BILLING CODE: 3510-22-P

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

RIN 0648-XD593

Takes of Marine Mammals Incidental to Specified Activities; Taking Marine Mammals Incidental to the U.S. Air Force Conducting Maritime Weapon Systems Evaluation Program Operational Testing within the Eglin Gulf Test and Training Range

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

ACTION: Notice; proposed incidental harassment authorization; request for comments.

SUMMARY: NMFS received an application from the U.S. Department of the Air Force, Headquarters 96th Air Base Wing (Air Force), Eglin Air Force Base (Eglin AFB), requesting an Incidental Harassment Authorization (Authorization) to take marine mammals, by harassment, incidental to a Maritime Weapon Systems Evaluation Program (Maritime WSEP) within the Eglin Gulf Test and Training Range in the Gulf of Mexico.

Eglin AFB's activities are military readiness activities per the Marine Mammal Protection Act (MMPA), as amended by the National Defense Authorization Act (NDAA) for Fiscal Year 2004. Per the MMPA, NMFS requests comments on its proposal to issue an Authorization to Eglin AFB to take, by harassment, two species of marine mammals during the specified activity for a period of one year.

DATES: NMFS must receive comments and information no later than [INSERT DATE 30 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER].

ADDRESSES: Address comments on the application to Jolie Harrison, Chief, Permits and Conservation Division, Office of Protected Resources, National Marine Fisheries Service, 1315 East-West Highway, Silver Spring, MD 20910. The mailbox address for providing email comments is ITP.Cody@noaa.gov. Please include 0648-XD593 in the subject line. Comments sent via email to ITP.Cody@noaa.gov, including all attachments, must not exceed a 25-megabyte file size. NMFS is not responsible for e-mail comments sent to addresses other than the one provided here.

Instructions: All submitted comments are a part of the public record and NMFS will post them to http://www.nmfs.noaa.gov/pr/permits/incidental/military.htm 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.

To obtain an electronic copy of the application, a list of the references used in this document, and Eglin AFB's Draft Environmental Assessment (DEA) titled, "Maritime Weapons System Evaluation Program," visit the internet at: http://www.nmfs.noaa.gov/pr/permits/incidental/military.htm.

FOR FURTHER INFORMATION CONTACT: Jeannine Cody, Office of Protected Resources, NMFS, (301) 427-8401.

SUPPLEMENTARY INFORMATION:

Background

Section 101(a)(5)(D) of the Marine Mammal Protection Act of 1972, as amended (MMPA; 16 U.S.C. 1361 et seq.) directs the Secretary of Commerce to allow, upon request, the incidental, but not intentional, taking of small numbers of marine mammals of a species

or population stock, by U.S. citizens who engage in a specified activity (other than commercial fishing) within a specified geographical region if, after NMFS provides a notice of a proposed authorization to the public for review and comment: (1) NMFS makes certain findings; and (2) the taking is limited to harassment.

Through the authority delegated by the Secretary, NMFS shall grant an Authorization for the incidental taking of small numbers of marine mammals if NMFS finds that the taking will have a negligible impact on the species or stock(s), and will not have an unmitigable adverse impact on the availability of the species or stock(s) for subsistence uses (where relevant).

The Authorization must also prescribe, where applicable, the permissible methods of taking by harassment pursuant to the activity; other means of effecting the least practicable adverse impact on the species or stock and its habitat, and on the availability of such species or stock for taking for subsistence uses (where applicable); the measures that NMFS determines are necessary to ensure no unmitigable adverse impact on the availability for the species or stock for taking for subsistence purposes (where applicable); and requirements pertaining to the mitigation, monitoring and reporting of such taking. 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; Public Law 108–136) removed the “small numbers” and “specified geographical region” limitations indicated earlier and amended the definition of harassment as it applies to a “military readiness activity” to read as follows: (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

NMFS received an application on August 5, 2014, from Eglin AFB for the taking, by harassment, of marine mammals, incidental to Maritime WESP operational testing in the spring of 2015 within the Eglin Gulf Test and Training Range (EGTTR). Eglin AFB submitted a revised application to NMFS on October 20, 2014, which provided updated take estimates for marine mammals based on updated acoustic thresholds for acoustic sources. Eglin AFB submitted a second revised application to NMFS on December 1, 2014, which provided updated mitigation zones to ensure adequacy and completeness of their MMPA application. NMFS determined the application adequate and complete on December 2, 2014.

Eglin AFB proposes to conduct Maritime WESP missions within the EGTTR airspace over the Gulf of Mexico, specifically within Warning Area 151 (W-151). The proposed testing activities would occur during the daytime over a three-week period between February and April, 2015. Eglin AFB proposes to use multiple types of live munitions (e.g., gunnery rounds, rockets, missiles, and bombs) against small boat targets in the EGTTR. These activities qualify as a military readiness activities under the MMPA and NDAA.

The following specific aspect of the proposed activity has the potential to take marine mammals: increased underwater sound and pressure generated during the WSEP testing missions. Take, by Level B harassment of individuals of common bottlenose dolphin (Tursiops truncatus) or Atlantic spotted dolphin (Stenella frontalis) could potentially result

from the specified activity. Additionally, although NMFS does not expect it to occur, Eglin AFB has also requested authorization for Level A Harassment of up to 40 individuals of either common bottlenose dolphins or Atlantic spotted dolphins. Therefore, Eglin AFB has requested authorization to take individuals of two cetacean species by Level A and Level B harassment.

Eglin AFB's Maritime WSEP operations may potentially impact marine mammals at or near the water surface. Marine mammals could potentially be harassed, injured, or killed by exploding and non-exploding projectiles, and falling debris. However, based on analyses provided in Eglin AFB's Draft Environmental Assessment (DEA); their Authorization application, including proposed mitigation and monitoring measures; and, for reasons discussed later in this document, NMFS does not anticipate that Eglin AFB's Maritime WSEP activities would result in any serious injury or mortality to marine mammals.

Description of the Specified Activity

Overview

Eglin AFB proposes to conduct live ordnance testing and training in the Gulf of Mexico as part of the Maritime WSEP operational testing. The Maritime WSEP test objectives are to evaluate maritime deployment data, evaluate tactics, techniques and procedures, and to determine the impact of techniques and procedures on combat Air Force training. The need to conduct this type of testing has arisen in response to increasing threats at sea posed by operations conducted from small boats which can carry a variety of weapons; can form in large or small numbers; and may be difficult to locate, track, and engage in the marine environment. Because of limited Air Force aircraft and munitions testing on engaging and defeating small boat threats, the Air Force proposes to employ live munitions against boat

targets in the EGTTR in order to continue development of techniques and procedures to train Air Force strike aircraft to counter small maneuvering surface vessels. Thus, the Department of Defense considers the Maritime WSEP activities as high priority for national security.

The proposed Maritime WSEP missions are similar to Eglin AFB's Maritime Strike Operations where NMFS issued an Incidental Harassment Authorization to Eglin AFB related to training exercises around small boat threats (78 FR 52135, August 22, 2013).

Dates and Duration

Eglin AFB proposes to schedule the Maritime WSEP missions over an approximate two- to three-week period that would begin February 6, 2015 and end by March 31, 2015. The proposed missions would occur on weekdays, during daytime hours only, with one or two missions occurring per day. Some minor deviation from Eglin AFB's requested dates is possible and the proposed Authorization, if issued, would be effective from February 5, 2015 through March 30, 2015.

Specified Geographic Region

The specific planned mission location is approximately 17 miles (mi) (27.3 kilometers [km]) offshore from Santa Rosa Island, Florida, in nearshore waters of the continental shelf in the Gulf of Mexico. All activities would take place within the EGTTR, defined as the airspace over the Gulf of Mexico controlled by Eglin AFB, beginning at a point three nautical miles (nmi) (3.5 miles [mi]; 5.5 kilometers [km]) from shore. The EGTTR consists of subdivided blocks including Warning Area 151 (W-151) where the proposed activities would occur, specifically in sub-area W-151A shown (Figure 1).

W-151: The inshore and offshore boundaries of W-151 are roughly parallel to the shoreline contour. The shoreward boundary is three nmi (3.5 mi; 5.5 km) from shore, while

the seaward boundary extends approximately 85 to 100 nmi (97.8 mi; 157.4 km to 115 mi; 185.2 km) offshore, depending on the specific location. W-151 covers a surface area of approximately 10,247 square nmi [nmi^2] (13,570 square mi [mi^2]; 35,145 square km [km^2]), and includes water depths ranging from about 20 to 700 meters (m) (65.6 to 2296.6 feet [ft]). This range of depth includes continental shelf and slope waters. Approximately half of W-151 lies over the shelf.

W-151A: W-151A extends approximately 60 nmi (69.0 mi; 111.1 km) offshore and has a surface area of 2,565 nmi^2 (3,396.8 mi^2; 8,797 km^2). Water depths range from about 30 to 350 m (98.4 to 1148.2 ft) and include continental shelf and slope zones. However, most of W-151A occurs over the continental shelf, in water depths less than 250 m (820.2 ft). Maritime WSEP missions will occur in the shallower, northern inshore portion of the sub-area, in a water depth of about 35 meters (114.8 ft).

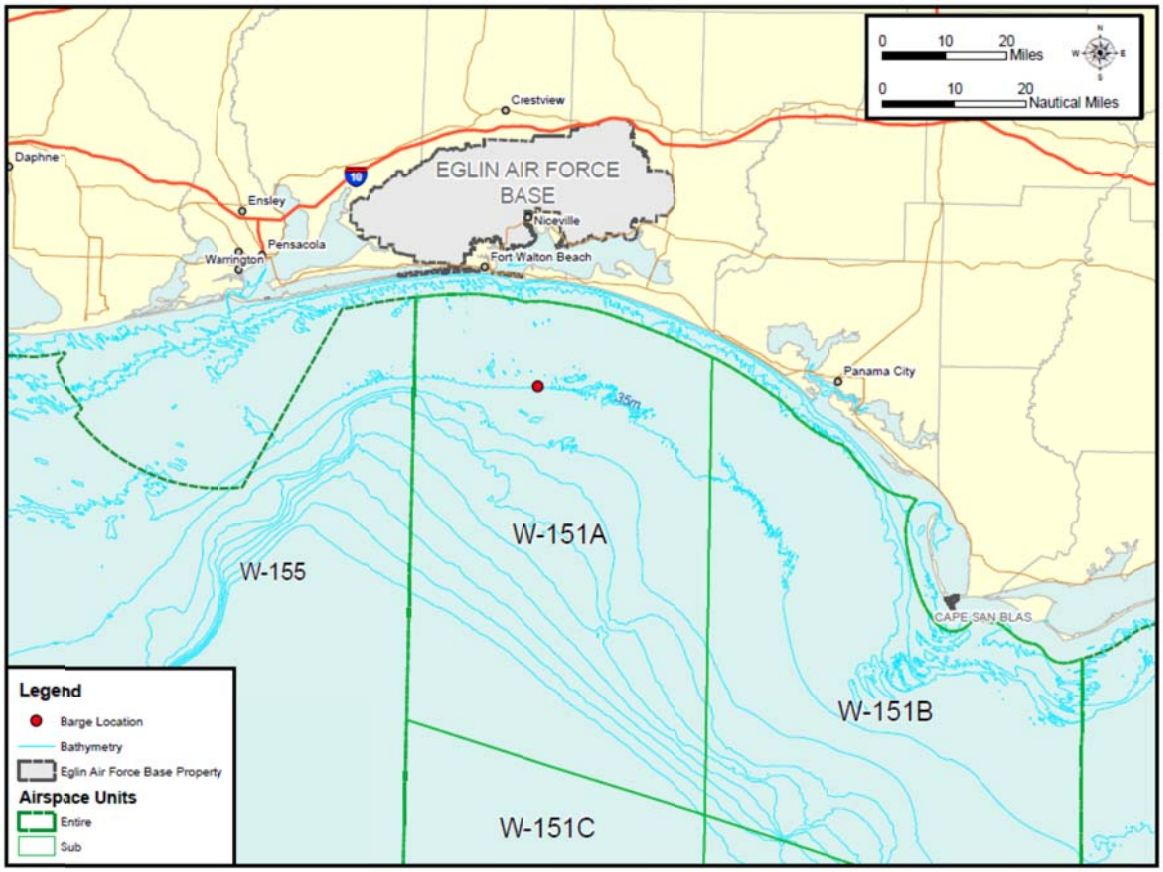

Figure 1 – Proposed Maritime WSEP operational testing location in block W-151A in the EGTRR.

