exposed to sound associated with testing activities that may result in 94 TTS and 100 behavioral reactions per year as a result of annually recurring testing activities. Humpback whales may be exposed to sound or energy from explosions associated with training and testing activities throughout the year. The acoustic analysis predicts that humpback whales could be exposed to sound or energy from explosions that may result in 1 TTS per year as a result of annually recurring training activities and 1 TTS to a humpback whale due to ship shock trials over a 5-year period. All predicted impacts would be to the Gulf of Maine stock because this is the only humpback whale stock present within the Study Area.

Research and observations show that if mysticetes are exposed to sonar or other active acoustic sources they may react in a number of ways depending on the characteristics of the sound source, their experience with the sound source, and whether they are migrating or on seasonal grounds (i.e., breeding or feeding). Reactions may include alerting, breaking off feeding dives and surfacing, diving or swimming away, or no response at all. Additionally, migrating animals may ignore a sound source, or divert around the source if it is in their path. In the ocean, the use of sonar and other active acoustic sources is transient and is unlikely to repeatedly expose the same population of animals over a short period. Around heavily trafficked Navy ports and on fixed ranges, the possibility is greater for animals that are resident during all or part of the year to be exposed multiple times to sonar and other active acoustic sources. A few behavioral reactions per year, even from a single individual, are unlikely to produce long-term consequences for that individual or the population. Furthermore, the implementation of mitigation measures and sightability of humpback whales (due to their large size) would further reduce the potential impacts.

Mysticetes exposed to the sound from explosions may react in a number of ways which may include alerting; startling; breaking off feeding dives and surfacing; diving or swimming away; or showing no response at all. Occasional behavioral reactions to intermittent explosions are unlikely to cause long-term consequences for individual mysticetes or populations. Furthermore, the implementation of mitigation measures and sightability of humpback whales (due to their large size) would further reduce the potential impacts in addition to reducing the potential for injury.

The Navy estimates it may strike and take, by injury or mortality, an average of two marine mammals per year as a result of training activities, with a maximum of three in any given year. Of the ESA-listed species in the Study Area, the Navy anticipates no more than three humpback whales would be struck over a 5-year period based on the percentages that those species have been involved in vessel collisions. The Navy provided a detailed analysis of strike data in section 6.1.9 of its LOA application. Marine mammal mortalities were not previously analyzed by NMFS in the 2009 rulemakings for AFAST and the east coast range complexes. However, between 1995 and 2012, there have been 19 Navy vessel strikes in the Study Area. Eight of the strikes resulted in a confirmed death, but in 11 of the 19 strikes the fate of the animal was undetermined. The mortalities from vessel strike are not expected to be an increase over the past decade, but rather NMFS proposes to authorize these takes for the first time in the AFTT Study Area.

Of the 19 reported Navy vessel strikes since 1995, only one strike was attributed to a testing event in 2001. Therefore, for testing events that will not occur on a training platform, the Navy estimates it could potentially take one marine mammal by injury or mortality over the course of the 5-year AFTT regulations. A number of the reported whale strikes were unidentified to species; therefore, the Navy cannot quantifiably predict that the proposed takes will be of any particular species.

Important feeding areas for humpbacks are located in the Northeast. Stellwagen Bank National Marine Sanctuary contains some of this important area and the Navy does not plan to conduct any activities within Stellwagen Bank. The Navy has designated several planning awareness areas (PAAs) based on locations of high productivity that have been correlated with high concentrations of marine mammals, including important feeding areas in the Northeast, and would avoid conducting major training exercises involving active sonar in PAAs.

Sei Whale

The acoustic analysis predicts that sei whales could be exposed to sound associated with training activities that may result in 1 PTS, 6,604 TTS, and 3,582 behavioral reactions per year from annually recurring training activities. The majority of these impacts are predicted in the VACAPES, Navy Cherry Point, and JAX Range Complexes, with a relatively small percent predicted in the GOMEX and Northeast Range Complexes and in areas outside of OPAREAS and range complexes. Sei whales could be exposed to sound associated with testing activities that may result in 439 TTS and 316 behavioral reactions per year as a result of annually recurring testing activities. Sei whales may be exposed to sound and energy from explosions associated with training and testing activities throughout the year. The acoustic analysis predicts that one sei whale could be exposed annually to sound from explosions associated with training activities that may cause TTS and one sei whale could exhibit a behavioral reaction. Annually recurring testing activities involving explosives may result in 1 TTS for a sei whale per year and 7 TTS due to exposure to explosive sound and energy from ship shock trials over a 5-year period. All predicted impacts would be to the Nova Scotia stock because this is the only sei whale stock present within the Study Area.

Research and observations show that if mysticetes are exposed to sonar or other active acoustic sources they may react in a number of ways depending on the characteristics of the sound source, their experience with the sound source, and whether they are migrating or on seasonal grounds (i.e., breeding or feeding). Reactions may include alerting, breaking off feeding dives and surfacing, diving or swimming away, or no response at all. Additionally, migrating animals may ignore a sound source, or divert around the source if it is in their path. In the ocean, the use of sonar and other active acoustic sources is transient and is unlikely to repeatedly expose the same population of animals over a short period. Around heavily trafficked Navy ports and on fixed ranges, the possibility is greater for animals that are resident during all or part of the year to be exposed multiple times to sonar and other active acoustic sources. A few behavioral reactions per year, even from a single individual, are unlikely to produce long-term consequences for that individual or the population. Furthermore, the implementation of mitigation measures and sightability of sei whales (due to their large size) would further reduce the potential impacts.

Mysticetes exposed to the sound from explosions may react in a number of ways, which may include alerting; startling; breaking off feeding dives and surfacing; diving or swimming away; or showing no response at all. Occasional behavioral reactions to intermittent explosions are unlikely to cause long-term consequences for individual mysticetes or populations. Furthermore, the implementation of mitigation measures and sightability of sei whales (due to their large size) would further reduce the potential impacts in addition to reducing the potential for injury.

The Navy estimates it may strike and take, by injury or mortality, an average of two marine mammals per year as a result of training activities, with a maximum of three in any given year. Of the ESA-listed species in the Study Area, the Navy anticipates no more than one sei whale would be struck over a 5-year period based on the percentages that those species have been involved in vessel collisions.

Of the 19 reported Navy vessel strikes since 1995, only one strike was attributed to a testing event in 2001. Therefore, for testing events that will not occur on a training platform, the

Navy estimates it could potentially take one marine mammal by injury or mortality over the course of the 5-year AFTT regulations. A number of the reported whale strikes were unidentified to species; therefore, the Navy cannot quantifiably predict that the proposed takes will be of any particular species.

No areas of specific importance for reproduction or feeding for sei whales have been identified in the AFTT Study Area. Sei whales in the North Atlantic belong to three stocks: Nova Scotia; Iceland-Denmark Strait; and Northeast Atlantic. The Nova Scotia stock occurs in the U.S. Atlantic waters. The best available abundance estimate for the Nova Scotia stock is 386 individuals.

Fin Whale

The acoustic analysis predicts that fin whales could be exposed to sound associated with training activities that may result in 1 PTS, 2,880 TTS and 1,608 behavioral reactions per year. The majority of these impacts are predicted in the VACAPES, Navy Cherry Point, and JAX Range Complexes, with a relatively small percent of impacts predicted in the GOMEX and Northeast Range Complexes. Fin whales could be exposed to sound associated with testing activities that may result in 263 TTS and 282 behavioral reactions per year as a result of annually recurring testing activities. The majority of these impacts are predicted within the Northeast Range Complexes with lesser impacts in the VACAPES, Navy Cherry Point, JAX, and GOMEX Range Complexes. Fin whales may be exposed to sound or energy from explosions associated with training and testing activities throughout the year. The acoustic analysis predicts one TTS and one behavioral response for fin whales annually from training activities, 1 TTS to fin whales per year from annually recurring testing activities, and 6 TTS per 5-year period due to ship shock trials. All predicted impacts would be to the Western North Atlantic stock because this is the only fin whale stock present within the Study Area.

Research and observations show that if mysticetes are exposed to sonar or other active acoustic sources they may react in a number of ways depending on the characteristics of the sound source, their experience with the sound source, and whether they are migrating or on seasonal grounds (i.e., breeding or feeding). Reactions may include alerting, breaking off feeding dives and surfacing, diving or swimming away, or no response at all. Additionally, migrating animals may ignore a sound source, or divert around the source if it is in their path. In the ocean, the use of sonar and other active acoustic sources is transient and is unlikely to repeatedly expose the same population of animals over a short period. Around heavily trafficked Navy ports and on fixed ranges, the possibility is greater for animals that are resident during all or part of the year to be exposed multiple times to sonar and other active acoustic sources. A few behavioral reactions per year, even from a single individual, are unlikely to produce long-term consequences for that individual or the population. Furthermore, the implementation of mitigation measures and sightability of fin whales (due to their large size) would further reduce the potential impacts.

Mysticetes exposed to the sound from explosions may react in a number of ways, which may include alerting; startling; breaking off feeding dives and surfacing; diving or swimming away; or showing no response at all. Occasional behavioral reactions to intermittent explosions are unlikely to cause long-term consequences for individual mysticetes or populations. Furthermore, the implementation of mitigation measures and sightability of fin whales (due to their large size) would further reduce the potential impacts in addition to reducing the potential for injury.

The Navy estimates it may strike and take, by injury or mortality, an average of two marine mammals per year as a result of training activities, with a maximum of three in any given year. Of the ESA-listed species in the Study Area, the Navy anticipates no more than two fin whales would be struck over a 5-year period based on the percentages that those species have been involved in vessel collisions.

Of the 19 reported Navy vessel strikes since 1995, only one strike was attributed to a testing event in 2001. Therefore, for testing events that will not occur on a training platform, the Navy estimates it could potentially take one marine mammal by injury or mortality over the course of the 5-year AFTT regulations. A number of the reported whale strikes were unidentified to species; therefore, the Navy cannot quantifiably predict that the proposed takes will be of any particular species.

New England waters are considered a major feeding ground for fin whales, and there is evidence the females continually return to this area (Waring *et al.,* 2010). The Navy has designated PAAs in the Northeast that include some of these important feeding areas and would avoid conducting major training exercises involving active sonar in PAAs. Fin whales in the North Atlantic belong to the western North Atlantic stock. The best abundance estimate for the western North Atlantic stock of fin whales is 3,985.

Blue Whale

Blue whales may be exposed to sonar or other active acoustic stressors associated with training and testing activities throughout the year. The acoustic analysis predicts that blue whales could be exposed to sound associated with training activities that may result in 97 TTS and 50 behavioral reactions per year. The majority of these impacts are predicted in the VACAPES, Navy Cherry Point, and JAX Range Complexes, with a relatively small percent of impacts predicted in the GOMEX and Northeast Range Complexes. The acoustic analysis predicts that 10 TTS and 6 behavioral reactions may result from annual testing activities that use sonar and other active acoustic sources per year as a result of annually recurring testing activities. Blue whales may be exposed to sound or energy from explosions associated with training and testing activities throughout the year; however, the acoustic analysis predicts that no individuals would be impacted. All predicted impacts would be to the Western North Atlantic stock because this is the only blue whale stock present within the Study Area.

Research and observations show that if mysticetes are exposed to sonar or other active acoustic sources they may react in a number of ways depending on the characteristics of the sound source, their experience with the sound source, and whether they are migrating or on seasonal grounds (i.e., breeding or feeding). Reactions may include alerting, breaking off feeding dives and surfacing, diving or swimming away, or no response at all. Additionally, migrating animals may ignore a sound source, or divert around the source if it is in their path. In the ocean, the use of sonar and other active acoustic sources is transient and is unlikely to repeatedly expose the same population of animals over a short period. Around heavily trafficked Navy ports and on fixed ranges, the possibility is greater for animals that are resident during all or part of the year to be exposed multiple times to sonar and other active acoustic sources. A few behavioral reactions per year, even from a single individual, are unlikely to produce long-term consequences for that individual or the population. Furthermore, the implementation of mitigation measures and sightability of blue whales (due to their large size) would further reduce the potential impacts.

Mysticetes exposed to the sound from explosions may react in a number of ways, which may include alerting; startling; breaking off feeding dives and surfacing; diving or swimming away; or showing no response at all. Occasional behavioral reactions to intermittent explosions are unlikely to cause long-term consequences for individual mysticetes or populations. Furthermore, the implementation of mitigation measures and sightability of blue whales (due to their large size) would further reduce the potential impacts in addition to reducing the potential for injury.

The Navy estimates it may strike and take, by injury or mortality, an average of two marine mammals per year as a result of training activities, with a maximum of three in any given year. Of the ESA-listed species in the Study Area, the Navy anticipates no more than one blue whale would be struck over a 5-year period based on the percentages that those species have been involved in vessel collisions.

Of the 19 reported Navy vessel strikes since 1995, only one strike was attributed to a testing event in 2001. Therefore, for testing events that will not occur on a training platform, the Navy estimates it could potentially take one marine mammal by injury or mortality over the course of the 5-year AFTT regulations. A number of the reported whale strikes were unidentified to species; therefore, the Navy cannot quantifiably predict that the proposed takes will be of any particular species.

No areas of specific importance for reproduction or feeding for blue whales have been identified in the AFTT Study Area. Blue whales in the western North Atlantic are classified as a single stock. The photo identification catalogue count of 440 recognizable individuals from the Gulf of St. Lawrence is considered a minimum population estimate for the western North Atlantic stock.

Minke Whale

The acoustic analysis predicts that minke whales could be exposed to sound associated with training activites that may result in 10 PTS, 40,866 TTS, and 19,497 behavioral reactions per year. The majority of these impacts are predicted in the VACAPES, Navy Cherry Point, and JAX Range Complexes, with a relatively small percent of effects predicted in the Northeast and GOMEX Range Complexes. The acoustic analysis predicts that minke whales could be exposed to sound that may result in 1 PTS, 3,571 TTS, and 3,100 behavioral reactions per year as a result of annually recurring testing activities. Minke whales may be exposed to sound or energy from explosions associated with training and testing activities throughout the year. The acoustic analysis predicts that minke whales could be exposed to sound annually from training activities that may result in 9 behavioral responses, 30 TTS, 4 PTS, 1 GI tract injury, and 1 slight lung injury (see Table 6–26 for predicted numbers of effects). As with mysticetes overall, effects are primarily predicted within the VACAPES Range Complex, followed by JAX, and Navy Cherry Point Range Complexes. Minke whales could be exposed to sound and energy from annual testing activities involving explosives that may result in 4 behavioral responses, 11 TTS, and 2 PTS, in addition to 41 TTS, 11 slight lung injury, and 3 mortalities due to exposure to explosive sound and energy from ship shock trials over a 5-year period. Based on conservativeness of the onset mortality criteria and impulse modeling and past observations of no marine mammal mortalities associated with ship shock trials, the predicted minke whale mortalities for CVN Ship Shock Trial are considered overestimates and highly unlikely to occur. All predicted effects on minke whales would be to the Canadian East Coast stock because this is the only stock present within the Study Area.

Research and observations show that if mysticetes are exposed to sonar or other active acoustic sources they may react in a number of ways depending on the characteristics of the sound source, their experience with the sound source, and whether they are migrating or on seasonal grounds (i.e., breeding or feeding). Reactions may include alerting, breaking off feeding dives and surfacing, diving or swimming away, or no response at all. Additionally, migrating animals may ignore a sound source, or divert around the source if it is in their path. In the ocean, the use of sonar and other active acoustic sources is transient and is unlikely to repeatedly expose the same population of animals over a short period. Around heavily trafficked Navy ports and on fixed ranges, the possibility is greater for animals that are resident during all or part of the year to be exposed multiple times to sonar and other active acoustic sources. A few behavioral reactions per year, even from a single individual, are unlikely to produce long-term consequences for that individual or the population. Furthermore, the implementation of mitigation measures and sightability of minke whales (due to their large size) would further reduce the potential impacts.

Mysticetes exposed to the sound from explosions may react in a number of ways, which may include alerting; startling; breaking off feeding dives and surfacing; diving or swimming away; or showing no response at all. Occasional behavioral reactions to intermittent explosions are unlikely to cause long-term consequences for individual mysticetes or populations. Furthermore, the implementation of mitigation measures and sightability of minke whales (due to their large size) would further reduce the potential impacts in addition to reducing the potential for injury.

Bryde's Whale

The acoustic analysis predicts that Bryde's whales could be exposed to sound associated with training activities that may result in 629 TTS and 326 behavioral reactions. The majority of these impacts are predicted in the VACAPES, Navy Cherry Point, and JAX Range Complexes, with a relatively small percent of effects predicted in the Northeast Range Complex. Bryde's whales could be exposed to sound that may result in 39 TTS and 21 behavioral reactions per year as a result of annually recurring testing activities. Bryde's whales may be exposed to sound or energy from explosions associated with training and testing activities throughout the year; however, the acoustic analysis predicts that no individuals would be impacted. All predicted effects on Bryde's whales would be to the Gulf of Mexico Oceanic stock because this is the only stock present within the Study Area.

Sperm Whale

Sperm whales may be exposed to sonar or other active acoustic stressors associated with training and testing activities throughout the year. The acoustic analysis predicts that sperm whales could be exposed to sound associated with training activities that may result in 435 TTS and 14,311 behavioral reactions annually from annually recurring training activities; and a maximum of one behavioral reactions from each biennial training activity civilian port defense. Sperm whales could be exposed to sound from annually recurring testing activities that may result in 584 TTS and 1,101 behavioral reactions per year. Sperm whales may be exposed to sound and energy from explosions associated with training and testing activities throughout the year. The acoustic analysis predicts one TTS and one behavioral response for sperm whales per year from explosions associated with training activities, one sperm whale behavioral response for per year due to annually recurring testing activities, and up to 20 TTS, 6 slight lung injuries, and 2 mortalities for sperm whales over a 5-year period as a result of ship shock trials in the VACAPES or JAX Range Complex. Based on conservativeness of the onset mortality criteria and impulse modeling and past observations of no marine mammal mortalities associated with ship shock trials, the predicted sperm whale mortalities for CVN ship shock trial are considered overestimates and highly unlikely to occur. Predicted effects on sperm whales within the Gulf of Mexico are presumed to primarily impact the Gulf of Mexico Oceanic stock, whereas the majority of impacts predicted offshore of the east coast would impact the North Atlantic stock.

Research and observations show that if sperm whales are exposed to sonar or other active acoustic sources they may react in a number of ways depending on their experience with the sound source and what activity they are engaged in at the time of the acoustic exposure. Sperm whales have shown resilience to acoustic and human disturbance, although they may react to sound sources and activities within a few kilometers. Sperm whales that are exposed to activities that involve the use of sonar and other active acoustic sources may alert, ignore the stimulus, avoid the area by swimming away or diving, or display aggressive behavior. Some (but not all) sperm whale vocalizations might overlap with the MFAS/HFAS TTS frequency range, which could potentially temporarily decrease an animal's sensitivity to the calls of conspecifics or returning echolocation signals. However, as noted previously, NMFS does not anticipate TTS of a long duration or severe degree to occur as a result of exposure to sonar and other active acoustic sources. The majority of Level B takes are expected to be in the form of mild responses. The implementation of mitigation measures and the large size of sperm whales (i.e., increased sightability) are expected to prevent any significant behavioral reactions. Therefore, long-term consequences for individuals or populations would not be expected.

The Navy estimates it may strike and take, by injury or mortality, an average of two marine mammals per year as a result of training activities, with a maximum of three in any given year. Of the ESA-listed species in the Study Area, the Navy anticipates no more than one sperm whale would be struck over a 5-year period based on the percentages that those species have been involved in vessel collisions.

Of the 19 reported Navy vessel strikes since 1995, only one strike was attributed to a testing event in 2001. Therefore, for testing events that will not occur on a training platform, the Navy estimates it could potentially take one marine mammal by injury or mortality over the course of the 5-year AFTT regulations. A number of the reported whale strikes were unidentified to species; therefore, the Navy cannot quantifiably predict that the proposed takes will be of any particular species.

The region of the Mississippi River Delta (Desoto Canyon) has been recognized for high densities of sperm whales and may represent an important calving and nursing or feeding area for these animals. Sperm whales typically exhibit a strong affinity for deep waters beyond the continental shelf, though in the area of the Mississippi Delta they also occur on the outer continental shelf break. However, there is a PAA designated immediately seaward of the continental shelf associated with the Mississippi Delta, in which the Navy plans to conduct no more than one major exercise and which they plan to take into consideration in the planning of unit-level exercises. Therefore, NMFS does not expect that impacts will be focuses, extensive, or severe in the sperm whale calving area.

Sperm whales within the Study Area belong to one of three stocks: North Atlantic; Gulf of Mexico Oceanic; or Puerto Rico and U.S. Virgin Islands. The best abundance estimate for sperm whales in the western North Atlantic is 4,804. The best abundance estimate for sperm whales in the northern Gulf of Mexico is 1,665.

Pygmy and Dwarf Sperm Whales

Pygmy and dwarf sperm whales may be exposed to sonar or other active acoustic stressors associated with training and testing activities throughout the year. The acoustic analysis predicts that pygmy and dwarf sperm whales could be exposed to sound that may result in 13 PTS, 4,914 TTS, and 169 behavioral reactions from annually recurring training activities; and a maximum of 1 TTS from the biennial training activity civilian port defense. The majority of predicted impacts on these species are within the JAX and GOMEX Range Complexes. Pygmy and dwarf sperm whales could be exposed to sound that may result in 5 PTS, 1,061 TTS and 29 behavioral reactions per year from annually recurring activities. Pygmy and dwarf sperm whales may be exposed to sound and energy from explosions associated with training and testing activities throughout the year. The acoustic analysis predicts that pygmy and dwarf sperm whales could be exposed to sound from annual training activities involving explosions that may result in 1 behavioral response, 5 TTS, and 2 PTS (see Table 6–26 in the LOA application for predicted numbers of effects). The majority of these exposures occur within the VACAPES and GOMEX Range Complexes. Pygmy or dwarf sperm whales could be exposed to energy or sound from underwater explosions that may result in 1 behavioral response, 2 TTS, and 1 PTS per year as a result of annually recurring testing activities. These impacts could happen anywhere throughout the Study Area where testing activities involving explosives occur. Additionally, the acoustic analysis predicts 6 TTS, 1 PTS, and 3 slight lung injury to a *Kogia* species over a 5-year period due to ship shock trials either in the VACAPES or JAX Range Complex. Predicted effects on pygmy and dwarf sperm whales within the Gulf of Mexico are presumed to primarily impact the Gulf of Mexico stocks, whereas the majority of effects predicted offshore of the east coast would impact the Western North Atlantic stocks.

Research and observations on *Kogia* species are limited. However, these species tend to avoid human activity and presumably anthropogenic sounds. Pygmy and dwarf sperm whales may startle and leave the immediate area of the anti-submarine warfare training exercise. Significant behavioral reactions seem more likely than with most other odontocetes, however it is unlikely that animals would receive multiple exposures over a short time period allowing animals time to recover lost resources (e.g., food) or opportunities (e.g., mating). Therefore, long-term consequences for individual *Kogia* or their respective populations are not expected.

No areas of specific importance for reproduction or feeding for *Kogia* species have been identified in the AFTT Study Area. *Kogia* species are separated into two stocks within the Study Area: The Western North Atlantic and Gulf of Mexico Oceanic. The best estimate for both species in the U.S. Atlantic is 395 individuals. The best estimate for both species in the northern Gulf of Mexico is 453.

Beaked Whales

Beaked whales (six species total) may be exposed to sonar or other active acoustic stressors associated with training and testing activities throughout the year. The acoustic analysis predicts that beaked whales could be exposed to sound that may result in 781 TTS and 135,573 behavioral reactions per year from annually recurring training activities; and a maximum of 8 behavioral reactions from each biennial training activity civilian port defense. Beaked whales could be exposed to sound that may result in 592 TTS and 32,695 behavioral reactions per year from annually recurring testing activities. The majority of these impacts happen within the Northeast Range Complexes, with lesser effects in the VACAPES, Navy Cherry Point, JAX, Key West and GOMEX Range Complexes. Beaked whales may be exposed to sound and energy from explosions associated with training and testing activities throughout the year; however, acoustic modeling predicts that no beaked whales would be impacted from annually recurring training and testing activities. The acoustic analysis predicts 7 TTS and 15 slight lung injuries to beaked whale species over a 5-year period due to ship shock trials. Predicted effects on beaked whales within the Gulf of Mexico are presumed to primarily impact the Gulf of Mexico stocks, whereas the majority of effects predicted offshore of the east coast would impact the Western North Atlantic stocks.

The Navy designated several planning awareness areas based on locations of high productivity that have been correlated with high concentrations of marine mammals and areas with steep bathymetric contours that are frequented by deep diving marine mammals such as beaked whales. For activities involving active sonar, the Navy would avoid planning major exercises in the planning awareness areas where feasible. In addition, to the extent operationally feasible, the Navy would not conduct more than one of the four major training exercises or similar scale events per year in the Gulf of Mexico planning awareness area. The best abundance estimate for the undifferentiated complex of beaked whales (*Ziphius* and *Mesoplodon* species) in the northwest Atlantic is 3,513. The best abundance estimate available for Cuvier's beaked whales in the northern Gulf of Mexico is 65. The best abundance estimate available for Mesoplodon species is a combined estimate for Blainville's beaked whale and Gervais' beaked whale in the oceanic waters of the Gulf of Mexico is 57. The current abundance estimate for the northern bottlenose whale in the eastern North Atlantic is 40,000, but population estimates for this species along the eastern U.S. coast are unknown.