Detailed Description of Activities

The Maritime WSEP operational testing missions, classified as military readiness activities, include the release of multiple types of inert and live munitions from fighter and bomber aircraft, unmanned aerial vehicles, and gunships against small, static, towed, and remotely-controlled boat targets. Munition types include bombs, missiles, rockets, and gunnery rounds (Table 1).

Table 1 - Live Munitions and Aircraft

Munitions	**Aircraft (not associated with specific munitions)**
GBU-10 laser-guided Mk-84 bomb	F-16C fighter aircraft
GBU-24 laser-guided Mk-84 bomb	F-16C+ fighter aircraft
GBU-12 laser-guided Mk-82 bomb	F-15E fighter aircraft
GBU-54 Laser Joint Direct Attack Munition (LJDAM), laser-guided Mk-82 bomb	A-10 fighter aircraft
CBU-105 (WCMD)	B-1B bomber aircraft
AGM-65 Maverick air-to-surface missile	B-52H bomber aircraft
GBU-38 Small Diameter Bomb II (Laser SDB)	MQ-1/9 unmanned aerial vehicle
AGM-114 Hellfire air-to-surface missile	AC-130 gunship
AGM-175 Griffin air-to-surface missile	
2.75 Rockets	
PGU-13/B high explosive incendiary 30 mm rounds	
7.62 mm/.50 Cal	

Key: AGM = air-to-ground missile; CBU = Cluster Bomb Unit; GBU = Guided Bomb Unit; LJDAM = Laser Joint Direct Attack Munition; Laser SDB = Laser Small Diameter Bomb; mm = millimeters; PGU = Projectile Gun Unit; WCMD = wind corrected munition dispenser.

The proposed activities involve detonations above the water, near the water surface, and under water within the EGTTR. However, because the tests will focus on weapon/target interaction, Eglin AFB will not specify a particular aircraft for a given test as long as it meets the delivery parameters.

Eglin AFB would deploy the munitions against static, towed, and remotely-controlled boat targets within W-151A. Eglin AFB would operate the remote-controlled boats from an instrumentation barge (Gulf Range Armament Test Vessel; GRATV) anchored on site within the test area. The GRATV would provide a platform for cameras and weapons-tracking

equipment and Eglin AFB would position the target boats approximately 182.8 m (600 ft) from the GRATV, depending on the munition type.

Table 2 provides the number, height, or depth of detonation, explosive material, and net explosive weight (NEW) in pounds (lbs) of each munition proposed for use during the Maritime WSEP activities.

Table 2 - Maritime WSEP munitions proposed for use in the W-151A test area.

Type of Munition	Total # of Live Munitions	Detonation Type	Warhead – explosive material	Net Explosive Weight per Munition
GBU-10 or GBU-24	2	Surface	MK-84 - Tritonal	945 lbs
GBU-12 or GBU- 54 (LJDAM)	6	Surface	MK-82 - Tritonal	192 lbs
AGM-65 (Maverick)	6	Surface	WDU-24/B penetrating blast-fragmentation warhead	86 lbs
CBU-105 (WCMD)	4	Airburst	10 BLU-108 sub-munitions each containing 4 projectiles parachute, rocket motor and altimeter	83 lbs
GBU-38 (Laser Small Diameter Bomb)	4	Surface	AFX-757 (Insensitive munition)	37 lbs
AGM-114 (Hellfire)	15	Subsurface (10 msec delay)	High Explosive Anti-Tank (HEAT) tandem anti-armor metal augmented charge	20 lbs
AGM-176 (Griffin)	10	Surface	Blast fragmentation	13 lbs
2.75 Rockets	100	Surface	Comp B-4 HEI	Up to 12 lbs
PGU-12 HEI 30 mm	1,000	Surface	30 x 173 mm caliber with aluminized RDX explosive. Designed for GAU-8/A Gun System	0.1 lbs
7.62 mm/.50 cal	5,000	Surface	N/A	N/A

Key: AGL = above ground level; AGM = air-to-ground missile; CBU = Cluster Bomb Unit; GBU = Guided Bomb Unit; JDAM = Joint Direct Attack Munition; LJDAM = Laser Joint Direct Attack Munition; mm = millimeters; msec = millisecond; lbs = pounds; PGU = Projectile Gun Unit; HEI = high explosive incendiary.

At least two ordnance delivery aircraft will participate in each live weapon release mission. Before delivering the ordnance, mission aircraft would make a dry run over the target area to ensure that it is clear of commercial and recreational boats. Jets will fly at a minimum speed of 300 knots indicated air speed (approximately 345 miles per hour, depending on atmospheric conditions) and at a minimum altitude of 305 m (1,000 ft). Due to

the limited flyover duration and potentially high speed and altitude, observation for marine species would probably be only marginally effective at best, and pilots would, therefore, not participate in species surveys. Eglin AFB's application and DEA, which is available upon request (see ADDRESSES), contain additional detailed information on the Maritime WSEP training operations.

Description of Marine Mammals in the Area of the Specified Activity

Table 3 provides the following: marine mammal species with possible or confirmed occurrence in the proposed activity area (Garrison et al., 2008; Navy, 2007; Davis et al., 2000); information on those species' status under the MMPA and the Endangered Species Act of 1973 (ESA; 16 U.S.C. 1531 et seq.); and abundance and likelihood of occurrence within the proposed activity area.

Table 3 – Marine mammals most likely to be harassed incidental to Eglin AFB's activities in W-151A.

Species	Stock Name	Regulatory Status[1, 2]	Estimated Abundance	Relative Occurrence in W-151
Common bottlenose dolphin	Choctawatchee Bay	MMPA - S ESA – NL	232 CV = 0.06[3]	Uncommon
	Pensacola/East Bay	MMPA - S ESA – NL	33 CV = 0.88[4]	Uncommon
	St. Andrew Bay	MMPA - S ESA – NL	124 CV = 0.18[4]	Uncommon
	Gulf of Mexico Northern Coastal	MMPA - S ESA – NL	2,473 CV = 0.25[5]	Common
	Northern Gulf of Mexico Continental Shelf	MMPA - NC ESA – NL	17,777 CV = 0.32[6]	Uncommon
	Northern Gulf of Mexico Oceanic	MMPA - NC ESA – NL	5,806 CV = 0.39[7]	Uncommon
Atlantic spotted dolphin	Northern Gulf of Mexico	MMPA - NC ESA – NL	37,611[8] CV = 0.28	Common

[1] MMPA: D = Depleted, S = Strategic, NC = Not Classified.
[2] ESA: EN = Endangered, T = Threatened, DL = Delisted, NL = Not listed.
[3] Conn et al. 201; 2012 NMFS Stock Assessment Report (Waring et al., 2013)
[4] Blaylock and Hoggard, 1994; 2012 NMFS Stock Assessment Report (Waring et al., 2013)
[5] 2007 Aerial surveys reported in the 2013 NMFS Stock Assessment Report (Waring et al., 2014)
[6] 2000-2001 Aerial surveys reported in the 2013 NMFS Stock Assessment Report (Waring et al., 2014)
[7] 2009 Line transect surveys reported in the 2013 NMFS Stock Assessment Report (Waring et al., 2014)
[8] 2000-2001 Aerial surveys reported in the 2013 NMFS Stock Assessment Report (Waring et al., 2014)

An additional 19 cetacean species have confirmed occurrence within the northeastern Gulf of Mexico, mainly occurring at or beyond the shelf break (i.e., water depth of approximately 200 m (656.2 ft)) located beyond the W-151A test area. NMFS and Eglin AFB consider the 19 species to be rare or extralimital in the W-151A test location area. These species are the Bryde's whale (Balaenoptera edeni), sperm whale (Physeter macrocephalus), dwarf sperm whale (Kogia sima), pygmy sperm whale (K. breviceps), pantropical spotted dolphin (Stenella atenuarta), Blainville's beaked whale (Mesoplodon densirostris), Cuvier's beaked whale (Ziphius cavirostris), Gervais' beaked whale (M. europaeus), Clymene dolphin (S. clymene), spinner dolphin (S. longirostris), striped dolphin (S. coeruleoalba), killer whale (Orcinus orca), false killer whale (Pseudorca crassidens), pygmy killer whale (Feresa attenuata), Risso's dolphin (Grampus griseus), Fraser's dolphin (Lagenodelphis hosei), melon-headed whale (Peponocephala electra), rough-toothed dolphin (Steno bredanensis), and short-finned pilot whale (Globicephala macrorhynchus).

Of these species, only the sperm whale is listed as endangered under the ESA and as depleted throughout its range under the MMPA. Sperm whale occurrence within W-151A is unlikely because almost all reported sightings have occurred in water depths greater than 200 m m (656.2 ft).

Because these species are unlikely to occur within the W-151A area, Eglin AFB has not requested and NMFS has not proposed the issuance of take authorizations for them. Thus, NMFS does not consider these species further in this notice.

NMFS has reviewed Eglin AFB's detailed species descriptions, including life history information, distribution, regional distribution, diving behavior, and acoustics and hearing, for accuracy and completeness. NMFS refers the reader to Sections 3 and 4 of the

Authorization application and to Chapter 3 in Eglin AFB's DEA rather than reprinting the information here.

Other Marine Mammals in the Proposed Action Area

The endangered West Indian manatee (Trichechus manatus) rarely occurs in the area (USAF, 2014). The U.S. Fish and Wildlife Service has jurisdiction over the manatee; therefore, NMFS would not include a proposed authorization to harass manatees and does not discuss this species further in this notice.

Potential Effects of the Specified Activity on Marine Mammals

This section includes a summary and discussion of the ways that the types of stressors associated with the specified activity (e.g., ordnance detonation and vessel movement) could impact marine mammals (via observations or scientific studies). This discussion may also include reactions that NMFS considers to rise to the level of a take and those that NMFS does not consider to rise to the level of a take (for example, with acoustics, we may include a discussion of studies that showed animals not reacting at all to sound or exhibiting barely measurable avoidance).

NMFS will provide an overview of potential effects of Eglin AFB's activities in this section and describe the effects of similar activities that have occurred in the past. This section does not consider the specific manner in which Eglin AFB would carry out the proposed activity, what mitigation measures they would implement, and how either of those would shape the anticipated impacts from this specific activity. The "Estimated Take by Incidental Harassment" section later in this document will include a quantitative analysis of the number of individuals that NMFS expects Eglin AFB to take during this activity. The "Negligible Impact Analysis" section will include the analysis of how this specific activity

would impact marine mammals. NMFS will consider the content of the following sections: (1) Estimated Take by Incidental Harassment; (2) Proposed Mitigation; and (3) Anticipated Effects on Marine Mammal Habitat, to draw conclusions regarding the likely impacts of this activity on the reproductive success or survivorship of individuals—and from that consideration—the likely impacts of this activity on the affected marine mammal populations or stocks.