Research and observations show that if beaked whales are exposed to sonar or other active acoustic sources they may startle, break off feeding dives, and avoid the area of the sound source to levels of 157 dB (McCarthy *et al.,* 2011). However, in research done at the Navy's instrumented tracking range in the Bahamas, animals leave the immediate area of the anti-submarine warfare training exercise, but return within a few days after the event ends. At the Bahamas range, populations of beaked whales appear to be stable. The analysis also indicates that no exposures to sound levels likely to result in Level A harassment would occur. However, while the Navy's model did not quantitatively predict any mortalities of beaked whales, the Navy requests a limited number of takes by mortality given the sensitivities these species may have to anthropogenic activities. Almost 40 years of conducting similar exercises in the AFTT Study Area without observed incident indicates that injury or motality are not expected to occur as a result of Navy activities.

Some beaked whale vocalizations might overlap with the MFAS/HFAS TTS frequency range (2–20 kHz), which could potentially temporarily decrease an animal's sensitivity to the calls of conspecifics or returning echolocation signals. However, NMFS does not anticipate TTS of a long duration or severe degree to occur as a result of exposure to sonar and other active acoustic sources. No beaked whales are predicted to be exposed to sound levels associated with PTS or injury.

As discussed previously, scientific uncertainty exists regarding the potential contributing causes of beaked whale strandings and the exact behavioral or physiological mechanisms that can potentially lead to the ultimate physical effects (stranding and/or death) that have been documented in a few cases. Although NMFS does not expect injury or mortality of any of these species to occur as a result of the training exercises involving the use of sonar and other active acoustic sources, there remains the potential for the operation of sonar and other active acoustic sources to contribute to the mortality of beaked whales. Consequently, NMFS proposes to authorize mortality and we consider the 10 potential mortalities from across the seven species potentially effected over the course of 5 years in our negligible impact determination (NMFS only intends to authorize a total of 10 beaked whale mortality takes, but since they could be of any of the species, we consider the effects of 10 mortalities of any of the six species).

Dolphins and Small Whales

Delphinids (dolphins and small whales) may be exposed to sonar or other active acoustic stressors associated with training and testing activities throughout the year. The acoustic analysis predicts that annually recurring training activities could expose 17 species of delphinids (Atlantic spotted dolphin, Atlantic white-sided dolphin, bottlenose dolphin, clymene dolphin, common dolphin, false killer whale, Fraser's dolphin, killer whale, melon-headed whale, pantropical spotted dolphin, pilot whale, pygmy killer whale, Risso's dolphin, rough-toothed dolphin, spinner dolphin, striped dolphin, and white-beaked dolphin) to sound that may result in 132,026 TTS and 1,542,713 behavioral reactions per year; and a maximum of 7 TTS and 592 behavioral reactions from each biennial training activity civilian port defense. The high take numbers are due in part to an increase in expended materials. However, many of these species generally travel in large pods and should be visible from a distance in order to implement mitigation measures and reduce potential impacts. In addition, the majority of takes are anticipated to be by behavioral harassment in the form of mild responses. Behavioral responses can range from alerting, to changing their behavior or vocalizations, to avoiding the sound source by swimming away or diving. Annually recurring testing activities involving sonar and other active acoustic sources could expose delphinids to sound that may result in 63,784 TTS and 113,169 behavioral reactions per year. Delphinids may be exposed to sound and energy from explosions associated with training and testing activities throughout the year. The acoustic analysis predicts that delphinids could be exposed to sound that may result in mortality, injury, temporary hearing loss and behavioral responses (see Table 6–26 in the LOA application for predicted numbers of effects). A total of 15 mortalities, 41 slight lung injuries, and 1 gastrointestinal tract injury, 13 PTS, 174 TTS, 91 behavioral responses are predicted per year for delphinids from explosions associated with training activities. The acoustic analysis of annually recurring testing activities predicts that delphinids could be exposed to sound that may result in 10 mortalities, 39 slight lung injuries, 1 PTS, 124 TTS, and 53 behavioral responses per year (see Table 6–27 in the LOA application for predicted numbers of effects). These predicted impacts would occur primarily in the VACAPES Range Complex, as well as the Naval Surface Warfare Center, Panama City Division Testing Range, but a few impacts could occur throughout the Study Area. While the Navy does not anticipate delphinid mortalities from underwater detonations during mine neutralization activities involving time-delay diver placed charges, there is a possibility of a marine mammal approaching too close to an underwater detonation when there is insufficient time to delay or stop without jeopardizing human safety. During ship shock trials, the acoustic analysis predicts that delphinids could be exposed to sound that may result in 5,386 TTS, 7,743 slight lung injuries, and 527 mortalities over a 5-year period, which would take place in either the VACAPES or JAX Range Complex (Tables 6–25 and 6–26 in the LOA application). Based on conservativeness of the onset mortality criteria and impulse modeling, past observations of no marine mammal mortalities associated with ship shock trials, and implementation of mitigation, the mortality results predicted by the acoustic analysis are over-estimated are not expected to occur. Therefore, the Navy conservatively estimates that 10 small odontocetes mortalities could occur during the CVN Ship Shock Trial and 5 small odontocetes mortalities could occur due to each DDG or LCS Ship Shock Trial. The majority of these exposures would occur within the VACAPES and GOMEX Range Complexes. Bottlenose dolphins may be exposed to sound and energy from pile driving associated with training activities throughout the year. The acoustic analysis predicts that bottlenose dolphins could be exposed to sound that may result in up to 747 behavioral responses per year. These exposures occur within the VACAPES and Cherry Point Range Complexes. Most delphinid species are separated into two stocks within the Study Area: The Western North Atlantic and Gulf of Mexico. Predicted effects on delphinids within the Gulf of Mexico are presumed to primarily impact the Gulf of Mexico stocks, whereas the majority of effects predicted offshore of the east coast would impact the Western North Atlantic stocks. Bottlenose dolphins are divided into one Oceanic and many Coastal stocks along the east coast. The majority of exposures to bottlenose dolphins are likely to the Oceanic stock with the exception of nearshore and in-port events that could expose animals in Coastal stocks.

Table 9 provides the abundance estimates for the different dolphin stocks. No areas of specific importance for reproduction or feeding for dolphins have been identified in the AFTT Study Area.

Harbor Porpoises

Harbor porpoises may be exposed to sonar or other active acoustic stressors associated with training and testing activities throughout the year. The acoustic analysis predicts that harbor porpoises could be exposed to sound that may result in 62 PTS, 20,161 TTS, and 120,895 behavioral reactions from annually recurring training activities; and a maximum of 432 TTS and 725 behavioral reactions from the biennial training activity civilian port defense. Annual testing activities could expose harbor porpoises to level of sonar and other active acoustic source sound resulting in 99 PTS, 78,250 TTS, and 1,964,774 behavioral responses per year. The high take numbers are due in part to an increase in expended materials. In addition, the majority of takes are anticipated to be by behavioral harassment in the form of mild responses. Behavioral responses can range from alerting, to changing their behavior or vocalizations, to avoiding the sound source by swimming away or diving. Predicted impacts on these species are within the VACAPES and Northeast Range Complexes primarily within inland waters and along the Northeast U.S. Continental Shelf Large Marine Ecosystem. The behavioral response function is not used to estimate behavioral responses by harbor porpoises; rather, a single threshold is used. Because of this very low behavioral threshold (120 dB re 1 μPa) for harbor porpoises, animals at distances exceeding 200 km in some cases are predicted to have a behavioral reaction in this acoustic analysis. Although this species is known to be more sensitive to these sources at lower received levels, it is not known whether animals would actually react to sound sources at these ranges, regardless of the received sound level. Harbor porpoises may be exposed to sound and energy from explosions associated with training and testing activities throughout the year. The acoustic analysis predicts that harbor porpoises could be exposed to sound that may result in 94 behavioral responses, 497 TTS, 177 PTS, 1 gastrointestinal tract injury, 21 slight lung injuries, and 2 mortalities annually; and 7 TTS and 1 PTS biannually for civilian port defense activities (see Table 6–26 and Table 6–28 in the LOA application for predicted numbers of effects). The acoustic analysis predicts that harbor porpoises could be exposed to sound that may result in 484 behavioral responses, 348 TTS, 110 PTS, 7 slight lung injuries, and 1 mortality per year due to annually recurring testing activities. The acoustic analysis predicts no impacts on harbor porpoises as a result of ship shock trials. Predicted impacts on this species are mostly in the VACAPES Range Complex, with a few impacts in the Northeast Range Complex, generally within the Northeast U.S. Continental Shelf Large Marine Ecosystem.

Research and observations of harbor porpoises show that this species is wary of human activity and will avoid anthropogenic sound sources in many situations at levels down to 120 dB. This level was determined by observing harbor porpoise reactions to acoustic deterrent and harassment devices used to drive away animals from around fishing nets and aquaculture facilities. Avoidance distances were on the order of a kilometer or more, but it is unknown if animals would react similarly if the sound source was located at a greater distance of tens or hundreds of kilometers. Since a large proportion of testing activities happen within harbor porpoise habitat in the northeast, predicted effects on this species are greater relative to other marine mammals. Nevertheless, it is not known whether or not animals would actually react to sound sources at these ranges, regardless of the received sound level. Harbor porpoises may startle and leave the immediate area of the testing event, but may return after the activity has ceased. Therefore, these animals could avoid more significant impacts, such as hearing loss, injury, or mortality. Significant behavioral reactions seem more likely than with most other odontocetes, especially at closer ranges (within a few kilometers). Since these species are typically found in nearshore and inshore habitats, resident animals that are present throughout the year near Navy ports of fixed ranges in the northeast could receive multiple exposures over a short period of time year round. Animals that do not exhibit a significant behavioral reaction would likely recover from any incurred costs, which reduce the likelihood of long-term consequences, such as reduced fitness, for the individual or population.

All harbor porpoises within the Study Area belong to the Gulf of Maine/Bay of Fundy Stock and therefore, all predicted impacts would be to this stock. No areas of specific importance for reproduction or feeding for harbor porpoises have been identified in the AFTT Study Area. The best abundance estimate for the Gulf of Maine/Bay of Fundy stock is 89,054 individuals.

Pinnipeds

Predicted effects on pinnipeds from annual training activities from sonar and other active acoustic sources indicate that three species (gray, harbor, and hooded seals) could be exposed to sound that may result in 77 behavioral reactions per year from annually recurring training activities and a maximum of 94 behavioral reactions per event for the biennial training activity, civilian port defense. Predicted effects on pinnipeds from annual testing activities from sonar and other active acoustic sources indicate that exposure to sound may result in 73 PTS, 7,494 TTS, and 6,489 behavioral reactions per year. These predicted impacts would occur almost entirely within the Northeast Range Complexes. Pinnipeds may be exposed to sound and energy from explosions associated with training and testing activities throughout the year. The acoustic analysis predicts 2 TTS and 1 behavioral reaction per year from explosions associated with annually recurring training activities and 15 behavioral responses, 15 TTS, and 2 PTS per year from explosions associated with annually recurring testing activities. The model predicts no impacts to pinnipeds from exposure to explosive energy and sound associated with ship shock trials. The predicted impacts would occur in the Northeast Range Complexes within the Northeast U.S. Continental Shelf Large Marine Ecosystem.

Research and observations show that pinnipeds in the water are tolerant of anthropogenic noise and activity. If seals are exposed to sonar or other active acoustic sources and explosives they may not react at all until the sound source is approaching within a few hundred meters and then may alert, ignore the stimulus, change their behaviors, or avoid the immediate area by swimming away or diving. Significant behavioral reactions would not be expected in most cases and long-term consequences for individual seals or populations are unlikely. Overall, predicted effects are low and the implementation of mitigation measures would further reduce potential impacts. Therefore, occasional behavioral reactions to intermittent anthropogenic noise are unlikely to cause long-term consequences for individual animals or populations.

No areas of specific importance for reproduction or feeding for pinnipeds have been identified in the AFTT Study Area. The acoustic analysis predicts that no pinnipeds will be exposed to sound levels or explosive detonations likely to result in mortality. Best estimates for the hooded and harp seals are 592,100 and 6.9 million, respectively. The best estimate for the western north Atlantic stock of harbor seals is 99,340. There is no best estimate available for gray seal, but a survey of the Canadian population ranged between 208,720 and 223,220. The North Atlantic Marine Mammal Commission Scientific Committee derived a rough estimate of the abundance of ringed seals in the northern extreme of the AFTT Study Area of approximately 1.3 million. There are no estimates available for bearded seals in the western Atlantic, the best available global population is 450,000 to 500,000, half of which inhabit the Bering and Chukchi Seas.

Preliminary Determination

Based on the analysis contained herein of the likely effects of the specified activity on marine mammals and their habitat and dependent upon the implementation of the mitigation and monitoring measures, NMFS preliminarily finds that the total taking from Navy training and testing exercises in the AFTT Study Area will have a negligible impact on the affected species or stocks. NMFS has proposed regulations for these exercises that prescribe the means of effecting the least practicable adverse impact on marine mammals and their habitat and set forth requirements pertaining to the monitoring and reporting of that taking.