The Maritime WSEP training exercises proposed for taking of marine mammals under an Authorization have the potential to take marine mammals by exposing them to impulsive noise and pressure waves generated by live ordnance detonation at or near the surface of the water. Exposure to energy or pressure resulting from these detonations could result in non-lethal injury (Level A harassment) and disturbance (Level B harassment). In addition, NMFS also considered the potential for harassment from vessel operations. NMFS outlines the analysis of potential impacts from these factors, including consideration of Eglin AFB's analysis in its MMPA application for an authorization, in the following sections. The potential effects of impulsive sound sources (underwater detonations) from the proposed training activities may include one or more of the following: tolerance, masking, disturbance, hearing threshold shift, stress response, and lethal responses.

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. NMFS presents a summary in this section.

Sound is a wave of pressure variations propagating through a medium (e.g., water). Pressure variations occur by compressing and relaxing the medium. Sound measurements

exist in two forms: intensity and pressure. Acoustic intensity is the average rate of energy transmitted through a unit area in a specified direction (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, 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 listener perceives sound as being ten times louder, however. 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 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 decibel values underwater and decibel values in air are not the same (different reference pressures and densities/sound speeds between media) and one should not directly compare the two mediums. 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 level in air and in water would be approximately 62 dB lower in air. Thus, a sound that measures 160 dB (re: 1 µPa) underwater would have the same approximate effective level as a sound that is 98 dB (re: 20 µPa) 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 consist of many different frequencies together. Acousticians characterize sounds made up of only a small range of frequencies as "narrowband" and sounds with a broad range of frequencies as "broadband"; explosives are an example of a broadband sound source.

Acoustic Impacts

The effects of noise on marine mammals are highly variable. Categorization of these effects includes the following (based on Richardson et al., 1995):

- The sound may be too weak to be heard at the location of the animal (i.e., lower than the prevailing ambient noise level, the hearing threshold of the animal at relevant frequencies, or both);
- The sound may be audible but not strong enough to elicit any overt behavioral response;
- The sound may elicit reactions of variable conspicuousness and variable relevance to the well-being of the marine mammal; these can range from temporary alert responses to active avoidance reactions, such as stampedes into the sea from terrestrial haul-out sites;
- Upon repeated exposure, a marine mammal may exhibit diminishing responsiveness (habituation), or disturbance effects may persist; the latter is most likely with sounds that are

highly variable in characteristics, infrequent and unpredictable in occurrence (as are vehicle launches), and associated with situations that a marine mammal perceives as a threat;

- Any anthropogenic sound that is strong enough to be heard has the potential to reduce (mask) the ability of a marine mammal to hear natural sounds at similar frequencies, including calls from conspecifics, and underwater environmental sounds such as surf noise;
- If marine mammals remain in an area because it is important for feeding, breeding, or some other biologically important purpose even though there is chronic exposure to noise, it is possible that there could be sound-induced physiological stress; this might in turn have negative effects on the well-being or reproduction of the animals involved; and
- Very strong sounds have the potential to cause temporary or permanent reduction in hearing sensitivity. In terrestrial mammals, and presumably marine mammals, received sound levels must far exceed the animal's hearing threshold for there to be any temporary threshold shift (TTS) in its hearing ability. For transient sounds, there is an inverse relation to the sound level necessary to cause TTS compared to the duration of the sound. Received sound levels must be even higher for there to be risk of permanent hearing impairment (PTS). In addition, intense acoustic or explosive events may cause trauma to tissues associated with organs vital for hearing, sound production, respiration, and other functions. This trauma may include minor to severe hemorrhage.

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. Current data indicate that not all marine mammal species have equal hearing capabilities (Richardson et al., 1995; Southall et al., 1997; Wartzok and Ketten, 1999; Au and Hastings, 2008).

Southall et al. (2007) designated "functional hearing groups" for marine mammals based on available behavioral data; audiograms derived from auditory evoked potentials; anatomical modeling; and other data. Southall et al. (2007) also estimated the lower and upper frequencies of functional hearing for each group. However, animals are less sensitive to sounds at the outer edges of their functional hearing range and are more sensitive to a range of frequencies within the middle of their functional hearing range.

The functional groups and the associated frequencies are:

- Low frequency cetaceans (13 species of mysticetes): functional hearing estimates occur between approximately 7 Hz and 30 kilohertz (kHz) (extended from 22 kHz based on data indicating that some mysticetes can hear above 22 kHz; Au et al., 2006; Lucifredi and Stein, 2007; Ketten and Mountain, 2009; Tubelli et al., 2012);
- Mid-frequency cetaceans (32 species of dolphins, six species of larger toothed whales, and 19 species of beaked and bottlenose whales): functional hearing estimates 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 estimates occur between approximately 200 Hz and 180 kHz; and
- Pinnipeds in water: phocid (true seals) functional hearing estimates occur between approximately 75 Hz and 100 kHz (Hemila et al., 2006; Mulsow et al., 2011; Reichmuth et al., 2013) and otariid (seals and sea lions) functional hearing estimates occur between approximately 100 Hz to 40 kHz.

As mentioned previously in this document, two marine mammal species (of the odontocete group) are likely to occur in the proposed action area. NMFS considers a species'

functional hearing group when analyzing the effects of exposure to sound on marine mammals.

Vocalization and Hearing

Bottlenose dolphins can typically hear within a broad frequency range of 0.04 to 160 kHz (Au, 1993; Turl, 1993). Electrophysiological experiments suggest that the bottlenose dolphin brain has a dual analysis system: one specialized for ultrasonic clicks and another for lower-frequency sounds, such as whistles (Ridgway, 2000). Scientists have reported a range of highest sensitivity between 25 and 70 kHz, with peaks in sensitivity at 25 and 50 kHz (Nachtigall et al., 2000). Research on the same individuals indicates that auditory thresholds obtained by electrophysiological methods correlate well with those obtained in behavior studies, except at lower (10 kHz) and higher (80 and 100 kHz) frequencies (Finneran and Houser, 2006).

Sounds emitted by bottlenose dolphins fall into two broad categories: pulsed sounds (including clicks and burst-pulses) and narrow-band continuous sounds (whistles), which usually are frequency modulated. Clicks have a dominant frequency range of 110 to 130 kHz and a source level of 218 to 228 dB re: 1 μPa (peak-to-peak) (Au, 1993) and 3.4 to 14.5 kHz at 125 to 173 dB re 1 μPa (peak-to-peak) (Ketten, 1998). Whistles are primarily associated with communication and can serve to identify specific individuals (i.e., signature whistles) (Caldwell and Caldwell, 1965; Janik et al., 2006). Cook et al. (2004) classified up to 52 percent of whistles produced by bottlenose dolphin groups with mother-calf pairs as signature whistles. Sound production is also influenced by group type (single or multiple individuals), habitat, and behavior (Nowacek, 2005). Bray calls (low-frequency vocalizations; majority of energy below 4 kHz), for example, are used when capturing fish,

specifically sea trout (Salmo trutta) and Atlantic salmon (Salmo salar), in some regions (i.e., Moray Firth, Scotland) (Janik, 2000). Additionally, whistle production has been observed to increase while feeding (Acevedo-Gutiérrez and Stienessen, 2004; Cook et al., 2004).

Researchers have recorded a variety of sounds including whistles, echolocation clicks, squawks, barks, growls, and chirps for the Atlantic spotted dolphin. Whistles have dominant frequencies below 20 kHz (range: 7.1 to 14.5 kHz) but multiple harmonics extend above 100 kHz, while burst pulses consist of frequencies above 20 kHz (dominant frequency of approximately 40 kHz) (Lammers et al., 2003). Other sounds, such as squawks, barks, growls, and chirps, typically range in frequency from 0.1 to 8 kHz (Thomson and Richardson, 1995). Recorded echolocation clicks had two dominant frequency ranges at 40 to 50 kHz and 110 to 130 kHz, depending on source level (i.e., lower source levels typically correspond to lower frequencies and higher frequencies to higher source levels (Au and Herzing, 2003). Echolocation click source levels as high as 210 dB re 1 μPa-m peak-to-peak have been recorded (Au and Herzing, 2003). Spotted dolphins in the Bahamas were frequently recorded during agonistic/aggressive interactions with bottlenose dolphins (and their own species) to produce squawks (0.2 to 12 kHz broad band burst pulses; males and females), screams (5.8 to 9.4 kHz whistles; males only), barks (0.2 to 20 kHz burst pulses; males only), and synchronized squawks (0.1-15 kHz burst pulses; males only in a coordinated group) (Herzing, 1996). The hearing ability for the Atlantic spotted dolphin is unknown. However, odontocetes are generally adapted to hear high-frequencies (Ketten, 1997).

Effects of Impulsive Sources

Marine mammals respond to various types of anthropogenic sounds introduced in the ocean environment. Responses are highly variable and depend on a suite of internal and external factors which in turn results in varying degrees of significance (NRC, 2003; Southall et al., 2007). Internal factors include: (1) individual hearing sensitivity, activity pattern, and motivational and behavioral state (e.g., feeding, traveling) at the time it receives the stimulus; (2) past exposure of the animal to the noise, which may lead to habituation or sensitization; (3) individual noise tolerance; and (4) demographic factors such as age, sex, and presence of dependent offspring. External factors include: (1) non-acoustic characteristics of the sound source (e.g., if it is moving or stationary); (2) environmental variables (e.g., substrate) which influence sound transmission; and (3) habitat characteristics and location (e.g., open ocean vs. confined area).

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 to an individual animal.

Tolerance

Numerous studies have shown that underwater sounds are often readily detectable by marine mammals in the water at distances of many kilometers. However, other studies have shown that marine mammals at distances more than a few kilometers away often show no apparent response to activities of various types (Miller et al., 2005). This is often true even in cases when the sounds must be readily audible to the animals based on measured received levels and the hearing sensitivity of that mammal group. Although various baleen whales, toothed whales, and (less frequently) pinnipeds have been shown to react behaviorally to underwater sound from sources such as airgun pulses or vessels under some conditions, at other times, mammals of all three types have shown no overt reactions (e.g., Malme et al., 1986; Richardson et al., 1995; Madsen and Mohl, 2000; Croll et al., 2001; Jacobs and Terhune, 2002; Madsen et al., 2002; Miller et al., 2005).

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. NMFS expects this principle to apply to marine mammals because of common biomechanical cochlear properties across taxa.

Richardson et al. (1995) 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 animal can barely hear the noise. This range applies to 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, and 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 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.

Holt et al. (2009) measured killer whale call source levels and background noise levels in the one to 40 kHz band and reported that the whales increased their call source levels by one dB SPL for every one dB SPL increase in background noise level. Similarly, another study on St. Lawrence River belugas (Delphinapterus leucas) reported a similar rate of increase in vocalization activity in response to passing vessels (Scheifele et al., 2005).

Although masking is a phenomenon which may occur naturally, the introduction of loud anthropogenic sounds into the marine environment at frequencies important to marine mammals increases the severity and frequency of occurrence of masking. For example, baleen whales exposed to continuous low-frequency sound from an industrial source, would be present within a reduced acoustic area around where it could hear the calls of another whale. The components of background noise that are similar in frequency to the signal in question primarily determine the degree of masking of that signal. In general, there is little data about the degree to which marine mammals rely upon detection of sounds from conspecifics, predators, prey, or other natural sources. In the absence of specific information about the importance of detecting these natural sounds, it is not possible to predict the impact of masking on marine mammals (Richardson et al., 1995). In general, masking effects are expected to be less severe when sounds are transient than when they are continuous.

While it may occur temporarily, NMFS does not expect auditory masking to result in detrimental impacts to an individual's or population's survival, fitness, or reproductive success. Dolphin movement is not restricted within the W-151 test area, allowing for movement out of the area to avoid masking impacts. Also, masking is typically of greater

concern for those marine mammals that utilize low frequency communications, such as baleen whales and, as such, is not likely to occur for marine mammals in the W-151 test area.

Disturbance

Behavioral responses to sound are highly variable and context-specific. Many different variables can influence an animal's perception of and response to (in both nature and magnitude) an acoustic event. An animal's prior experience with a sound or sound source affects 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 versus retreating), similarity of the 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.

Because the few available studies show wide variation in response to underwater sound, it is difficult to quantify exactly how sound from the Maritime WSEP operational testing would affect marine mammals. Exposure of marine mammals to sound sources can result in,

but is not limited to, no response or any of the following observable responses: increased alertness; orientation or attraction to a sound source; vocal modifications; cessation of feeding; cessation of social interaction; alteration of movement or diving behavior; avoidance; habitat abandonment (temporary or permanent); and, in severe cases, panic, flight, stampede, or stranding, potentially resulting in death (Southall et al., 2007). Richardson first conducted a review of marine mammal responses to anthropogenic sound in 1995. A more recent review (Nowacek et al., 2007) addresses studies conducted since 1995 and focuses on observations where researchers knew or could estimate the received sound level of the exposed marine mammal(s).

The following sub-sections provide examples of behavioral responses that provide an idea of the variability in behavioral responses 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. Estimates of the types of behavioral responses that could occur for a given sound exposure should be determined from the literature that is available for each species or extrapolated from closely related species when no information exists.

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).

Response to Predators: Evidence suggests that at least some marine mammals have the ability to acoustically identify potential predators. For example, certain groups of killer whales, but not others, frequently target harbor seals residing in the coastal waters off British

Columbia. 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 may prevent marine mammals 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 the sound impedes predator cues. Predator evasion is typically of greater concern for coastal marine mammals. Because of the low likelihood of bottlenose dolphin predators, such as killer whales, occurring within the W-151 test area, NMFS does not consider predator evasion likely to occur.

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, studies have observed Indo-Pacific humpback dolphins (Sousa chinensis) 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, one cannot decouple the influence of the sound exposure from the physical presence of a surface vessel, thus complicating interpretations 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). Researchers did not find that the low frequency signals of the Acoustic Thermometry of Ocean Climate (ATOC) sound source affected dive times of humpback whales (Megaptera novaeangliae) in Hawaiian waters (Frankel and Clark, 2000) or overtly affected elephant seal (Mirounga angustirostris) 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.

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 would 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 occur naturally with different behaviors, and variations in respiration rate as a function of acoustic exposure could 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 (Phocoena phocoena) showed increased respiration rates upon introduction of acoustic alarms (Kastelein et al., 2001; Kastelein et al., 2006) 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., 2006), 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: Sound can affect social interactions between mammals 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 this notice's discussion does not provide a specific overview. However, one should consider social disruptions in the 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. Some have suggested a similar compensatory effect for the presence of low frequency vessel noise for right whales; as researchers have observed right whales 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.). Often, 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). Studies have observed acute avoidance responses 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, b). Short term avoidance of seismic surveys, low frequency emissions, and acoustic deterrents 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).

Haviland-Howell et al. (2007) compared sighting rates of bottlenose dolphins within the Wilmington, North Carolina stretch of the Atlantic Intracoastal Waterway (ICW) on weekends, when recreational vessel traffic was high, to weekdays, when vessel traffic was relatively minimal. The authors found that dolphins were less often sighted in the ICW during times of increased boat traffic (i.e., on weekends) and theorized that because vessel noise falls within the frequencies of dolphin communication whistles and primary energy of

most fish vocalizations, the continuous vessel traffic along that stretch of the ICW could result in social and foraging impacts. However, the extent to which these impacts affect individual health and population structure is unknown.

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 it occurred 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, one should consider any orienting response in context of other reactions that may occur.

Vessel and Aircraft Presence: The marine mammals most vulnerable to vessel strikes are slow-moving and/or spend extended periods of time at the surface in order to restore oxygen levels within their tissues after deep dives (e.g., North Atlantic right whales (Eubalaena glacialis), fin whales (Balaenoptera physalus), and sperm whales). Smaller marine mammals such as common bottlenose and Atlantic spotted dolphins are agile and move more quickly through the water, making them less susceptible to ship strikes. NMFS and Eglin AFB are not aware of any vessel strikes of common bottlenose and Atlantic spotted dolphins within in W-151 during training operations and both parties do not anticipate that Eglin AFB vessels engaged in the specified activity would strike any marine mammals.

Dolphins within the Gulf of Mexico are continually exposed to recreational, commercial, and military vessels. Behaviorally, marine mammals may or may not respond to the operation of vessels and associated noise. Responses to vessels vary widely among marine mammals in general, but also among different species of small cetaceans. Responses may include attraction to the vessel (Richardson et al., 1995); altering travel patterns to avoid vessels (Constantine, 2001; Nowacek et al., 2001; Lusseau, 2003, 2006); relocating to other

areas (Allen and Read, 2000); cessation of feeding, resting, and social interaction (Baker et al., 1983; Bauer and Herman, 1986; Hall, 1982; Krieger and Wing, 1984; Lusseau, 2003; Constantine et al., 2004); abandoning feeding, resting, and nursing areas (Jurasz and Jurasz 1979; Dean et al., 1985; Glockner-Ferrari and Ferrari, 1985, 1990; Lusseau, 2005; Norris et al., 1985; Salden, 1988; Forest, 2001; Morton and Symonds, 2002; Courbis, 2004; Bejder, 2006); stress (Romano et al., 2004); and changes in acoustic behavior (Van Parijs and Corkeron, 2001). However, in some studies marine mammals display no reaction to vessels (Watkins, 1986; Nowacek et al., 2003) and many odontocetes show considerable tolerance to vessel traffic (Richardson et al., 1995). Dolphins may actually reduce the energetic cost of traveling by riding the bow or stern waves of vessels (Williams et al., 1992; Richardson et al., 1995).

Aircraft produce noise at frequencies that are well within the frequency range of cetacean hearing and also produce visual signals such as the aircraft itself and its shadow (Richardson et al., 1995, Richardson and Wursig, 1997). A major difference between aircraft noise and noise caused by other anthropogenic sources is that the sound is generated in the air, transmitted through the water surface and then propagates underwater to the receiver, diminishing the received levels significantly below what is heard above the water's surface. Sound transmission from air to water is greatest in a sound cone 26 degrees directly under the aircraft.

There are fewer reports of reactions of odontocetes to aircraft than those of pinnipeds. Responses to aircraft include diving, slapping the water with pectoral fins or tail fluke, or swimming away from the track of the aircraft (Richardson et al., 1995). The nature and degree of the response, or the lack thereof, are dependent upon the nature of the flight (e.g.,

type of aircraft, altitude, straight vs. circular flight pattern). Wursig et al. (1998) assessed the responses of cetaceans to aerial surveys in the north central and western Gulf of Mexico using a DeHavilland Twin Otter fixed-wing airplane. The plane flew at an altitude of 229 m (751.3 ft) at 204 km/hr (126.7 mph) and maintained a minimum of 305 m (1,000 ft) straight line distance from the cetaceans. Water depth was 100 to 1,000 m (328 to 3,281 ft). Bottlenose dolphins most commonly responded by diving (48 percent), while 14 percent responded by moving away. Other species (e.g., beluga (Delphinapterus leucas) and sperm whales) show considerable variation in reactions to aircraft but diving or swimming away from the aircraft are the most common reactions to low flights (less than 500 m; 1,640 ft).

Stress Response

An acoustic source is considered a potential stressor if, by its action on the animal, via auditory or non-auditory means, it may produce a stress response in the animal. Here, the stress response will refer to an increase in energetic expenditure that results from exposure to the stressor and which is predominantly characterized by either the stimulation of the sympathetic nervous system (SNS) or the hypothalamic-pituitary-adrenal (HPA) axis (Reeder and Kramer, 2005). The SNS response to a stressor is immediate and acute and occurs by the release of the catecholamine neurohormones norepinephrine and epinephrine (i.e., adrenaline). These hormones produce elevations in the heart and respiration rate, increase awareness, and increase the availability of glucose and lipids for energy. The HPA response results in increases in the secretion of the glucocorticoid steroid hormones, predominantly cortisol in mammals. The presence and magnitude of a stress response in an animal depends on a number of factors. These include the animal's life history stage (e.g., neonate, juvenile, adult), the environmental conditions, reproductive or developmental state, and experience

with the stressor. Not only will these factors be subject to individual variation, but they will also vary within an individual over time. The stress response may or may not result in a behavioral change, depending on the characteristics of the exposed animal. However, provided that a stress response occurs, NMFS assumes that some contribution is made to the animal's allostatic load. One can assume that any immediate effect of exposure that produces an injury also produce a stress response and contribute to the allostatic load. Allostasis is the ability of an animal to maintain stability through change by adjusting its physiology in response to both predictable and unpredictable events (McEwen and Wingfield, 2003). If the animal does not perceive the sound, the acoustic source would not produce tissue effects and does not produce a stress response by any other means. Thus, NMFS assumes that the exposure does not contribute to the allostatic load.

Physiology-Hearing Threshold Shift

In mammals, high-intensity sound may rupture the eardrum, damage the small bones in the middle ear, or over stimulate the electromechanical hair cells that convert the fluid motions caused by sound into neural impulses sent to the brain. Lower level exposures may cause a loss of hearing sensitivity, termed a threshold shift (TS) (Miller, 1974). Incidence of TS may be either permanent, referred to as permanent threshold shift (PTS), or temporary, referred to as temporary threshold shift (TTS). The amplitude, duration, frequency, and 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, generally, so does the amount of TS and recovery time. Human non-impulsive noise exposure guidelines are based on exposures of equal energy (the same SEL) producing equal amounts of hearing impairment regardless of how the sound energy

distributes over time (NIOSH, 1998). Until recently, previous marine mammal TTS studies have also generally supported this equal energy relationship (Southall et al., 2007). Three newer studies, two by Mooney et al. (2009a, 2009b) on a single bottlenose dolphin either exposed to playbacks of Navy mid-frequency active sonar or octave-band noise (4-8 kHz) and one by Kastak et al. (2007) on a single California sea lion (Zalophus californianus) exposed to airborne octave-band noise (centered at 2.5 kHz), concluded that for all noise exposure situations the equal energy relationship may not be the best indicator to predict TTS onset levels. Generally, with sound exposures of equal energy, those that were quieter (lower SPL) with longer duration induced TTS onset more than louder (higher SPL) and shorter durations (more similar to noise from the Marine Corps' exercises at BT-9 and BT-11). For intermittent sounds, less threshold shift would occur than from a continuous exposure with the same energy (some recovery will occur between exposures) (Kryter et al., 1966; Ward, 1997). Additionally, although 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). However, these studies highlight the inherent complexity of predicting TTS onset in marine mammals, as well as the importance of considering exposure duration when assessing potential impacts.

PTS consists of non-recoverable physical damage to the sound receptors in the ear, which can include total or partial deafness, or an impaired ability to hear sounds in specific frequency ranges; NMFS considers PTS as Level A harassment. TTS is recoverable, resulting from temporary, non-injurious impacts to hearing-related tissues. NMFS considers TTS as Level B harassment.

Permanent Threshold Shift

Auditory trauma represents direct mechanical injury to hearing related structures, including tympanic membrane rupture, disarticulation of the middle ear ossicles, and trauma to the inner ear structures such as the organ of Corti and the associated hair cells. Auditory trauma is irreversible and considered to be an injury that could result in PTS. 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. In some cases, there can be total or partial deafness across all frequencies, whereas in other cases, the animal has an impaired ability to hear sounds in specific frequency ranges.