Subsistence Harvest of Marine Mammals

NMFS has preliminarily determined that the issuance of 5-year regulations and subsequent LOAs for Navy training and testing exercises in the AFTT Study Area would not have an unmitigable adverse impact on the availability of the affected species or stocks for subsistence use, since there are no such uses in the specified area.

ESA

There are six marine mammal species under NMFS jurisdiction included in the Navy's incidental take request that are listed as endangered under the ESA with confirmed or possible occurrence in the Study Area: blue whale, humpback whale, fin whale, sei whale, sperm whale, and North Atlantic right whale. The Navy will consult with NMFS pursuant to section 7 of the ESA, and NMFS will also consult internally on the issuance of LOAs under section 101(a)(5)(A) of the MMPA for AFTT activities. Consultation will be concluded prior to a determination on the issuance of the final rule and an LOA.

NMSA

Some Navy activities may potentially affect resources within National Marine Sanctuaries. The Navy will continue to analyze potential impacts to sanctuary resources and has provided the analysis in Navy's Draft Environmental Impact Statement/Overseas Environmental Impact Statement for AFTT to NOAA's Office of National Marine Sanctuaries. Navy will initiate consultation with NOAA's Office of National Marine Sanctuaries pursuant to the requirements of the National Marine Sanctuaries Act as warranted by ongoing analysis of the activities and their effects on sanctuary resources.

NEPA

NMFS has participated as a cooperating agency on the AFTT DEIS/OEIS, which was published on May 11, 2012. The AFTT DEIS/OEIS is posted on NMFS' Web site: *http://www.nmfs.noaa.gov/pr/permits/incidental.htm#applications*. NMFS intends to adopt the Navy's final EIS/OEIS (FEIS/OEIS), if adequate and appropriate. Currently, we believe that the adoption of the Navy's FEIS/OEIS will allow NMFS to meet its responsibilities under NEPA for the issuance of regulations and LOAs for AFTT. If the Navy's FEIS/OEIS is deemed inadequate, NMFS would supplement the existing analysis to ensure that we comply with NEPA prior to the issuance of the final rule or LOA.

Classification

The Office of Management and Budget has determined that this proposed rule is not significant for purposes of Executive Order 12866.

Pursuant to the Regulatory Flexibility Act (RFA), the Chief Counsel for Regulation of the Department of Commerce has certified to the Chief Counsel for Advocacy of the Small Business Administration that this proposed rule, if adopted, would not have a significant economic impact on a substantial number of small entities. The RFA requires federal agencies to prepare an analysis of a rule's impact on small entities whenever the agency is required to publish a notice of proposed rulemaking. However, a federal agency may certify, pursuant to 5 U.S.C. 605(b), that the action will not have a significant economic impact on a substantial number of small entities. The Navy is the sole entity that will be affected by this rulemaking, not a small governmental jurisdiction, small organization, or small business, as defined by the RFA. Any requirements imposed by an LOA issued pursuant to these regulations, and any monitoring or reporting requirements imposed by these regulations, would be applicable only to the Navy. NMFS does not expect the issuance of these regulations or the associated LOAs to result in any impacts to small entities pursuant to the RFA. Because this action, if adopted, would directly affect the Navy and not a small entity, NMFS concludes the action would not result in a significant economic impact on a substantial number of small entities.

List of Subjects in 50 CFR Part 218

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

Dated: January 23, 2013.

Alan D. Risenhoover,

Director, Office of Sustainable Fisheries, performing the functions and duties of the Deputy Assistant Administrator for Regulatory Programs.

For reasons set forth in the preamble, 50 CFR part 218 is proposed to be amended as follows:

PART 218—REGULATIONS GOVERNING THE TAKING AND IMPORTING OF MARINE MAMMALS

■ 1. The authority citation for part 218 continues to read as follows:

Authority: 16 U.S.C. 1361 *et seq.*

■ 2. Subpart I is added to part 218 to read as follows:

Subpart I—Taking and Importing Marine Mammals; U.S. Navy's Atlantic Fleet Training and Testing (AFTT)

Sec.

Subpart I—Taking and Importing Marine Mammals; U.S. Navy's Atlantic Fleet Training and Testing (AFTT)

§ 218.80 Specified activity and specified geographical region.

(a) Regulations in this subpart apply only to the U.S. Navy for the taking of marine mammals that occurs in the area outlined in paragraph (b) of this section and that occurs incidental to the activities described in paragraph (c) of this section.

(b) The taking of marine mammals by the Navy is only authorized if it occurs within the AFTT Study Area, which is comprised of established operating and warning areas across the North Atlantic Ocean and the Gulf of Mexico (see Figure 1–1 in the Navy's application). In addition, the Study Area also includes U.S. Navy pierside locations where sonar maintenance and testing occurs within the Study Area, and areas on the high seas that are not part of the range complexes, where training and testing may occur during vessel transit.

(c) The taking of marine mammals by the Navy is only authorized if it occurs incidental to the following activities within the designated amounts of use identified in paragraphs (c)(5) through (c)(11) of this section:

(1) Training events:

(i) Amphibious Warfare:

(A) Fire Support Exercise (FIREX) at Sea—up to 50 per year.

(B) Elevated Causeway System (ELCAS)—up to 1 event per year.

(ii) Anti-Surface Warfare:

(A) Gunnery Exercise (GUNEX) (Surface-to-Surface) Ship—Medium-caliber—up to 827 events per year.

(B) GUNEX (Surface-to-Surface) Ship—Large-caliber—up to 294 events per year.

(C) GUNEX (Surface-to-Surface) Boat—Medium-caliber—up to 434 events per year.

(D) Missile Exercise (MISSILEX) (Surface-to-Surface)—up to 20 events per year.

(E) GUNEX (Air-to-Surface)—up to 715 events per year.

(F) MISSILEX (Air-to-Surface) Rocket—up to 210 events per year.

(G) MISSILEX (Air-to-Surface)—up to 248 events per year.

(H) Bombing Exercise (BOMBEX) (Air-to-Surface)—up to 930 events per year.

(I) Sinking Exercise (SINKEX)—up to 1 event per year.

(J) Maritime Security Operations (MSO)—Anti-swimmer Grenades—up to 12 events per year.

(iii) Anti-Submarine Warfare:

(A) Tracking Exercise/Torpedo Exercise (TRACKEX/TORPEX)-Submarine—up to 102 events per year.

(B) TRACKEX/TORPEX-Surface– up to 764 events per year.

(C) TRACKEX/TORPEX-Helicopter—up to 432 events per year.

(D) TRACKEX/TORPEX-Maritime Patrol Aircraft—up to 752 events per year.

(E) TRACKEX-Maritime Patrol Aircraft Extended Echo Ranging Sonobuoys—up to 160 events per year.

(iv) Major Training Events:

(A) Anti-Submarine Warfare Tactical Development Exercise—up to 4 events in per year.

(B) Composite Training Unit Exercise—up to 5 events per year.

(C) Joint Task Force Exercise/ Sustainment Exercise—up to 4 events per year.

(D) Integrated Anti-Submarine Warfare Course—up to 5 events per year.

(E) Group Sail—up to 20 events per year.

(v) Mine Warfare:

(A) Mine Countermeasures Exercise-MCM Sonar-Ship—up to 116 events per year.

(B) Mine Countermeasures—Mine Detection—up to 2,538 events per year.

(C) Mine Neutralization-Explosive Ordnance Disposal (EOD)—up to 618 events per year.

(D) Mine Neutralization—Remotely Operated Vehicle—up to 508 events per year.

(E) Coordinated Unit Level Helicopter Airborne Mine Countermeasure Exercises—up to 8 events per year.

(F) Civilian Port Defense—up to 1 event every other year.

(vi) Other Training Activities:

(A) Submarine Navigation—up to 284 events per year.

(B) Submarine Navigation Under Ice Certification—up to 24 events per year.

(C) Surface Ship Object Detection—up to 144 events per year.

(D) Surface Ship Sonar Maintenance—up to 824 events per year.

(D) Submarine Sonar Maintenance—up to 220 events per year.

(2) Naval Air Systems Command Testing Events:

(i) Anti-Surface Warfare (ASUW):

(A) Air-to-Surface Missile Test—up to 239 events per year.

(B) Air-to-Surface Gunnery Test—up to 165 events per year.

(C) Rocket Test—up to 332 events per year.

(ii) Anti-Submarine Warfare (ASW):

(A) Anti-Submarine Warfare Torpedo Test—up to 242 events per year.

(B) Kilo Dip—up to 43 events per year.

(C) Sonobuoy Lot Acceptance Test—up to 39 events per year.

(D) Anti-Submarine Warfare Tracking Test—Helicopter—up to 428 events per year.

(E) Anti-Submarine Warfare Tracking Test—Maritime Patrol Aircraft—up to 75 events per year.

(iii) Mine Warfare (MIW):

(A) Airborne Towed Minehunting Sonar System Test—up to155 events per year.
(B) Airborne Mine Neutralization System Test—up to 165 events per year.
(C) Airborne Projectile-based Mine Clearance System—up to 237 events per year.
(D) Airborne Towed Minesweeping Test—up to 72 events per year.
(3) Naval Sea Systems Command Testing Events:
(i) New Ship Construction:
(A) Surface Combatant Sea Trials—Pierside Sonar Testing—up to 12 events per year.
(B) Surface Combatant Sea Trials—ASW Testing—up to 10 events per year.
(C) Submarine Sea Trials—Pierside Sonar Testing—up to 6 events per year.
(D) Submarine Sea Trials—ASW Testing—up to 12 events per year.
(D) Mission Package Testing—ASW—up to 24 events per year.
(E) Mission Package Testing—Mine Countermeasures—up to 8 events per year.
(ii) Life Cycle Activities:
(A) Surface Ship Sonar Testing/Maintenance—up to 16 events per year.
(B) Submarine Sonar Testing/Maintenance—up to 28 events per year.
(C) Combat System Ship Qualification Trial (CSSQT)—In-Port Maintenance Period—up to 12 events per year.
(D) Combat System Ship Qualification (CSSQT)—Undersea Warfare (USW)—up to 9 events per year.
(iii) NAVSEA Range Activities:
(A) Unmanned Underwater Vehicles Demonstration—up to 3 events per 5 year period.
(B) Mine Detection and Classification Testing—up to 81 events per year.
(C) Stationary Source Testing—up to 11 events per year.
(D) Special Warfare Testing—up to 110 events per year.
(E) Unmanned Underwater Vehicle Testing—up to 211 events per year.
(F) Torpedo Testing (non-explosive)—up to 30 events per year.
(G) Towed Equipment Testing—up to 33 events per year.
(H) Semi-Stationary Equipment Testing—up to 154 events per year.
(I) Pierside Integrated Swimmer Defense Testing—up to 6 events per year.
(J) Signature Analysis Activities—up to 18 events per year.
(K) Mine Testing—up to 33 events per year.
(L) Surface Testing—up to 33 events per year.
(M) Mine Countermeasure/Neutralization Testing—up to 15 events per year.
(N) Ordnance Testing—up to 37 events per year.
(iv) Additional Activities Outside of NAVSEA Ranges:
(A) Torpedo (non-explosive) Testing—up to 26 events per year.
(B) Torpedo (explosive) Testing—up to 4 events per year.
(C) Countermeasure Testing—up to 3 events per year.
(D) Pierside Sonar Testing—up to 23 events per year.
(E) At-sea Sonar Testing—up to 15 events per year.
(F) Mine Detection and Classification Testing—up to 66 events per year.
(G) Mine Countermeasure/Neutralization Testing—up to 28 events per year.
(H) Pierside Integrated Swimmer Defense Testing—up to 3 events per year.
(I) Unmanned Vehicle Deployment and Payload Testing—up to 111 events per year.
(J) Special Warfare Testing—up to 4 events per year.
(K) Aircraft Carrier Sea Trials—Gun Testing—Medium Caliber—up to 410 events per year.
(L) Surface Warfare Mission Package—Gun Testing—Medium Caliber—up to 5 events per year.
(M) Surface Warfare Mission Package—Gun Testing—Large Caliber—up to 5 events per year.
(N) Surface Warfare Mission Package—Missile/Rocket Testing—up to 15 events per year.
(O) Mine Countermeasure Mission Package Testing—up to 8 events per year.
(P) Aircraft Carrier Full Ship Shock Trial—1 event per 5 year period
(Q) DDG 1000 Zumwalt Class Destroyer Full Ship Shock Trial—1 event per 5 year period.
(R) Littoral Combat Ship Full Ship Shock Trial—up to 2 events per 5 year period.
(S) At-sea Explosives Testing—up to 4 events per year.
(4) Active Acoustic Sources Used During Annual Training:
(i) Mid-frequency (MF) Source Classes:
(A) MF1—up to 9,844 hours per year.
(B) MF1K—up to 163 hours per year.
(C) MF2—up to 3,150 hours per year.
(D) MF2K—up to 61 hours per year.
(E) MF3—up to 2,058 hours per year.
(F) MF4—up to 927 hours per year.
(G) MF5—up to 14,556 sonobuoys per year.
(H) MF11—up to 800 hours per year.
(I) MF12—up to 687 hours per year.
(ii) High-frequency (HF) and Very High-frequency (VHF) Source Classes:
(A) HF1—up to 1,676 hours per year.
(B) HF4—up to 8,464 hours per year.
(iii) Anti-Submarine Warfare (ASW) Source Classes:
(A) ASW1—up to 128 hours per year.
(B) ASW2—up to 2,620 sonobuoys per year.
(C) ASW3—up to 13,586 hours per year.
(D) ASW4—up to 1,365 devices per year.
(iv) Torpedoes (TORP) Source Classes:
(A) TORP1—up to 54 torpedoes per year.
(B) TORP2—up to 80 torpedoes year.
(5) Active Acoustic Sources Used During Annual Testing:
(i) LF:
(A) LF4—up to 254 hours per year.
(B) LF5—up to 370 hours per year.
(ii) MF:
(A) MF1—up to 220 hours per year.
(B) MF1K—up to 19 hours per year.
(C) MF2—up to 36 hours per year.
(D) MF3—up to 434 hours per year.
(E) MF4—up to 776 hours per year.
(F) MF5—up to 4,184 sonobuoys per year.
(G) MF6—up to 303 items per year.
(H) MF8—up to 90 hours per year.
(I) MF9—up to 13,034 hours per year.
(J) MF10—up to 1,067 hours per year.
(K) MF12—up to 144 hours per year.
(iii) HF and VHF:
(A) HF1—up to 1,243 hours per year.
(B) HF3—up to 384 hours per year.
(C) HF4—up to 5,572 hours per year.
(D) HF5—up to 1,206 hours per year.
(E) HF6—up to 1,974 hours per year.
(F) HF7—up to 366 hours per year.
(iv) ASW:
(A) ASW1—up to 96 hours per year.
(B) ASW2—up to 2,743 sonobuoys per year.
(C) ASW2—up to 274 hours per year.
(D) ASW3—up to 948 hours per year.
(E) ASW4—up to 483 devices per year.
(v) TORP:
(A) TORP1—up to 581 torpedoes per year.
(B) TORP2—up to 521 torpedoes per year.
(vi) Acoustic Modems (M):
(A) M3—up to 461 hours per year.
(B) [Reserved]
(vii) Swimmer Detection Sonar (SD):
(A) SD1 and SD2—up to 230 hours per year.
(B) [Reserved]
(viii) Forward Looking Sonar (FLS):
(A) FLS2 and FLS3—up to 365 hours per year.
(B) [Reserved]
(ix) Synthetic Aperture Sonar (SAS):
(A) SAS1—up to 6 hours per year.
(B) SAS2—up to 3,424 hours per year.
(6) Explosive Sources Used During Annual Training:
(i) Explosive Classes:
(A) E1 (0.1 to 0.25 lb NEW)—up to 124,552 detonations per year.
(B) E2 (1.26 to 0.5 lb NEW)—up to 856 detonations per year.