There is no empirical data for onset of PTS in any marine mammal for ethical reasons. Therefore, research must extrapolate PTS-onset based on hearing loss growth rates (i.e., rate of how quickly threshold shifts grow in relation to increases in decibel level; expressed in dB of TTS/dB of noise) from limited marine mammal TTS studies and more numerous terrestrial mammal TTS/PTS experiments. Typically, the magnitude of a threshold shift increases with increasing duration or level of exposure, until it becomes asymptotic (growth rate begins to level or the upper limit of TTS; Mills et al., 1979; Clark et al., 1987; Laroche et al., 1989; Yost, 2007). One presumes that PTS is likely if reduction to the hearing threshold occurs by greater than or equal to 40 dB (i.e., 40 dB of TTS).

Temporary Threshold Shift

TTS is the mildest form of hearing impairment that can occur during exposure to a loud sound (Kryter, 1985). 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 as Level B Harassment, not Level A Harassment (injury); however, NMFS does not consider the onset of TTS to be the lowest level at which Level B Harassment may occur (see Behavior section).

Southall et al. (2007) considers a 6 dB TTS (*i.e.*, baseline hearing thresholds are elevated by 6 dB) sufficient to be recognized as an unequivocal deviation and thus a sufficient definition of TTS onset. Researchers testing hearing in marine mammals have experimentally induced TTS in bottlenose dolphins. For example, Finneran et al. (2002) exposed a trained captive bottlenose dolphin to a seismic watergun simulator with a single acoustic pulse. No TTS was observed in the dolphin at the highest exposure condition (peak: 207 kiloPascals (kPa; 30 pressure per square inch (psi)); peak-to-peak: 228 dB re: 1 μPa; SEL: 188 dB re: 1 μPa^2-s). Schludt et al. (2000) demonstrated temporary shifts in masked hearing thresholds in five bottlenose dolphins occurring generally between 192 and 201 dB rms (192 and 201 dB SEL) after exposure to intense, non-pulse, 1-second tones at 3 kHz, 10 kHz, and 20 kHz. TTS onset occurred at mean sound exposure level of 195 dB rms (195 dB SEL). At 0.4 kHz, no subjects exhibited threshold shifts after SPL exposures of 193 dB re: 1 μPa (192 dB re: 1 $microPa^2$-s). In the same study, at 75 kHz, one dolphin exhibited a TTS after exposure at 182 dB SPL re: 1 μPa but not at higher exposure levels. Another dolphin experienced no threshold shift after exposure to maximum SPL levels of 193 dB re: 1 μPa at the same frequency.

Preliminary research indicates that TTS and recovery after noise exposure are frequency dependent and that an inverse relationship exists between exposure time and sound pressure level associated with exposure (Mooney et al., 2005; Mooney, 2006). For example,

Nachtigall et al. (2003) measured TTS in a bottlenose dolphin and found an average 11-dB shift following a 30-minute net exposure to the octave-band noise (OBN) at a 7.5 kHz center frequency (maximum SPL of 179 dB re: 1 μPa; SEL: 212- 214 dB re:1 μPa^2-s). No TTS was observed after exposure to the same duration and frequency noise with maximum SPLs of 165 and 171 dB re:1 μPa. After 50 minutes of exposure to the same 7.5 kHz frequency OBN, Natchigall et al. (2004) measured a 4 -8 dB shift (max SPL: 160 dB re: 1 μPa; SEL: 193-195 dB re:1 μPa^2-s). Finneran et al. (2005) concluded that a sound exposure level of 195 dB re 1 μPa2-s is a reasonable threshold for the onset of TTS in bottlenose dolphins exposed to mid-frequency tones.

Lethal Responses

Elgin AFB proposes to use several types of explosive sources during its training exercises. The underwater explosions from these weapons would send a shock wave and blast noise through the water, release gaseous by-products, create an oscillating bubble, and cause a plume of water to shoot up from the water surface. The shock wave and blast noise are of most concern to marine animals. In general, potential impacts from explosive detonations can range from brief effects (such as short term behavioral disturbance), tactile perception, physical discomfort, slight injury of the internal organs and the auditory system, to death of the animal (Yelverton et al., 1973; O'Keeffe and Young, 1984; DoN, 2001).

The effects of an underwater explosion on a marine mammal depend on many factors, including the size, type, and depth of both the animal and the explosive charge; the depth of the water column; and the standoff distance between the charge and the animal, as well as the sound propagation properties of the environment. Physical damage of tissues resulting from a shock wave (from an explosive detonation) constitutes 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 to damage (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.

Non-lethal injury includes slight injury to internal organs and the auditory system; however, delayed lethality can be a result of individual or cumulative sublethal injuries (DoN, 2001). Immediate lethal injury would be a result of massive combined trauma to internal organs as a direct result of proximity to the point of detonation (DoN, 2001). Exposure to distance explosions could result only in behavioral changes. Researchers have measured masked underwater hearing thresholds in two bottlenose dolphins and one beluga whale before and after exposure to impulsive underwater sounds with waveforms resembling distant signatures of underwater explosions (Finneran et al., 2000). The authors found no temporary shifts in masked-hearing thresholds, defined as a 6-dB or larger increase in threshold over pre-exposure levels, had been observed at the highest impulse level generated (500 kg at 1.7 km, peak pressure 70 kPa); however, disruptions of the animals' trained behaviors began to occur at exposures corresponding to 5 kg at 9.3 km and 5 kg at 1.5 km for the dolphins and 500 kg at 1.9 km for the beluga whale.

Anticipated Effects on Habitat

Detonations of live ordnance would result in temporary changes to the water environment. Munitions could hit the targets and not explode in the water. However, because

the targets are located over the water, in water explosions could occur. An underwater explosion from these weapons could send a shock wave and blast noise through the water, release gaseous by-products, create an oscillating bubble, and cause a plume of water to shoot up from the water surface. However, these effects would be temporary and not expected to last more than a few seconds.

Similarly, Eglin AFB does not expect any long-term impacts with regard to hazardous constituents to occur. Eglin AFB considered the introduction of fuel, debris, ordnance, and chemical materials into the water column within its DEA. The potential effects of each were analyzed in the Draft Environmental Assessment and determined to be insignificant. The analyses are summarized in the following paragraphs (for a complete discussion of potential effects, please refer to section 3.3 in the DEA).

Metals typically used to construct bombs, missiles, and gunnery rounds include copper, aluminum, steel, and lead, among others. Aluminum is also present in some explosive materials. These materials would settle to the seafloor after munitions detonate. Metal ions would slowly leach into the substrate and the water column, causing elevated concentrations in a small area around the munitions fragments. Some of the metals, such as aluminum, occur naturally in the ocean at varying concentrations and would not necessarily impact the substrate or water column. Other metals, such as lead, could cause toxicity in microbial communities in the substrate. However, such effects would be localized to a very small distance around munitions fragments and would not significantly affect the overall habitat quality of sediments in the northeastern Gulf of Mexico. In addition, metal fragments would corrode, degrade, and become encrusted over time.

Chemical materials include explosive byproducts and also fuel, oil, and other fluids associated with remotely controlled target boats. Explosive byproducts would be introduced into the water column through detonation of live munitions. Explosive materials would include 2,4,6-trinitrotoluene (TNT) and RDX, among others. Various byproducts are produced during and immediately after detonation of TNT and RDX. During the very brief time that a detonation is in progress, intermediate products may include carbon ions, nitrogen ions, oxygen ions, water, hydrogen cyanide, carbon monoxide, nitrogen gas, nitrous oxide, cyanic acid, and carbon dioxide (Becker, 1995). However, reactions quickly occur between the intermediates, and the final products consist mainly of water, carbon monoxide, carbon dioxide, and nitrogen gas, although small amounts of other compounds are typically produced as well.

Chemicals introduced into the water column would be quickly dispersed by waves, currents, and tidal action, and eventually become uniformly distributed. A portion of the carbon compounds such as carbon monoxide and carbon dioxide would likely become integrated into the carbonate system (alkalinity and pH buffering capacity of seawater). Some of the nitrogen and carbon compounds, including petroleum products, would be metabolized or assimilated by phytoplankton and bacteria. Most of the gas products that do not react with the water or become assimilated by organisms would be released into the atmosphere. Due to dilution, mixing, and transformation, none of these chemicals are expected to have significant impacts on the marine environment.

Explosive material that is not consumed in a detonation could sink to the substrate and bind to sediments. However, the quantity of such materials is expected to be inconsequential. Research has shown that if munitions function properly, nearly full combustion of the

explosive materials will occur, and only extremely small amounts of raw material will remain. In addition, any remaining materials would be naturally degraded. TNT decomposes when exposed to sunlight (ultraviolet radiation), and is also degraded by microbial activity (Becker, 1995). Several types of microorganisms have been shown to metabolize TNT. Similarly, RDX decomposes by hydrolysis, ultraviolet radiation exposure, and biodegradation.

While NMFS anticipates that the specified activity may result in marine mammals avoiding certain areas due to temporary ensonification, this impact to habitat and prey resources would be temporary and reversible. The main impact associated with the proposed activity would be temporarily elevated noise levels and the associated direct effects on marine mammals, previously discussed in this notice. Marine mammals are anticipated to temporarily vacate the area of live fire events. However, these events usually do not last more than 90 to 120 minutes at a time, and animals are anticipated to return to the activity area during periods of non-activity. Thus, based on the preceding discussion, NMFS does not anticipate that the proposed activity would have any habitat-related effects that could cause significant or long-term consequences for individual marine mammals or their populations.

Proposed Mitigation

In order to issue an incidental take authorization 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, and the availability of such species or stock for taking for certain subsistence uses (where relevant).

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.

NMFS and Eglin AFB have worked to identify potential practicable and effective mitigation measures, which include 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 "military-readiness activity." NMFS refers the reader to Section 11 of their application for more detailed information on the proposed mitigation measures which include the following:

Visual Mitigation

Eglin AFB would require visual monitoring during Maritime WSEP missions from surface vessels and three high-definition video cameras. If the high-definition video cameras are not operational for any reason, Eglin AFB will not conduct Maritime WSEP missions.

In addition to the two types of visual monitoring discussed later, Eglin AFB personnel are present within the mission area (on boats and the GRATV) on each day of testing well in advance of weapon deployment, typically near sunrise. They will perform a variety of tasks including target preparation, equipment checks, etc., and will opportunistically observe for marine mammals and indicators as feasible throughout test preparation. However, such observations are considered incidental and would only occur as time and schedule permits. Any sightings would be relayed to the Lead Biologist, as described in the following mitigation sections.

Vessel-Based Monitoring: Eglin AFB would station a large number of range clearing boats (approximately 20 to 25) around the test site to prevent non-participating vessels from entering the human safety zone. Based on the composite footprint, range clearing boats will be located approximately 15.28 km (9.5 mi) from the detonation point (see Figure 11-1 in Eglin AFB's application). However, the actual distance will vary based on the size of the munition being deployed.

Trained marine species observers would be aboard five of these boats and will conduct protected species surveys before and after each test. The protected species survey vessels will be dedicated solely to observing for marine species during the pre-mission surveys while the remaining safety boats clear the area of non-authorized vessels. The protected species survey vessels will begin surveying the area at sunrise. The area to be surveyed will encompass the largest applicable zone of influence (ZOI), which is the Level A harassment range. Animals that may enter the area after the pre-mission surveys have been completed and prior to detonation would not reach the predicted smaller slight lung injury and/or mortality zones

Because of human safety issues, observers will be required to leave the test area at least 30 minutes in advance of live weapon deployment and move to a position on the safety zone periphery, approximately 9.5 miles from the detonation point. Observers will continue to scan for marine mammals from the periphery, but effectiveness will be limited as the boat will remain at a designated station.

Video Monitoring: In addition to vessel-based monitoring, three high-definition video cameras would be positioned on the GRATV anchored on-site, as described earlier, to allow for real-time monitoring for the duration of the mission. The camera configuration and actual number of cameras used would depend on specific mission requirements. In addition to

monitoring the area for mission objective issues, the camera(s) would also monitor for the presence of protected species. A trained marine species observer from Eglin Natural Resources would be located in Eglin AFB's Central Control Facility, along with mission personnel, to view the video feed before and during test activities. The distance to which objects can be detected at the water surface by use of the cameras is considered generally comparable to that of the human eye.

The GRATV will be located about 183 m (600 ft) from the target. The larger mortality threshold ranges correspond to the modified Goertner model adjusted for the weight of an Atlantic spotted dolphin calf, and extend from 0 to 237 m (0 to 778 ft) from the target, depending on the ordnance, and the Level A ranges for both common bottlenose and Atlantic spotted dolphins extend from 7 to 965 m (23 to 3,166 ft) from the target, depending on the ordnance and harassment criterion. Given these distances, observers could reasonably be expected to view a substantial portion of the mortality zone in front of the camera, although a small portion would be behind or to the side of the camera view. Some portion of the Level A harassment zone could also be viewed, although it would be less than that of the mortality zone (a large percentage would be behind or to the side of the camera view).

Pre-mission Monitoring

The purposes of pre-mission monitoring are to: 1) evaluate the mission site for environmental suitability, and 2) verify that the ZOI is free of visually detectable marine mammals, as well as potential indicators of these species. On the morning of the mission, the Test Director and Safety Officer will confirm that there are no issues that would preclude mission execution and that weather is adequate to support mitigation measures.

Sunrise or Two Hours Prior to Mission: Eglin AFB range clearing vessels and protected species survey vessels will be on site at least two hours prior to the mission. The Lead Biologist on board one survey vessel will assess the overall suitability of the mission site based on environmental conditions (sea state) and presence/absence of marine mammal indicators. This information will be communicated to Tower Control and relayed to the Safety Officer in Central Control Facility.

One and One-Half Hours Prior to Mission: Vessel-based surveys will begin approximately one and one-half hours prior to live weapon deployment. Surface vessel observers will survey the ZOI and relay all marine species and indicator sightings, including the time of sighting, GPS location, and direction of travel, if known, to the Lead Biologist. The Lead Biologist will document all sighting information on report forms to be submitted to Eglin Natural Resources after each mission. Surveys would continue for approximately one hour. During this time, Eglin AFB personnel in the mission area will also observe for marine species as feasible. If marine mammals or indicators are observed within the ZOI, the range will be declared "fouled," a term that signifies to mission personnel that conditions are such that a live ordnance drop cannot occur (e.g., protected species or civilian vessels are in the mission area). If no marine mammals or indicators are observed, Eglin AFB would declare the range clear of protected species.

One-Half Hour Prior to Mission: At approximately 30 minutes to one hour prior to live weapon deployment, marine species observers will be instructed to leave the mission site and remain outside the safety zone, which on average will be 9.5 miles from the detonation point. The actual size is determined by weapon NEW and method of delivery. The survey team will continue to monitor for protected species while leaving the area. As the survey vessels leave

the area, marine species monitoring of the immediate target areas will continue at CCF through the live video feed received from the high definition cameras on the GRATV. Once the survey vessels have arrived at the perimeter of the safety zone (approximately 30 minutes after being instructed to leave, depending on actual travel time) the range will be declared "green" and mission will be allowed to proceed, assuming all non-participating vessels have left the safety zone as well.

Execution of Mission: Immediately prior to live weapon drop, the Test Director and Safety Officer will communicate to confirm the results of marine mammal surveys and the appropriateness of proceeding with the mission. The Safety Officer will have final authority to proceed with, postpone, or cancel the mission. The mission would be postponed if:

- Any of the high-definition video cameras are not operational for any reason.
- Any marine mammal is visually detected within the ZOI. Postponement would continue until the animal(s) that caused the postponement is: (1) confirmed to be outside of the ZOI on a heading away from the targets; or (2) not seen again for 30 minutes and presumed to be outside the ZOI due to the animal swimming out of the range
- Large schools of fish or large flocks of birds feeding at the surface are observed within the ZOI. Postponement would continue until these potential indicators are confirmed to be outside the ZOI.
- Any technical or mechanical issues related to the aircraft or target boats.
- Non-participating vessels enter the human safety zone prior to weapon release.

In the event of a postponement, protected species monitoring would continue from the Central Control Facility through the live video feed.

Post-mission Monitoring

Post-mission monitoring is designed to determine the effectiveness of pre-mission mitigation by reporting sightings of any dead or injured marine mammals. Post-detonation monitoring surveys will commence once the mission has ended or, if required, as soon as personnel declare the mission area safe. Vessels will move into the survey area from outside the safety zone and monitor for at least 30 minutes, concentrating on the area down-current of the test site. This area is easily identifiable because of the floating debris in the water from impacted targets. Up to 10 Eglin AFB support vessels will be cleaning debris and collecting damaged targets from this area thus spending many hours in the area once the mission is completed. All vessels will be instructed to report any dead or injured marine mammals to the Lead Biologist. The protected species survey vessels will document any marine mammals that were killed or injured as a result of the mission and, if practicable, recover and examine any dead animals. The species, number, location, and behavior of any animals observed will be documented and reported to Eglin Natural Resources.

Mission Delays Due to Weather

Eglin AFB would delay or reschedule Maritime WSEP missions if the Beaufort sea state is greater than number 4 at the time of the test. The Lead Biologist aboard one of the survey vessels will make the final determination of whether conditions are conducive for sighting protected species or not.

NMFS has carefully evaluated Eglin AFB's proposed mitigation measures in the context of ensuring that we prescribe the means of effecting the least practicable impact on the affected marine mammal species and stocks and their habitat. NMFS' 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 to 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.

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 here:

1. Avoidance or minimization of injury or death of marine mammals wherever possible (goals 2, 3, and 4 may contribute to this goal).

2. A reduction in the numbers of marine mammals (total number or number at biologically important time or location) exposed to training exercises that we expect to result in the take of marine mammals (this goal may contribute to 1, above, or to reducing harassment takes only).

3. A reduction in the number of times (total number or number at biologically important time or location) individuals would be exposed to training exercises that we expect to result in the take of marine mammals (this goal may contribute to 1, above, or to reducing harassment takes only).

4. A reduction in the intensity of exposures (either total number or number at biologically important time or location) to training exercises that we expect to result in the take of marine mammals (this goal may contribute to a, above, or to reducing the severity of harassment takes only).

5. 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.

6. For monitoring directly related to mitigation—an increase in the probability of detecting marine mammals, thus allowing for more effective implementation of the mitigation.

Based on the evaluation of Eglin AFB's proposed measures, as well as other measures considered, NMFS has preliminarily determined that the proposed mitigation measures provide the means of effecting the least practicable impact on marine mammal 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 the impact of effectiveness of the military readiness activity.

The public 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 preliminarily determined that the proposed mitigation measures presented in this document will 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.

Proposed Monitoring and Reporting

In order to issue an Authorization for an activity, section 101(a)(5)(D) of the MMPA states that we 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 an authorization must include the suggested means of accomplishing the necessary monitoring and reporting that will result in increased knowledge of the species and our expectations of the level of taking or impacts on populations of marine mammals present in the action area.

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

1. An increase in the probability of detecting marine mammals, both within the mitigation zone (thus allowing for more effective implementation of the mitigation) and during other times and locations, in order to generate more data to contribute to the analyses mentioned later;

2. An increase in our understanding of how many marine mammals would be affected by seismic airguns and other active acoustic sources and the likelihood of associating those exposures with specific adverse effects, such as behavioral harassment, temporary or permanent threshold shift;

3. An increase in our understanding of how marine mammals respond to stimuli that we expect to result in take and how those 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:

a. Behavioral observations in the presence of stimuli compared to observations in the absence of stimuli (i.e., we need to be able to accurately predict received level, distance from source, and other pertinent information);

b. Physiological measurements in the presence of stimuli compared to observations in the absence of stimuli (i.e., we need to be able to accurately predict received level, distance from source, and other pertinent information);

c. Distribution and/or abundance comparisons in times or areas with concentrated stimuli versus times or areas without stimuli;

4. An increased knowledge of the affected species; and

5. An increase in our understanding of the effectiveness of certain mitigation and monitoring measures.

NMFS proposes to include the following measures in the Maritime WSEP Authorization (if issued). They are:

(1) Eglin will track their use of the EGTTR for test firing missions and protected species observations, through the use of mission reporting forms.

(2) A summary annual report of marine mammal observations and Maritime WSEP activities will be submitted to the NMFS Southeast Regional Office (SERO) and the Office of Protected Resources either at the time of a request for renewal of an Authorization or 90 days after expiration of the current Authorization if a new Authorization is not requested. This annual report must include the following information: (i) Date and time of each Maritime WSEP exercise; (ii) a complete description of the pre-exercise and post-exercise activities related to mitigating and monitoring the effects of Maritime WSEP exercises on marine mammal populations; and (iii) results of the Maritime WSEP exercise monitoring,

including numbers by species/stock of any marine mammals noted injured or killed as a result of the missions and number of marine mammals (by species if possible) that may have been harassed due to presence within the activity zone.

(3) If any dead or injured marine mammals are observed or detected prior to testing, or injured or killed during live fire, a report must be made to NMFS by the following business day.

(4) Any unauthorized takes of marine mammals (i.e., injury or mortality) must be immediately reported to NMFS and to the respective stranding network representative.

Estimated Numbers of Marine Mammals Taken by Harassment, Injury, and Mortality

NMFS' analysis identified the physiological responses, and behavioral responses that could potentially result from exposure to underwater explosive detonations. In this section, we will relate the potential effects to marine mammals from underwater detonation of explosives to the MMPA regulatory definitions of Level A and Level B harassment. This section will also quantify the effects that might occur from the proposed military readiness activities in W-151.

Definition of Harassment

The NDAA removed the "small numbers" and "specified geographic region" limitations indicated earlier in this document and amended the definition of harassment as it applies to a "military readiness activity" to read as follows: (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 described earlier in this document, 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 above definition, when resulting from exposures to non-impulsive or impulsive sound, is 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 predicting Level B harassment based on estimated behavioral responses, those takes may have a stress-related physiological component.

Acoustic Masking and Communication Impairment—NMFS considers acoustic masking to be 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.

Temporary Threshold Shift (TTS)—As discussed previously, TTS can affect how an animal behaves in response to the environment, including conspecifics, predators, and prey. NMFS classifies TTS (when resulting from exposure to 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, the following are the types of effects that fall into the Level A Harassment category:

Permanent Threshold Shift (PTS)—PTS (resulting either from exposure to explosive detonations) is irreversible and NMFS considers this to be an injury.

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

Impulsive Sound Explosive Thresholds

For the purposes of this proposed regulation, NMFS has identified two levels of take for Eglin AFB's training exercises: Level B harassment and Level A harassment. NMFS presents the acoustic thresholds for impulse sounds in this section.

In the absence of mitigation, it is likely that the activities could kill or injure marine mammals as a result of an explosive detonation, due to the response of air cavities in the body (e.g., lungs and intestines). These effects are likely to be most severe in near surface waters where the reflected shock wave creates a region of negative pressure called cavitation. Extensive lung hemorrhage is debilitating and potentially fatal. Suffocation caused by lung hemorrhage is likely to be the major cause of marine mammal death from underwater shock waves. The estimated range for the onset of extensive lung hemorrhage to marine mammals varies depending upon the animal's weight, with the smallest mammals having the greatest potential hazard range.