(C) E3 (0.6 to 2.5 lb NEW)—up to 3,132 detonations per year.
(D) E4 (>2.5 to 5 lb NEW)—up to 2,190 detonations per year.
(E) E5 (>5 to 10 lb NEW)—up to 14,370 detonations per year.
(F) E6 (>10 to 20 lb NEW)—up to 500 detonations per year.
(G) E7 (>20 to 60 lb NEW)—up to 322 detonations per year.
(H) E8 (>60 to 100 lb NEW)—up to 77 detonations per year.
(I) E9 (>100 to 250 lb NEW)—up to 2 detonations per year.
(J) E10 (>250 to 500 lb NEW)—up to 8 detonations per year.
(K) E11 (>500 to 650 lb NEW)—up to 1 detonations per year.
(L) E12 (>650 to 1,000 lb NEW)—up to 133 detonations per year.
(ii) [Reserved]
(7) Explosive Sources Used During Annual Testing:
(i) Explosive Classes:
(A) E1 (0.1 to 0.25 lb NEW)—up to 25,501 detonations per year.
(B) E2 (0.26 to 0.5 lb NEW)—up to 0 detonations per year.
(C) E3 (0.6 to 2.5 lb NEW)—up to 2,912 detonations per year.
(D) E4 (>2.5 to 5 lb NEW)—up to 1,432 detonations per year.
(E) E5 (>5 to 10 lb NEW)—up to 495 detonations per year.
(F) E6 (>10 to 20 lb NEW)—up to 54 detonations per year.
(G) E7 >20 to 60 lb NEW)—up to 0 detonations per year.
(H) E8 (>60 to 100 lb NEW)—up to 11 detonations per year.
(I) E9 (>100 to 250 lb NEW)—up to 0 detonations per year.
(J) E10 (>250 to 500 lb NEW)—up to 10 detonations per year.
(K) E11 (>500 to 650 lb NEW)—up to 27 detonations per year.
(L) E12 (>650 to 1,000 lb NEW)—up to 0 detonations per year.
(M) E13 (>1,000 to 1,740 lb NEW)—up to 0 detonations per year.
(N) E14(>1,714 to 3,625 lb NEW)—up to 4 detonations per year.
(ii) [Reserved]
(8) Active Acoustic Source Used During Non-Annual Training
(i) HF4—up to 192 hours
(ii) [Reserved]
(9) Active Acoustic Sources Used During Non-Annual Testing
(i) LF5—up to 240 hours
(ii) MF9—up to 480 hours
(iii) HF5—up to 240 hours
(iv) HF6—up to 720 hours
(v) HF7—up to 240 hours
(vi) FLS2 and FLS3—up to 240 hours
(vii) SAS2—up to 720 hours
(10) Explosive Sources Used During Non-Annual Training
(i) E2(0.26 to 0.5 lbs NEW)—up to 2
(ii) E4 (2.6 to 5 lbs NEW)—up to 2
(11) Explosive Sources Used During Non-Annual Training
(i) E1 (0.1 to 0.25 lbs NEW)—up to 600
(ii) E16 (7,251 to 14,500 lbs NEW)—up to 12
(iii) E17 (14,501 to 58,000 lbs NEW)—up to 4

§ 218.81 Effective dates and definitions.

(a) Regulations are effective January 25, 2013 through January 25, 2018.
(b) The following definitions are utilized in these regulations:
(1) *Uncommon Stranding Event (USE)*—A stranding event that takes place during a major training exercise (MTE) and involves any one of the following:
(i) Two or more individuals of any cetacean species (not including mother/calf pairs), unless of species of concern listed in paragraph (b)(1)(ii) of this section found dead or live on shore within a 2-day period and occurring within 30 miles of one another.
(ii) A single individual or mother/calf pair of any of the following marine mammals of concern: beaked whale of any species, *Kogia* spp., Risso's dolphin, melon-headed whale, pilot whale, North Atlantic right whale, humpback whale, sperm whale, blue whale, fin whale, or sei whale.
(iii) A group of two or more cetaceans of any species exhibiting indicators of distress.
(2) *Shutdown*—The cessation of MFAS/HFAS operation or detonation of explosives within 14 nautical miles of any live, in the water, animal involved in a USE.

§ 218.82 Permissible methods of taking.

(a) Under Letters of Authorization (LOAs) issued pursuant to § 218.87, the Holder of the Letter of Authorization may incidentally, but not intentionally, take marine mammals within the area described in § 218.80, provided the activity is in compliance with all terms, conditions, and requirements of these regulations and the appropriate LOA.
(b) The activities identified in § 218.80(c) must be conducted in a manner that minimizes, to the greatest extent practicable, any adverse impacts on marine mammals and their habitat.
(c) The incidental take of marine mammals under the activities identified in § 218.80(c) is limited to the following species, by the identified method of take and the indicated number of times:
(1) Level B Harassment for all Training Activities:
(i) Mysticetes:
(A) Blue whale (*Balaenoptera musculus*)—735 (an average of 147 per year)
(B) Bryde's whale (*Balaenoptera edeni*)—4,775 (an average of 955 per year)
(C) Fin whale (*Balaenoptera physalus*)—22,450 (an average of 4,490 per year)
(D) North Atlantic right whale (*Eubalaena glacialis*)—560 (an average of 112 per year)
(E) Humpback whale (*Megaptera novaeangliae*)—8,215 (an average of 1,643 per year)
(F) Minke whale (*Balaenoptera acutorostrata*)—302,010 (an average of 60,402 per year)
(G) Sei whale (*Balaenoptera borealis*)—50,940 (an average of 10,188 per year)
(ii) Odontocetes:
(A) Atlantic spotted dolphin (*Stenella frontalis*)—887,550 (an average of 177,570 per year)
(B) Atlantic white-sided dolphin (Lagenorhynchus acutus)—156,100 (an average of 31,228)
(C) Blainville's beaked whale (*Mesoplodon densirostris*)—140,893 (28,179 per year)
(D) Bottlenose dolphin (*Tursiops truncatus*)—1,422,938 (284,728 per year)
(E) Clymene dolphin (Stenella clymene)—97,938 (19,588 per year)
(F) Common dolphin (Delphinus spp.)—2,325,022 (465,014 per year)
(G) Cuvier's beaked whale (*Ziphius cavirostris*)—174,473 (34,895 per year)
(H) False killer whale (*Pseudorca crassidens*)—3,565 (an average of 713 per year)
(I) Fraser's dolphin (*Lagenodelphis hosei*)—11,025 (2,205 per year)
(J) Gervais' beaked whale (Mesoplodon europaeus)—141,271 (28,255 per year)
(K) Harbor porpoise (*Phocoena phocoena*)—711,727 (142,811 per year)
(L) Killer whale (*Orcinus orca*)—70,273 (14,055 per year)
(M) *Kogia* spp.—25,448 (5,090 per year)
(N) Melon-headed whale (*Peponocephala electra*)—104,380 (20,876 per year)
(O) Northern bottlenose whale (Hyperoodon ampullatus)—91,786 (18,358 per year)
(P) Pantropical spotted dolphin (*Stenella attenuata*)—354,834 (70,968 per year)
(Q) Pilot whale (*Globicephala spp.*)—506,240 (101,252 per year)
(R) Pygmy killer whale (*Feresa attenuata*)—7,435 (1,487 per year)
(S) Risso's dolphin (*Grampus griseus*)—1,192,618 (238,528 per year)
(T) Rough-toothed dolphin (*Steno bredanensis*)—5,293 (1,059 per year)

(U) Sowerby's beaked whale (*Mesoplodon bidens*)—49,818 (9,964 per year)

(V) Sperm whale (*Physeter macrocephalus*)—73,743 (14,749 per year)

(W) Spinner dolphin (*Stenella longirostris*)—102,068 (20,414 per year)

(X) Striped dolphin (*Stenella coerulealba*)—1,121,511 (224,305 per year)

(Y) True's beaked whale (*Mesoplodon mirus*)—83,553 (16,711 per year)

(Z) White-beaked dolphin (Lagenorhynchus albirostris)—8,027 (1,613 per year)

(iii) Pinnipeds:

(A) Gray seal (*Halichoerus grypus*)—316 (82 per year)

(B) Harbor seal (*Phoca vitulina*)—329 (83 per year)

(C) Harp seal (*Pagophilus groenlanica*)—12 (4 per year)

(D) Hooded seal (*Cystophora cristata*)—25 (5 per year)

(2) Level A Harassment for all Training Activities:

(i) Mysticetes:

(A) Minke whale (*Balaenoptera acutorostrata*)—80 (16 per year)

(B) Fin whale (*Balaenoptera physalus*)—5 (1 per year)

(C) Humpback whale (*Megaptera novaeangliae*)—5 (1 per year)

(D) Sei whale (*Balaenoptera borealis*)—5 (1 per year)

(ii) Odontocetes:

(A) Atlantic spotted dolphin (*Stenella frontalis*)—60 (12 per year)

(B) Atlantic white-sided dolphin (Lagenorhynchus acutus)—15 (3 per year)

(C) Bottlenose dolphin (*Tursiops truncatus*)—40 (8 per year)

(D) Clymene dolphin (Stenella clymene)—5 (1 per year)

(E) Common dolphin (Delphinus spp.)—85 (17 per year)

(F) Harbor porpoise (*Phocoena phocoena*)—1,308 (262 per year)

(G) *Kogia* spp.—75 (15 per year)

(H) Pantropical spotted dolphin (*Stenella attenuata*)—5 (1 per year)

(I) Pilot whale (*Globicephala spp.*)—15 (3 per year)

(J) Risso's dolphin (*Grampus griseus*)—15 (3 per year)

(K) Striped dolphin (*Stenella coerulealba*)—35 (7 per year)

(3) Mortality for all Training Activities:

(i) No more than 85 mortalities (17 per year) applicable to any small odontocete species from an impulse source.