Table 4 summarizes the marine mammal impulsive sound explosive thresholds used for Eglin AFB's acoustic impact modeling for marine mammal take in its application. Several standard acoustic metrics (Urick, 1983) describe the thresholds for predicting potential physical impacts from underwater pressure waves. They are:

- Total energy flux density or Sound Exposure Level (SEL). For plane waves (as assumed here), SEL is the time integral of the instantaneous intensity, where the instantaneous intensity is defined as the squared acoustic pressure divided by the characteristic impedance of sea water. Thus, SEL is the instantaneous pressure amplitude squared, summed over the duration of the signal. Standard units are dB referenced to 1 re: μPa^2-s.

- 1/3-octave SEL. This is the SEL in a 1/3-octave frequency band. A 1/3-octave band has upper and lower frequency limits with a ratio of 21:3, creating bandwidth limits of about 23 percent of center frequency.

- Positive impulse. This is the time integral of the initial positive pressure pulse of an explosion or explosive-like wave form. Standard units are Pa-s or psi-ms.

- Peak pressure. This is the maximum positive amplitude of a pressure wave, dependent on charge mass and range. Standard units are psi, μPa, or Bar.

Table 4 –Impulsive sound explosive thresholds used by the Marine Corps in its previous acoustics impacts modeling.

Criterion	Criterion Definition	Threshold
Mortality	Onset of severe lung injury (mass of dolphin calf: 12.2 kg) (1% probability of mortality)	31 psi-msec (positive impulse)
Level A harassment (injury)	50% animals would experience ear drum rupture 30% animals exposed sustain permanent threshold shift	205 dB re 1 μPa^2-s EFD (full spectrum energy)
Level A harassment (injury)	Onset of slight lung injury (mass of dolphin calf: 12.2 kg)	13 psi-msec (positive impulse)
Level B harassment	TTS and associated behavioral disruption	23 psi peak pressure
Level B harassment	TTS and associated behavioral disruption (dual criteria)	182 dB re: 1 μPa^2-s EFD*, 1/3 octave band
Level B harassment	Sub-TTS behavioral disruption (for multiple/sequential detonations only)	177 dB re: 1 μPa^2-s EFD*, 1/3 octave band

* Note: In greatest 1/3-octave band above 10 Hz or 100 Hz.

NMFS previously developed the explosive thresholds for assessing impacts of explosions on marine mammals shown in Table 4 for the shock trials of the USS Seawolf and USS Winston S. Churchill. However, at NMFS' recommendation, Eglin AFB has updated the

thresholds used for onset of temporary threshold shift (TTS; Level B Harassment) and onset of permanent threshold shift (PTS; Level A Harassment) to be consistent with the thresholds outlined in the Navy's report titled, "Criteria and Thresholds for U.S. Navy Acoustic and Explosive Effects Analysis Technical Report," which the Navy coordinated with NMFS. NMFS believes that the thresholds outlined in the Navy's report represent the best available science. The report is available on the internet at: http://aftteis.com/Portals/4/aftteis/Supporting%20Technical%20Documents/Criteria_and_Thresholds_for_US_Navy_Acoustic_and_Explosive_Effects_Analysis-Apr_2012.pdf.

Table 5 in this document outlines the revised acoustic thresholds used by NMFS for this proposed Authorization when addressing noise impacts from explosives.

Table 5 –Impulsive sound explosive thresholds used by Eglin AFB in its current acoustics impacts modeling.

Group	Behavior		Slight Injury			Mortality
	Behavioral	TTS	PTS	Gastro-Intestinal Tract	Lung	
Mid-frequency Cetaceans	167 dB SEL	172 dB SEL or 23 psi	187 dB SEL or 45.86 psi	104 psi	$39.1\ M^{1/3}\ (1+[D_{Rm}/10.081])^{1/2}$ Pa-sec Where: M = mass of the animals in kg D_{Rm} = depth of the receiver (animal) in meters	$91.4\ M^{1/3}\ (1+D_{Rm}/10.081])^{1/2}$ Pa-sec Where: M = mass of the animals in kg D_{Rm} = depth of the receiver (animal) in meters

Eglin AFB conservatively modeled that all explosives would detonate at a 1.2 m (3.9 ft) water depth despite the training goal of hitting the target, resulting in an above water or on land explosion. For sources detonated at shallow depths, it is frequently the case that the explosion may breech the surface with some of the acoustic energy escaping the water column. Table 6 provides the estimated maximum range or radius, from the detonation point to the various thresholds described in Table 5. Eglin AFB uses the range information shown in Table 6 (Table 6.3 in Eglin's application) to calculate the total area of the ZOI and

combine the calculated ZOIs with density estimates (adjusted for depth distribution) and the number of live munitions to provide an estimate of the number of marine mammals potentially exposed to the various impact thresholds.

Table 6 – Distances (m) to harassment thresholds from Eglin AFB's explosive ordnance.

Munition	NEW (lbs)	Total #	Detonation Scenario	Mortality	Level A Harassment				Level B Harassment		
				Modified Goertner Model 1	Slight Lung Injury	GI Track Injury	PTS		TTS		Behavioral
					Modified Goertner Model 2	237 dB SPL	187 dB SEL	230 dB Peak SPL	172 dB SEL	224 dB Peak SPL	167 dB SEL
Bottlenose Dolphin											
GBU-10 or GBU-24	945	2	Surface	199	350	340	965	698	1,582	1,280	2,549
GBU-12 or GBU-54	192	6	Surface	111	233	198	726	409	2,027	752	2,023
AGM-65 (Maverick)	86	6	Surface	82	177	150	610	312	1,414	575	1,874
GBU-39 (LSDB)	37	4	Surface	59	128	112	479	234	1,212	433	1,543
AGM-114 (Hellfire)	20	15	(10 ft depth)	110	229	95	378	193	2,070	354	3,096
AGM-175 (Griffin)	13	10	Surface	38	83	79	307	165	1,020	305	1,343
2.75 Rockets	12	100	Surface	36	81	77	281	161	1,010	296	1,339
PGU-13 HEI 30 mm	0.1	1,000	Surface	0	7	16	24	33	247	60	492
Atlantic Spotted Dolphin and Unidentified Dolphin[1]											
GBU-10 or GBU-24	945	2	Surface	237	400	340	965	698	1,582	1,280	2,549
GBU-12 or GBU-54	192	6	Surface	138	274	198	726	409	2,027	752	2,023
AGM-65 (Maverick)	86	6	Surface	101	216	150	610	312	1,414	575	1,874
GBU-39 (LSDB)	37	4	Surface	73	158	112	479	234	1,212	433	1,543
AGM-114 (Hellfire)	20	15	(10 ft depth)	135	277	95	378	193	2,070	354	3,096
AGM-175 (Griffin)	13	10	Surface	47	104	79	307	165	1,020	305	1,343
2.75 Rockets	12	100	Surface	45	100	77	281	161	1,010	296	1,339
PGU-13 HEI 30 mm	0.1	1,000	Surface	0	9	16	24	33	247	60	492

AGM = air-to-ground missile; cal = caliber; CBU = Cluster Bomb Unit; ft = feet; GBU = Guided Bomb Unit; HEI = high explosive incendiary; lbs = pounds; mm = millimeters; N/A = not applicable; NEW = net explosive weight; PGU = Projectile Gun Unit; SDB = small diameter bomb; PTS = permanent threshold shift; TTS = temporary threshold shift; WCMD = wind corrected munition dispenser

[1]Unidentified dolphin can be either bottlenose or Atlantic spotted dolphin. Eglin AFB based the mortality and slight lung injury criteria on the mass of a newborn Atlantic spotted dolphin.

Determination of the Mitigation Monitoring Zones

The ranges that are presented in Table 6 represent a radius of impact for a given threshold from a single detonation of each munition/detonation scenario. They do not consider accumulated energies from multiple detonation occurring within the same 24-hour time period. For calculating take estimates, the single detonation approach is more conservative because it multiplies the exposures from a single detonation by the number of munitions and assumes a fresh population of marine mammals is being impacted each time. Eglin AFB used this approach because of the uncertainty surrounding which munitions they would release on a given day. Multiple variables, such as weather, aircraft mechanical issues, munition malfunctions, and target availability may prevent planned munitions releases. By treating each detonation as a separate event and summing those impacts accordingly, Eglin AFB would have maximum operational flexibility to conduct the missions without limitations on either the total number of munitions allowed to be dropped in a day, or on the specific combinations of munitions that could be released.

While this methodology overestimates the overall potential takes presented in the next section, the ranges do not accurately represent the actual area acoustically impacted for a given threshold from multiple detonations in a given mission day. The total acoustic impact area for two identical bombs detonating within a given timeframe is less than twice the impact area of a single bomb's detonation. This has to do with the accumulated energy from multiple detonations occurring sequentially. When one weapon is detonated, a certain level of transmission loss is required to be calculated to achieve each threshold level which can then be equated to a range. By releasing a second munition in the same event (same place and close in time), even though the total energy is increased, the incremental impact area from

the second detonation is slightly less than that of the first; however the impact range for the two munitions is larger than the impact range for one. Since each additional detonation adds energy to the sound exposure level (SEL) metric, all the energy from all munitions released in a day is accumulated. By factoring in the transmission loss of the first detonation added with the incremental increases from the second, third, fourth, etc., the range of the cumulative energy that is below each threshold level can be determined. Unlike the energy component, peak pressure is not an additive factor, therefore Eglin AFB did not consider thresholds expressed as either acoustic impulse or peak SPL metrics (i.e., mortality, slight lung injury, gastrointestinal tract injury) in their calculations.

Eglin AFB has created a sample day reflecting the maximum number of munitions that could be released and resulting in the greatest impact in a single mission day. However, this scenario is only a representation and may not accurately reflect how Eglin AFB may conduct actual operations. However, NMFS and Eglin AFB are considering this conservative assumption to calculate the impact range for mitigation monitoring measures. Thus, Eglin AFB has modeled, combined, and compared the sum of all energies from these detonations against thresholds with energy metric criteria to generate the accumulated energy ranges for this scenario. Table 7 displays these ranges which form the basis of the mitigation monitoring thresholds.

Table 7 – Distances (m) to harassment thresholds for an example mission day.

Munition	NEW (lbs)	Total # per Day	Detonation Scenario	Level A Harassment	Level B Harassment	
				PTS	TTS	Behavioral
				187 dB SEL	172 dB SEL	167 dB SEL
GBU-10 or GBU-24	945	1	Surface	5,120	12,384	15,960
GBU-12 or GBU-54	192	1	Surface			
AGM-65 (Maverick)	86	1	Surface			
GBU-39 (LSDB)	37	1	Surface			
AGM-114 (Hellfire)	20	3	(10 ft depth)			
AGM-175 (Griffin)	13	2	Surface			
2.75 Rockets	12	12	Surface			
PGU-13 HEI 30 mm	0.1	125	Surface			

AGM = air-to-ground missile; cal = caliber; CBU = Cluster Bomb Unit; ft = feet; GBU = Guided Bomb Unit; HEI = high explosive incendiary; lbs = pounds; mm = millimeters; N/A = not applicable; NEW = net explosive weight; PGU = Projectile Gun Unit; SDB = small diameter bomb; PTS = permanent threshold shift; TTS = temporary threshold shift; WCMD = wind corrected munition dispenser

Based on the ranges presented in Table 7 and factoring operational limitations associated with survey-based vessel support for the missions, Eglin AFB estimates that during pre-mission surveys, the proposed monitoring area would be approximately 5 km (3.1 miles) from the target area, which corresponds to the Level A harassment threshold range. Eglin AFB proposes to survey the same-sized area for each mission day, regardless of the planned munition expenditures. By clearing the Level A harassment threshold range of protected species, animals that may enter the area after the completed pre-mission surveys but prior to detonation would not reach the smaller slight lung injury or mortality zones (presented in Table 6). Because of human safety issues, Eglin AFB would require observers to leave the test area at least 30 minutes in advance of live weapon deployment and move to a position on the safety zone periphery, approximately 9.5 miles (15 km) from the detonation point. Observers would continue to scan for marine mammals from the periphery, but effectiveness would be limited as the boat would remain at a designated station.