(ii) No more than 10 beaked whale mortalities (2 per year).

(iii) No more than 10 large whale mortalities (no more than 3 in any given year) from vessel strike.

(4) Level B Harassment for all Testing Activities:

(i) Mysticetes:

(A) Blue whale (*Balaenoptera musculus*)—82 (18 per year)

(B) Bryde's whale (*Balaenoptera edeni*)—304 (64 per year)

(C) Fin whale (*Balaenoptera physalus*)—2,784 (599 per year)

(D) North Atlantic right whale (*Eubalaena glacialis*)—395 (87 per year)

(E) Humpback whale (*Megaptera novaeangliae*)—976 (200 per year)

(F) Minke whale (*Balaenoptera acutorostrata*)—34,505 (7,756 per year)

(G) Sei whale (*Balaenoptera borealis*)—3,821 (796 per year)

(ii) Odontocetes:

(A) Atlantic spotted dolphin (*Stenella frontalis*)—104,647 (24,429 per year)

(B) Atlantic white-sided dolphin (Lagenorhynchus acutus)—50,133 (10,330 per year)

(C) Blainville's beaked whale (*Mesoplodon densirostris*)—23,561 (4,753 per year)

(D) Bottlenose dolphin (*Tursiops truncatus*)—146,863 (33,708 per year)

(E) Clymene dolphin (Stenella clymene)—10,169 (2,173 per year)

(F) Common dolphin (Delphinus spp.)—235,493 (52,546 per year)

(G) Cuvier's beaked whale (*Ziphius cavirostris*)—30,472 (6,144 per year)

(H) False killer whale (*Pseudorca crassidens*)—497 (an average of 109 per year)

(I) Fraser's dolphin (*Lagenodelphis hosei*)—791 (171 per year)

(J) Gervais' beaked whale (Mesoplodon europaeus)—23,388 (4,764 per year)

(K) Harbor porpoise (*Phocoena phocoena*)—10,358,300 (2,182,872 per year)

(L) Killer whale (*Orcinus orca*)—7,173 (1,540 per year)

(M) *Kogia* spp.—5,536 (1,163 per year)

(N) Melon-headed whale (*Peponocephala electra*)—6,950 (1,512 per year)

(O) Northern bottlenose whale (Hyperoodon ampullatus)—60,409 (12,096 per year)

(P) Pantropical spotted dolphin (*Stenella attenuata*)—38,385 (7,985 per year)

(Q) Pilot whale (*Globicephala spp.*)—74,614 (15,701 per year)

(R) Pygmy killer whale (*Feresa attenuata*)—603 (135 per year)

(S) Risso's dolphin (*Grampus griseus*)—113,682 (24,356 per year)

(T) Rough-toothed dolphin (*Steno bredanensis*)—618 (138 per year)

(U) Sowerby's beaked whale (*Mesoplodon bidens*)—13,338 (2,698 per year)

(V) Sperm whale (*Physeter macrocephalus*)—8,533 (1,786 per year)

(W) Spinner dolphin (*Stenella longirostris*)—13,208 (2,862 per year)

(X) Striped dolphin (*Stenella coerulealba*)—97,852 (21,738 per year)

(Y) True's beaked whale (*Mesoplodon mirus*)—15,569 (3,133 per year)

(Z) White-beaked dolphin (Lagenorhynchus albirostris)—8,370 (1,818 per year)

(iii) Pinnipeds:

(A) Bearded seal (*Erignathus barbatus*)—161 (33 per year)

(B) Gray seal (*Halichoerus grypus*)—14,149 (3,293 per year)

(C) Harbor seal (*Phoca vitulina*)—38,860 (8,668 per year)

(D) Harp seal (*Pagophilus groenlanica*)—16,277 (3,997 per year)

(E) Hooded seal (*Cystophora cristata*)—1,447 (295 per year)

(F) Ringed seal (*Pusa hispida*)—1,795 (359 per year)

(5) Level A Harassment for all Testing Activities:

(i) Mysticetes:

(A) Minke whale (*Balaenoptera acutorostrata*)—28 (15 per year)

(B) [Reserved]

(ii) Odontocetes:

(A) Atlantic spotted dolphin (*Stenella frontalis*)—1,964 (1,854 per year)

(B) Atlantic white-sided dolphin (Lagenorhynchus acutus)—166 (147 per year)

(C) Bottlenose dolphin (*Tursiops truncatus*)—190 (149 per year)

(D) Clymene dolphin (Stenella clymene)—87 (80 per year)

(E) Common dolphin (Delphinus spp.)—2,369 (2,203 per year)

(F) Harbor porpoise (*Phocoena phocoena*)—1,080 (216 per year)

(G) Killer whale (Orcinus orca)—2 (2 per year)

(H) *Kogia* spp.—36 (12 per year)

(I) Melon-headed whale (*Peponocephala electra*)—30 (28 per year)

(J) Pantropical spotted dolphin (*Stenella attenuata*)—92 (71 per year)

(K) Pilot whale (*Globicephala spp.*)—163 (153 per year)

(L) Pygmy killer whale (*Feresa attenuata*)—3 (3 per year)

(M) Risso's dolphin (*Grampus griseus*)—89 (70 per year)

(N) Spinner dolphin (*Stenella longirostris*)—34 (28 per year)

(O) Striped dolphin (*Stenella coerulealba*)—2,751 (2,599 per year)

(P) White-beaked dolphin (Lagenorhynchus albirostris)—3 (3 per year)

(iii) Pinnipeds:

(A) Gray seal (*Halichoerus grypus*)—46 (14 per year)

(B) Harbor seal (*Phoca vitulina*)—330 (78 per year)

(C) Harp seal (*Pagophilus groenlanica*)—30 (14 per year)

(6) Mortality for all Testing Activities:

(i) No more than 55 mortalities (11 per year) applicable to any small odontocete species from an impulse source.

(ii) No more than 1 large whale mortalities (no more than 1 in any given year) from vessel strike.

(iii) Nor more than 25 mortalities (no more than 20 in any given year) applicable to any small odontocete species from Ship Shock trials.

§ 218.83 Prohibitions.

Notwithstanding takings contemplated in § 218.82 and authorized by an LOA issued under § 216.106 of this chapter and § 218.87, no person in connection with the activities described in § 218.80 may:

(a) Take any marine mammal not specified in § 218.82(c);

(b) Take any marine mammal specified in § 218.82(c) other than by incidental take as specified in § 218.82(c);

(c) Take a marine mammal specified in § 218.82(c) if such taking results in more than a negligible impact on the species or stocks of such marine mammal; or

(d) Violate, or fail to comply with, the terms, conditions, and requirements of these regulations or an LOA issued under § 216.106 of this chapter and § 218.87.

§ 218.84 Mitigation.

(a) When conducting training and testing activities, as identified in § 218.80, the mitigation measures contained in the LOA issued under § 216.106 of this chapter and § 218.87 must be implemented. These mitigation measures include, but are not limited to:

(1) Lookouts—The following are protective measures concerning the use of lookouts.

(i) Lookouts positioned on surface ships will be dedicated solely to diligent observation of the air and surface of the water. Their observation objectives will include, but are not limited to, detecting the presence of biological resources and recreational or fishing boats, observing buffer zones, and monitoring for vessel and personnel safety concerns.

(ii) Lookouts positioned in aircraft or on boats will, to the maximum extent practicable and consistent with aircraft and boat safety and training and testing requirements, comply with the observation objectives described above in paragraph (a)(1)(i) of this section.

(iii) Lookout measures for non-impulsive sound:

(A) With the exception of vessels less than 65 ft (20 m) in length and the Littoral Combat Ship (and similar vessels which are minimally manned), ships using low-frequency or hull-mounted mid-frequency active sonar sources associated with anti-submarine warfare and mine warfare activities at sea will have two Lookouts at the forward position of the vessel. For the purposes of this rule, low-frequency active sonar does not include surface towed array surveillance system low-frequency active sonar.

(B) While using low-frequency or hull-mounted mid-frequency active sonar sources associated with anti-submarine warfare and mine warfare activities at sea, vessels less than 65 ft (20 m) in length and the Littoral Combat Ship (and similar vessels which are minimally manned) will have one Lookout at the forward position of the vessel due to space and manning restrictions.

(C) Ships conducting active sonar activities while moored or at anchor (including pierside testing or maintenance) will maintain one Lookout.

(D) Ships or aircraft conducting non-hull-mounted mid-frequency active sonar, such as helicopter dipping sonar systems, will maintain one Lookout.

(E) Surface ships or aircraft conducting high-frequency or non-hull-mounted mid-frequency active sonar activities associated with anti-submarine warfare and mine warfare activities at sea will have one Lookout.

(iv) Lookout measures for explosives and impulsive sound:

(A) Aircraft conducting activities with IEER sonobuoys and explosive sonobuoys with 0.6 to 2.5 lbs net explosive weight will have one Lookout.

(B) Surface vessels conducting anti-swimmer grenade activities will have one Lookout.

(C) During general mine countermeasure and neutralization activities using up to a 500-lb net explosive weight detonation (bin E10 and below), vessels greater than 200 ft will have two Lookouts, while vessels less than 200 ft will have one Lookout.

(D) General mine countermeasure and neutralization activities using a 501 to 650-lb net explosive weight detonation (bin E11), will have two Lookouts. One Lookout will be positioned in an aircraft and one in a support vessel.

(E) Mine neutralization activities involving diver-placed charges using up to 100-lb net explosive weight detonation (E8) conducted with a positive control device will have a total of two Lookouts. One Lookout will be positioned in each of the two support vessels. When aircraft are used, the pilot or member of the aircrew will serve as an additional Lookout. All divers placing the charges on mines will support the Lookouts while performing their regular duties. The divers placing the charges on mines will report all marine mammal sightings to their dive support vessel.

(F) When mine neutralization activities using diver-placed charges with up to a 20-lb net explosive weight detonation (bin E6) are conducted with a time-delay firing device, four Lookouts will be used. Two Lookouts will be positioned in each of two small rigid hull inflatable boats. When aircraft are used, the pilot or member of the aircrew will serve as an additional Lookout. The divers placing the charges on mines will report all marine mammal sightings to their dive support vessel.

(G) Surface vessels conducting line charge testing will have one Lookout

(H) Surface vessels or aircraft conducting small- and medium-caliber gunnery exercises will have one Lookout.

(I) Surface vessels or aircraft conducting large-caliber gunnery exercises will have one Lookout.

(J) Surface vessels or aircraft conducting missile exercises against surface targets will have one Lookout.

(K) Aircraft conducting bombing exercises will have one Lookout.

(L) During explosive torpedo testing, one Lookout will be used and positioned in an aircraft.

(M) During sinking exercises, two Lookouts will be used. One Lookout will be positioned in an aircraft and one on a surface vessel.

(N) Prior to commencement, during, and after ship shock trials using up to 10,000 lb HBX charges, the Navy will have Lookouts or trained marine species observers positioned either in an aircraft or on multiple surface vessels. If vessels are the only available platform, a sufficient number will be used to provide visual observation of the mitigation zone comparable to that achieved by aerial surveys.

(O) Prior to commencement and after ship shock trials using up to 40,000 lb HBX charges, the Navy will have a minimum of two Lookouts or trained marine species observers positioned in an aircraft. During ship shock trials using up to 40,000 lb HBX charges, the Navy will have a total of four Lookouts or trained marine species observers. Two Lookouts will be positioned in an aircraft and two Lookouts will be positioned on a surface vessel.

(P) Each surface vessel supporting at-sea explosive testing will have at least one lookout.

(Q) During pile driving, one lookout will be used and positioned on the platform that will maximize the potential for marine mammal sightings (e.g., the shore, an elevated causeway, or on a ship).

(R) Surface vessels conducting explosive and non-explosive large-caliber gunnery exercises will have one lookout. This may be the same lookout used during large-caliber gunnery exercises with a surface target.

(v) Lookout measures for physical strike and disturbance:

(A) While underway, surface ships will have at least one lookout.

(B) During activities using towed in-water devices, one lookout will be used.

(C) Activities involving non-explosive practice munitions (e.g., small-, medium-, and large-caliber gunnery exercises) using a surface target will have one lookout.

(D) During activities involving non-explosive bombing exercises, one lookout will be used.

(2) *Mitigation Zones*—The following are protective measures concerning the implementation of mitigation zones.

(i) Mitigation zones will be measured as the radius from a source and represent a distance to be monitored.

(ii) Visual detections of marine mammals within a mitigation zone will be communicated immediately to a watch station for information dissemination and appropriate action.

(iii) Mitigation zones for non-impulsive sound:

(A) When marine mammals are visually detected, the Navy shall ensure that low-frequency and hull-mounted mid-frequency active sonar transmission levels are limited to at least 6 dB below normal operating levels if any detected marine mammals are within 1,000 yd (914 m) of the sonar dome (the bow).

(B) The Navy shall ensure that low-frequency and hull-mounted mid-frequency active sonar transmissions are limited to at least 10 dB below the equipment's normal operating level if any detected marine mammals are within 500 yd (457 m) of the sonar dome.

(B) The Navy shall ensure that low-frequency and hull-mounted mid-frequency active sonar transmissions are ceased if any visually detected marine mammals are within 200 yd (183 m) of the sonar dome. 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 yd beyond the location of the last detection.

(C) When marine mammals are visually detected, the Navy shall ensure that high-frequency and non-hull-mounted mid-frequency active sonar transmission levels are ceased if any visually detected marine mammals are within 200 yd (183 m) of the source. 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 yd beyond the location of the last detection.

(D) 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.

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

(iv) Mitigation zones for explosive and impulsive sound:

(A) A mitigation zone with a radius of 600 yd (549 m) shall be established for IEER sonobuoys (bin E4).

(B) A mitigation zone with a radius of 350 yd (320 m) shall be established for explosive sonobuoys using 0.6 to 2.5 lb net explosive weight (bin E3).

(C) A mitigation zone with a radius of 200 yd (183 m) shall be established for anti-swimmer grenades (bin E2).

(D) A mitigation zone ranging from 350 yd (320 m) to 850 yd (777 m), dependent on charge size, shall be established for mine countermeasure and neutralization activities using diver placed positive control firing devices. Mitigation zone distances are specified for charge size in Table 11–2 of the Navy's application.

(E) A mitigation zone with a radius of 1,000 yd (915 m) shall be established for mine neutralization diver placed mines using time-delay firing devices (bin E6).

(F) A mitigation zone with a radius of 900 yd (823 m) shall be established for ordnance testing (line charge testing) (bin E4).

(G) A mitigation zone with a radius of 200 yd (183 m) shall be established for small- and medium-caliber gunnery exercises with a surface target (bin E2).

(H) A mitigation zone with a radius of 600 yd (549 m) shall be established for large-caliber gunnery exercises with a surface target (bin E5).

(I) A mitigation zone with a radius of 900 yd (823 m) shall be established for missile exercises with up to 250 lb net explosive weight and a surface target (bin E9).

(J) A mitigation zone with a radius of 2,000 yd (1.8 km) shall be established for missile exercises with 251 to 500 lb net explosive weight and a surface target (E10).

(K) A mitigation zone with a radius of 2,500 yd (2.3 km) shall be established for bombing exercises (bin E12).

(L) A mitigation zone with a radius of 2,100 yd (1.9 km) shall be established for torpedo (explosive) testing (bin E11).

(M) A mitigation zone with a radius of 2.5 nautical miles shall be established for sinking exercises (bin E12).

(N) A mitigation zone with a radius of 1,600 yd (1.4 km) shall be established for at-sea explosive testing (bin E5).

(O) A mitigation zone with a radius of 60 yd (55 m) shall be established for elevated causeway system pile driving.

(P) A mitigation zone with a radius of 3.5 nautical miles shall be established for a shock trial.

(v) Mitigation zones for vessels and in-water devices:

(A) A mitigation zone of 500 yd (457 m) for observed whales and 200 yd (183 m) for all other marine mammals (except bow riding dolphins) shall be established for all vessel movement, providing it is safe to do so.

(B) A mitigation zone of 250 yd (229 m) shall be established for all towed in-water devices, providing it is safe to do so.

(vi) Mitigation zones for non-explosive practice munitions:

(A) A mitigation zone of 200 yd (183 m) shall be established for small, medium, and large caliber gunnery exercises using a surface target.

(B) A mitigation zone of 1,000 yd (914 m) shall be established for bombing exercises.

(3) *Protective Measures Specific to North Atlantic Right Whales.*

(i) North Atlantic Right Whale Calving Habitat off the Southeast United States.

(A) The Southeast Right Whale Mitigation Area is defined by a 5 nm (9.3 km) buffer around the coastal waters between 31–15 N. lat. and 30–15 N. lat. extending from the coast out 15 nm (27.8 km), and the coastal waters between 30–15 N. lat. to 28–00 N. lat. from the coast out to 5 nm (9.3 km).

(B) Between November 15 and April 15, the following activities are prohibited within the Southeast Right Whale Mitigation Area:

(*1*) High-frequency and non-hull mounted mid-frequency active sonar (except helicopter dipping)

(*2*) Missile activities (explosive and non-explosive)

(*3*) Bombing exercises (explosive and non-explosive)

(*4*) Underwater detonations

(*5*) Improved extended echo ranging sonobuoy exercises

(*6*) Torpedo exercises (explosive)

(*7*) Small-, medium-, and large-caliber gunnery exercises

(C) Prior to transiting or training in the Southeast Right Whale Mitigation Area, ships shall contact Fleet Area Control and Surveillance Facility, Jacksonville, to obtain the latest whale sightings and other information needed to make informed decisions regarding safe speed and path of intended movement. Submarines shall contact Commander, Submarine Force United States Atlantic Fleet for similar information.

(D) The following specific mitigation measures apply to activities occurring within the Southeast Right Whale Mitigation Area:

(*1*) When transiting within the Southeast Right Whale Mitigation Area, vessels shall exercise extreme caution and proceed at a slow safe speed. The speed shall be the slowest safe speed that is consistent with mission, training, and operations.

(*2*) Speed reductions (adjustments) are required when a North Atlantic right whale is sighted by a vessel, when the vessel is within 9 km (5 nm) of a sighting reported within the past 12 hours, or when operating at night or during periods of poor visibility.

(*3*) Vessels shall avoid head-on approaches to North Atlantic right whales(s) and shall maneuver to maintain at least 457 m (500 yd) of separation from any observed whale if deemed safe to do so. These requirements do not apply if a vessel's safety is threatened, such as when a change of course would create an imminent and serious threat to a person, vessel, or aircraft, and to the extent vessels are restricted in their ability to maneuver.

(*4*) Vessels shall minimize to the extent practicable north-south transits through the Southeast Right Whale Mitigation Area. If transit in a north-south direction is required during training or testing activities, the Navy shall implement the measures described above.

(*5*) Ship, surfaced subs, and aircraft shall report any North Atlantic right whale sightings to Fleet Area Control and Surveillance Facility, Jacksonville, by the most convenient and fastest means. The sighting report shall include the time, latitude/longitude, direction of movement and number and description of whale (i.e., adult/calf)

(ii) North Atlantic Right Whale Foraging Habitat off the Northeast United States.

(A) The Northeast Right Whale Mitigation Area consists of two areas: the Great South Channel and Cape Cod Bay. The Great South Channel is defined by the following coordinates: 41-40 N. Lat., 69-45 W. Long.; 41-00 N. Lat., 69-05 W. Long.; 41-38 N. Lat., 68-13 W. Long.; and 42-10 N. Lat., 68-31 W. Long. Cape Cod Bay is defined by the following coordinates: 42-04.8 N. Lat., 70-10 W. Long.; 42-10 N. Lat., 70-15 W. Long.; 42-12 N. Lat., 70-30 W. Long.; 41-46.8 N. Lat., 70-30 W. Long.; and on the south and east by the interior shoreline of Cape Cod.

(B) Year-round, the following activities are prohibited within the Northeast Right Whale Mitigation Area:

(*1*) Improved extended echo ranging sonobuoy exercises in or within 5.6 km (3 nm) of the mitigation area.

(*2*) Bombing exercises (explosive and non-explosive)

(*3*) Underwater detonations

(*4*) Torpedo exercises (explosive)

(C) Prior to transiting or training in the Northeast Right Whale Mitigation Area, ships and submarines shall contact the Northeast Right Whale Sighting Advisory System to obtain the latest whale sightings and other information needed to make informed decisions regarding safe speed and path of intended movement.

(D) The following specific mitigation measures apply to activities occurring within the Northeast Right Whale Mitigation Area:

(*1*) When transiting within the Northeast Right Whale Mitigation Area, vessels shall exercise extreme caution and proceed at a slow safe speed. The speed shall be the slowest safe speed that is consistent with mission, training, and operations.

(*2*) Speed reductions (adjustments) are required when a North Atlantic right whale is sighted by a vessel, when the vessel is within 9 km (5 nm) of a sighting reported within the past week, or when operating at night or during periods of poor visibility.

(*3*) When conducting TORPEXs, the following additional speed restrictions shall be required: during transit, surface vessels and submarines shall maintain a speed of no more than 19 km/hour (10 knots); during torpedo firing exercises, vessel speeds should, where feasible, not exceed 10 knots; when a submarine is used as a target, vessel speeds should, where feasible, not exceed 18 knots; when surface vessels are used as targets, vessels may exceed 18 knots for a short period of time (e.g., 10–15 minutes).

(*4*) Vessels shall avoid head-on approaches to North Atlantic right whales(s) and shall maneuver to maintain at least 457 m (500 yd) of separation from any observed whale if deemed safe to do so. These requirements do not apply if a vessel's safety is threatened, such as when a change of course would create an imminent and serious threat to a person, vessel, or aircraft, and to the extent vessels are restricted in their ability to maneuver.

(*5*) Non-explosive torpedo testing shall be conducted during daylight hours only in Beaufort sea states of 3 or less to increase the probability of marine mammal detection.

(*6*) Non-explosive torpedo testing activities shall not commence if concentrations of floating vegetation (*Sargassum* or kelp patties) are observed in the vicinity.

(*7*) Non-explosive torpedo testing activities shall cease if a marine mammal is visually detected within the immediate vicinity of the activity. The tests may recommence when any one of the following conditions are met: the animal is observed exiting the immediate vicinity of the activity; the animal is thought to have exited the immediate vicinity based on its course and speed; or the immediate vicinity of the activity has been clear from any additional sightings for a period of 30 minutes.

(iii) North Atlantic Right Whale Mid-Atlantic Migration Corridor

(A) The Mid-Atlantic Right Whale Mitigation Area consists of the following areas:

(*1*) Block Island Sound: the area bounded by 40-51-53.7 N. Lat., 70-36-44.9 W. Long.; and 41-20-14.1 N. Lat., 70-49-44.1 W. Long.

(*2*) New York and New Jersey: 37 km (20 nm) seaward of the line between 40-29-42.2 N. Lat., 73-55-57.6 W. Long.

(*3*) Delaware Bay: 38-52-27.4 N. Lat., 75-01-32.1 W. Long.

(*4*) Chesapeake Bay: 37-00-36.9 N. Lat., 75-57-50.5 W. Long.

(*5*) Morehead City, North Carolina: 34-41-32 N. Lat., 76-40-08.3 W. Long.

(*6*) Wilmington, North Carolina, through South Carolina, and to Brunswick, Georgia: within a continuous area 37 km (20 nm) from shore and west back to shore bounded by 34-10-30 N. Lat., 77-49-12 W. Long.; 33-56-42 N. Lat., 77-31-30 W. Long.; 33-36-30 N. Lat., 77-47-06 W. Long.; 33-28-24 N. Lat., 78-32-30 W. Long.; 32-59-06 N. Lat., 78-50-18 W. Long.; 31-50 N. Lat., 80-33-12 W. Long.; 31-27 N. Lat., 80-51-36 W. Long.

(B) Between November 1 and April 30, when transiting within the Mid-Atlantic Right Whale Mitigation Area, vessels shall exercise extreme caution and proceed at a slow safe speed. The speed shall be the slowest safe speed that is consistent with mission, training, and operations.

(iv) Planning Awareness Areas.

(A) The Navy shall avoid planning exercises involving the use of active sonar in the specified planning awareness areas (PAAs—see Figure 11-1 in the Navy's LOA application) where feasible. Should national security require the conduct of more than five major exercises (C2X, JTFEX, SEASWITI, or similar scale event) in these areas (meaning all or a portion of the exercise) per year, the Navy shall provide NMFS with prior notification and include the information in any associated after-action or monitoring reports.

(4) *Stranding Response Plan.*

(i) The Navy shall abide by the current Stranding Response Plan for Major Navy Training Exercises in the Study Area, to include the following measures:

(A) Shutdown Procedures—When an Uncommon Stranding Event (USE—defined in § 218.71(b)(1)) occurs during a Major Training Exercise (MTE) in the AFTT Study Area, the Navy shall implement the procedures described below.

(*1*) The Navy shall implement a shutdown (as defined § 218.81(b)(2)) when advised by a NMFS Office of Protected Resources Headquarters Senior Official designated in the AFTT Study Area 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 the Navy will maintain a dialogue, as needed, regarding the identification of the USE and the potential need to implement shutdown procedures.

(*2*) 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).

(*3*) If the Navy finds an injured or dead animal floating at sea during an 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, NFMS will determine if, and advise the Navy whether a modified shutdown is appropriate on a case-by-case basis.

(*4*) In the event, following a USE, that qualified individuals are attempting to herd animals back out to the open ocean and animals are not willing to leave, or 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 mid-frequency active sonar training activities or explosive detonations, though farther than 14 nautical miles 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 AFTT Study Area Communication Protocol) regarding the location, number and types of acoustic/explosive sources, direction and speed of units using mid-frequency active sonar, and marine mammal sightings information associated with training activities occurring within 80 nautical miles (148 km) and 72 hours prior to the USE event. Information not initially available regarding the 80-nautical miles (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.

(ii) [Reserved]

(b) [Reserved]

§ 218.85 Requirements for monitoring and reporting.

(a) As outlined in the AFTT Study Area Stranding Communication Plan, the Holder of the Authorization must notify NMFS immediately (or as soon as clearance procedures allow) if the specified activity identified in § 218.80 is thought to have resulted in the mortality or injury of any marine mammals, or in any take of marine mammals not identified in § 218.81.

(b) The Holder of the LOA must conduct all monitoring and required reporting under the LOA, including abiding by the AFTT Monitoring Plan.

(c) General Notification of Injured or Dead Marine Mammals—Navy personnel shall ensure that NMFS (regional stranding coordinator) is notified immediately (or as soon as clearance procedures allow) if an injured or dead marine mammal is found during or shortly after, and in the vicinity of, an Navy training or testing activity utilizing mid- or high-frequency active sonar, or underwater explosive detonations. The Navy shall provide NMFS with species identification or description of the animal(s), the condition of the animal(s) (including carcass condition if the animal is dead), location, time of first discovery, observed behaviors (if alive), and photo or video (if available). The Navy shall consult the Stranding Response Plan to obtain more specific reporting requirements for specific circumstances.

(d) Annual AFTT Monitoring Plan Report—The Navy shall submit an annual report describing the implementation and results of the AFTT Monitoring Plan, described in this section. Data collection methods will be standardized across range complexes and study areas to allow for comparison in different geographic locations. Although additional information will be gathered, the protected species observers collecting marine mammal data pursuant to the AFTT Monitoring Plan shall, at a minimum, provide the same marine mammal observation data required in this section. The AFTT Monitoring Plan may be provided to NMFS within a larger report that includes the required Monitoring Plan reports from multiple range complexes and study areas.

(e) Annual AFTT Exercise Report—The Navy shall submit an annual AFTT Exercise Report. This report shall contain information identified in paragraphs (e)(1) through (5) of this section.

(1) MFAS/HFAS Major Training Exercises—This section shall contain the following information for Major Training Exercises conducted in the AFTT Study Area:

(i) Exercise Information (for each MTE):

(A) Exercise designator.

(B) Date that exercise began and ended.

(C) Location.

(D) Number and types of active sources used in the exercise.

(E) Number and types of passive acoustic sources used in exercise.

(F) Number and types of vessels, aircraft, etc., participating in exercise.

(G) Total hours of observation by watchstanders.

(H) Total hours of all active sonar source operation.

(I) Total hours of each active sonar source bin.

(J) Wave height (high, low, and average during exercise).

(ii) Individual marine mammal sighting info (for each sighting in each MTE).

(A) Location of sighting.

(B) Species (if not possible, indication of whale/dolphin/pinniped).

(C) Number of individuals.

(D) Calves observed (y/n).

(E) Initial Detection Sensor.

(F) Indication of specific type of platform observation made from (including, for example, what type of surface vessel, i.e., FFG, DDG, or CG).

(G) Length of time observers maintained visual contact with marine mammal.

(H) Wave height (in feet).

(I) Visibility.

(J) Sonar source in use (y/n).

(K) Indication of whether animal is <200 yd, 200 to 500 yd, 500 to 1,000 yd, 1,000 to 2,000 yd, or >2,000 yd from sonar source in paragraph (e)(1)(ii)(J) of this section.

(L) Mitigation Implementation—Whether operation of sonar sensor was delayed, or sonar was powered or shut down, and how long the delay was.

(M) If source in use (see paragraph (e)(1)(ii)(J) of this section) is hull-mounted, true bearing of animal from ship, true direction of ship's travel, and estimation of animal's motion relative to ship (opening, closing, parallel).

(N) Observed behavior—Watchstanders shall report, in plain language and without trying to categorize in any way, the observed behavior of the animals (such as animal closing to bow ride, paralleling course/speed, floating on surface and not swimming, etc.).

(iii) An evaluation (based on data gathered during all of the MTEs) of the effectiveness of mitigation measures designed to avoid exposing animals to mid-frequency active sonar. This evaluation shall identify the specific observations that support any conclusions the Navy reaches about the effectiveness of the mitigation.

(2) ASW Summary—This section shall include the following information as summarized from both MTEs and non-major training exercises (i.e., unit-level exercises, such as TRACKEXs):

(i) Total annual hours of each sonar source bin.

(ii) Cumulative Impact Report—To the extent practicable, the Navy, in coordination with NMFS, shall develop and implement a method of annually reporting non-major training exercises utilizing hull-mounted sonar. The report shall present an annual (and seasonal, where practicable) depiction of non-major training exercises geographically across the AFTT Study Area. The Navy shall include (in the AFTT annual report) a brief annual progress update on the status of development until an agreed-upon (with NMFS) method has been developed and implemented.

(3) SINKEXs—This section shall include the following information for each SINKEX completed that year:

(i) Exercise information (gathered for each SINKEX):

(A) Location.

(B) Date and time exercise began and ended.

(C) Total hours of observation by watchstanders before, during, and after exercise.

(D) Total number and types of explosive source bins detonated.

(E) Number and types of passive acoustic sources used in exercise.

(F) Total hours of passive acoustic search time.

(G) Number and types of vessels, aircraft, etc., participating in exercise.

(H) Wave height in feet (high, low, and average during exercise).

(I) Narrative description of sensors and platforms utilized for marine mammal detection and timeline illustrating how marine mammal detection was conducted.

(ii) Individual marine mammal observation (by Navy lookouts) information (gathered for each marine mammal sighting):

(A) Location of sighting.

(B) Species (if not possible, indicate whale, dolphin, or pinniped).

(C) Number of individuals.

(D) Whether calves were observed.

(E) Initial detection sensor.

(F) Length of time observers maintained visual contact with marine mammal.

(G) Wave height.

(H) Visibility.

(I) Whether sighting was before, during, or after detonations/exercise, and how many minutes before or after.

(J) Distance of marine mammal from actual detonations (or target spot if not yet detonated).

(K) Observed behavior—Watchstanders will report, in plain language and without trying to categorize in any way, the observed behavior of the animal(s) (such as animal closing to bow ride, paralleling course/speed, floating on surface and not swimming etc.), including speed and direction.

(L) Resulting mitigation implementation—Indicate whether explosive detonations were delayed, ceased, modified, or not modified due to marine mammal presence and for how long.

(M) If observation occurs while explosives are detonating in the water, indicate munition type in use at time of marine mammal detection.

(4) IEER Summary—This section shall include an annual summary of the following IEER information:

(i) Total number of IEER events conducted in the AFTT Study Area.

(ii) Total expended/detonated rounds (buoys).

(iii) Total number of self-scuttled IEER rounds.

(5) Explosives Summary—To the extent practicable, the Navy will provide the information described below for all of their explosive exercises. Until the Navy is able to report in full the information below, they will provide an annual update on the Navy's explosive tracking methods, including improvements from the previous year.

(i) Total annual number of each type of explosive exercises (of those identified as part of the ''specified activity'' in this subpart) conducted in the AFTT Study Area.

(ii) Total annual expended/detonated rounds (missiles, bombs, etc.) for each explosive source bin.

(f) Sonar Exercise Notification—The Navy shall submit to the NMFS Office of Protected Resources (specific contact information to be provided in LOA) either an electronic (preferably) or verbal report within fifteen calendar days after the completion of any major exercise (COMPTUEX, JTFEX, SEASWITI or similar scale event) indicating:

(1) Location of the exercise.

(2) Beginning and end dates of the exercise.

(3) Type of exercise (e.g., COMPTUEX, JTFEX, SEASWITI or similar scale event).

(g) AFTT Study Area 5-yr Comprehensive Report—The Navy shall submit to NMFS a draft report that analyzes and summarizes all of the multi-year marine mammal information gathered during ASW and explosive exercises for which annual reports are required (Annual AFTT Exercise Reports and AFTT Monitoring Plan reports). This report will be submitted at the end of the fourth year of the rule (November 2018), covering activities that have occurred through June 1, 2018.

(h) Comprehensive National ASW Report—By June 2019, the Navy shall submit a draft Comprehensive National Report that analyzes, compares, and summarizes the active sonar data gathered (through January 1, 2019) from the watchstanders in accordance with the Monitoring Plans for HSTT, AFTT, MITT, and NWTT.

(i) The Navy shall respond to NMFS' comments and requests for additional information or clarification on the AFTT Comprehensive Report, the draft National ASW report, the Annual AFTT Exercise Report, or the Annual AFTT Monitoring Plan report (or the multi-Range Complex Annual Monitoring Plan Report, if that is how the Navy chooses to submit the information) if submitted within 3 months of receipt. These reports will be considered final after the Navy has addressed NMFS' comments or provided the requested information, or three months after the submittal of the draft if NMFS does not provide comment.

§ 218.86 Applications for Letters of Authorization.

To incidentally take marine mammals pursuant to the regulations in this subpart, the U.S. citizen (as defined by § 216.106 of this chapter) conducting the activity identified in § 218.80(c) (the U.S. Navy) must apply for and obtain either an initial LOA in accordance with § 218.87 or a renewal under § 218.88.

§ 218.87 Letters of Authorization.

(a) An LOA, unless suspended or revoked, will be valid for a period of time not to exceed the period of validity of this subpart.

(b) Each LOA will set forth:

(1) Permissible methods of incidental taking;

(2) Means of effecting the least practicable adverse impact on the species, its habitat, and on the availability of the species for subsistence uses (i.e., mitigation); and

(3) Requirements for mitigation, monitoring and reporting.

(c) Issuance and renewal of the LOA will be based on a determination that the total number of marine mammals taken by the activity as a whole will have no more than a negligible impact on the affected species or stock of marine mammal(s).

§ 218.88 Renewal of Letters of Authorization.

(a) A Letter of Authorization issued under § 216.106 of this chapter and § 218.87 for the activity identified in § 218.80(c) will be renewed based upon:

(1) Notification to NMFS that the activity described in the application submitted under this sectionwill be undertaken and that there will not be a substantial modification to the described work, mitigation, or monitoring undertaken during the upcoming period of validity;

(2) Timely receipt (by the dates indicated in this subpart) of the monitoring reports required under § 218.85(c) through (j); and

(3) A determination by the NMFS that the mitigation, monitoring, and reporting measures required under § 218.84 and the LOA issued under § 216.106 of this chapter and § 218.87, were undertaken and will be undertaken during the upcoming period of validity of a renewed Letter of Authorization.

(b) If a request for a renewal of an LOA issued under this § 216.106 of this chapter and § 218.87 indicates that a substantial modification, as determined by NMFS, to the described work, mitigation or monitoring undertaken during the upcoming season will occur, NMFS will provide the public a period of 30 days for review and comment on the request. Review and comment on renewals of LOAs are restricted to:

(1) New cited information and data indicating that the determinations made in this document are in need of reconsideration; and

(2) Proposed changes to the mitigation and monitoring requirements contained in these regulations or in the current LOA.

(c) A notice of issuance or denial of an LOA renewal will be published in the **Federal Register**.

(d) NMFS, in response to new information and in consultation with the Navy, may modify the mitigation or monitoring measures in subsequent LOAs if doing so creates a reasonable likelihood of more effectively accomplishing the goals of mitigation and monitoring. Below are some of the possible sources of new data that could contribute to the decision to modify the mitigation or monitoring measures:

(1) Results from the Navy's monitoring from the previous year (either from the AFTT Study Area or other locations).

(2) Compiled results of Navy-funded research and development (R&D) studies (presented pursuant to the ICMP (§ 218.85(d)).

(3) Results from specific stranding investigations (either from the AFTT Study Area or other locations, and involving coincident mid- or high-frequency active sonar or explosives training or not involving coincident use).

(4) Results from the Long Term Prospective Study.

(5) Results from general marine mammal and sound research (funded by the Navy (or otherwise).

§ 218.89 Modifications to Letters of Authorization.

(a) Except as provided in paragraph (b) of this section, no substantive modification (including withdrawal or suspension) to the LOA by NMFS, issued pursuant to § 216.106 of this chapter and § 218.87 and subject to the provisions of this subpart shall be made until after notification and an opportunity for public comment has been provided. For purposes of this paragraph, a renewal of an LOA under § 218.88, without modification (except for the period of validity), is not considered a substantive modification.

(b) If the Assistant Administrator determines that an emergency exists that poses a significant risk to the well-being of the species or stocks of marine mammals specified in § 218.82(c), an LOA issued pursuant to § 216.106 of this chapter and § 218.87 may be substantively modified without prior notification and an opportunity for public comment. Notification will be published in the **Federal Register** within 30 days subsequent to the action.

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