Density Estimation

Density estimates for bottlenose dolphin and spotted dolphin were derived from two sources (Table 8). Bottlenose dolphin density estimates were derived from a habitat modeling project conducted for portions of the EGTTR, including the Maritime WSEP project area (Garrison, 2008). NMFS developed habitat models using recent aerial survey line transect data collected during winter and summer. The surveys covered nearshore and continental shelf waters (to a maximum depth of 200 m), with the majority of effort concentrated in waters from the shoreline to 20 m depth. Marine species encounter rates during the surveys were corrected for sighting probability and the probability that animals were available on the surface to be seen. In combination with remotely sensed environmental data/habitat parameters (water depth, sea surface temperature (SST) and chlorophyll), these data were used to develop habitat models for cetaceans within the continental shelf and coastal waters of the eastern Gulf of Mexico. The technical approach, described as Generalized Regression and Spatial Prediction, spatially projects the species-habitat relationship based on distribution of environmental factors, resulting in predicted densities for un-sampled locations and times. The spatial density model can therefore be used to predict density in unobserved areas and at different times of year based upon the monthly composite SST and chlorophyll datasets derived from satellite data. Similarly, the spatial density model can be used to predict relative density for any sub-region within the surveyed area.

Garrison (2008) produced bottlenose dolphin density estimates at various spatial scales within the EGTTR. At the largest scale, density data were aggregated into four principal strata categories: North-Inshore, North-Offshore, South-Inshore, and South-Offshore. Densities for these strata were provided in the published survey report. Unpublished

densities were also provided for smaller blocks (sub-areas) corresponding to airspace units and a number of these sub-areas were combined to form larger zones. Densities in these smaller areas were provided to Eglin AFB in Excel© spreadsheets by the report author.

For both large areas and sub-areas, regions occurring entirely within waters deeper than 200 meters were excluded from predictions, and those straddling the 200 meter isobath were clipped to remove deep water areas. In addition, because of limited survey effort, density estimates beyond 150 meters water depth are considered invalid. The environmental conditions encountered during the survey periods (February and July/August) do not necessarily reflect the range of conditions potentially encountered throughout the year. In particular, the transition seasons of spring (April-May) and fall (October-November) have a very different range of water temperatures. Accordingly, for predictions outside of the survey period or spatial range, it is necessary to evaluate the statistical variance in predicted values when attempting to apply the model. The coefficient of variation (CV) of the predicted quantity is used to measure the validity of model predictions. According to Garrison (2008), the best predictions have CV values of approximately 0.2. When CVs approach 0.7, and particularly when they exceed 1.0, the resulting model predictions are extremely uncertain and are considered invalid.

Based upon the preceding discussion, the bottlenose dolphin density estimate used in this document is the median density corresponding to sub-area 137 (see Figure 3-1 in Eglin AFB's IHA application). The planned Maritime WSEP test location lies within this sub-area. Within this block, Garrison (2008) provided densities based upon one year (2007) and five-year monthly averages for SST and chlorophyll. The 5-year average is considered

preferable. Only densities with a CV rounded to 0.7 or lower (i.e., 0.64 and below) were considered. The CV for June in this particular block is 0.62.

Atlantic spotted dolphin density was derived from Fulling et al. (2003), which describes the results of mammal surveys conducted in association with fall ichthyoplankton surveys from 1998 to 2001. The surveys were conducted by NMFS personnel from the U.S.-Mexico border to southern Florida, in water depths of 20 to 200 meters. Using the software program DISTANCE©, density estimates were generated for East and West regions, with Mobile Bay as the dividing point. The East region is used in this document. Densities were provided for Atlantic spotted dolphins and unidentified T. truncatus/S. frontalis (among other species). The unidentified T. truncatus/S. frontalis category is treated as a separate species group with a unique density. Density estimates from Fulling et al. (2003) were not adjusted for sighting probability (perception bias) or surface availability (availability bias) [g(0) = 1] in the original survey report, likely resulting in underestimation of true density. Perception bias refers to the failure of observers to detect animals, although they are present in the survey area and available to be seen. Availability bias refers to animals that are in the survey area, but are not able to be seen because they are submerged when observers are present. Perception bias and availability bias result in the underestimation of abundance and density numbers (negative bias)

Fulling et al. (2003) did not collect data to correct density for perception and availability bias. However, in order to address this negative bias, Eglin AFB has adjusted density estimates based on information provided in available literature. There are no published g(0) correction factors for Atlantic spotted dolphins. However, Barlow (2006) estimated g(0) for numerous marine mammal species near the Hawaiian Islands, including offshore pantropical

spotted dolphins (Stenella attenuata). Separate estimates for this species were provided for group sizes of 1 to 20 animals [g(0) = 0.76], and greater than 20 animals [g(0) = 1.00]. Although Fulling et al. (2003) sighted some spotted dolphin groups of more than 20 individuals, the 0.76 value is used as a more conservative approach.

NMFS refers the reader to Section 3 of Eglin AFB's application for detailed information on additional equations used to calculate densities (i.e., Barlow, 2006) for Atlantic spotted dolphins. Using the same method, Eglin AFB estimated the adjusted density for the unidentified T. truncatus/S. frontalis species group at 0.009 animals/km^2.There are no variances attached to either of these recalculated density values, so overall confidence in these values is unknown.

Table 8- Marine mammal density estimates within Eglin AFB's EGTTR,

Species	Density (animals/km^2)
Bottlenose dolphin[1]	1.194
Atlantic spotted dolphin[2]	0.265
Unidentified bottlenose dolphin/Atlantic spotted dolphin[2]	0.009

[1]Source: Garrison, 2008; adjusted for observer and availability bias by the author.
[2]Source: Fulling et al., 2003; adjusted for negative bias based on information provided by Barlow (2003; 2006).

Table 9 indicates the modeled potential for lethality, injury, and non-injurious harassment (including behavioral harassment) to marine mammals in the absence of mitigation measures. The numbers represent total impacts for all detonations combined. Mortality was calculated as approximately one-half an animal for bottlenose dolphins and about 0.1 animals for spotted dolphins. It is expected that, with implementation of the management practices described below, potential impacts would be mitigated to the point that there would be no mortality takes. Based on the low mortality exposure estimates calculated by the acoustic model combined with the implementation of mitigation measures, zero marine mammals are expected to be affected by pressure levels associated with mortality. Therefore, Eglin AFB

has requested an Incidental Harassment Authorization, as opposed to regulations and a Letter of Authorization under section 101(a)(5)(A).

Table 9 provides Eglin AFB's annual number of marine mammals, by species, potentially taken by Level A harassment and Level B harassment, by Maritime WSEP operations. NMFS notes that Eglin AFB derived these estimates without consideration of the effectiveness of their proposed mitigation measures. As indicated in Table 9, Eglin AFB and NMFS estimate that approximately 40 marine mammals could potentially be exposed to injurious Level A harassment noise levels (187 dB SEL).

Table 9 - Modeled number of marine mammals potentially affected by maritime strike missions. Proposed authorized takes for Level A and Level B harassment are the same as those modeled. NMFS does not propose to authorize takes for mortality.

Species	Mortality	Level A Harassment	Level B Harassment (TTS)	Level B Harassment (Behavioral)
Bottlenose dolphin	0.47	33.10	405.32	862.53
Atlantic spotted dolphin	0.11	6.58	74.15	146.41
Unidentified bottlenose dolphin/Atlantic spotted dolphin	0.00	0.22	2.52	4.97
TOTAL	0.58	39.90	481.99	1,013.91

Approximately 481.99 marine mammals would be exposed annually to non-injurious Level B behavioral harassment. TTS results from fatigue or damage to hair cells or supporting structures and may cause disruption in the processing of acoustic cues; however, hearing sensitivity is recovered within a relatively short time. Based on Eglin AFB and NMFS' estimates, up to 1,014 marine mammals may experience a behavioral response to these exercises associated with the 167 dB re: 1 μPa^2-s threshold. NMFS has preliminarily determined that this number will be significantly lower due to the expected effectiveness of the mitigation measures proposed for inclusion in the Authorization (if issued).

Negligible Impact Analysis and Preliminary Determinations

As explained previously, we have defined the term "negligible impact" to mean "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'' (50 CFR 216.103). The lack of likely adverse effects on annual rates of recruitment or survival (i.e., population level effects) forms the basis of a negligible impact finding. Thus, 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, and the number of estimated mortalities, effects on habitat, and the status of the species.

In making a negligible impact determination, we consider:

- The number of anticipated injuries, serious injuries, or mortalities;
- The number, nature, and intensity, and duration of Level B harassment; and
- The context in which the takes occur (e.g., impacts to areas of significance, impacts to local populations, and cumulative impacts when taking into account successive/contemporaneous actions when added to baseline data);
- The status of stock or species of marine mammals (i.e., depleted, not depleted, decreasing, increasing, stable, impact relative to the size of the population);
- Impacts on habitat affecting rates of recruitment/survival; and

- The effectiveness of monitoring and mitigation measures to reduce the number or severity of incidental take.

For reasons stated previously in this document and based on the following factors, Eglin AFB's specified activities are not likely to cause long-term behavioral disturbance, permanent threshold shift, or other non-auditory injury, serious injury, or death.

The takes from Level B harassment will be due to potential behavioral disturbance and TTS. The takes from Level A harassment will be due to potential tympanic-membrane (TM) rupture. Activities would only occur over a timeframe of two to three weeks in beginning in February, 2015, with one or two missions occurring per day. It is possible that some individuals may be taken more than once if those individuals are located in the exercise area on two different days when exercises are occurring. However, multiple exposures are not anticipated to have effects beyond Level A and Level B harassment.

While animals may be impacted in the immediate vicinity of the activity, because of the small ZOIs (compared to the vast size of the Gulf of Mexico ecosystem where these species live) and the short duration of the Maritime WSEP operations, NMFS has preliminarily determined that there will not be a substantial impact on marine mammals or on the normal functioning of the nearshore or offshore Gulf of Mexico ecosystems. The proposed activity is not expected to impact rates of recruitment or survival of marine mammals since neither mortality (which would remove individuals from the population) nor serious injury are anticipated to occur. In addition, the proposed activity would not occur in areas (and/or times) of significance for the marine mammal populations potentially affected by the exercises (e.g., feeding or resting areas, reproductive areas), and the activities would only occur in a small part of their overall range, so the impact of any potential temporary

displacement would be negligible and animals would be expected to return to the area after the cessations of activities. Although the proposed activity could result in Level A (TM rupture) and Level B (behavioral disturbance and TTS) harassment of marine mammals, the level of harassment is not anticipated to impact rates of recruitment or survival of marine mammals because the number of exposed animals is expected to be low due to the short term and site specific nature of the activity, and the type of effect would not be detrimental to rates of recruitment and survival.

Additionally, the mitigation and monitoring measures proposed to be implemented (described earlier in this document) are expected to further minimize the potential for harassment. The protected species surveys would require Eglin AFB to search the area for marine mammals, and if any are found in the live fire area, then the exercise would be suspended until the animal(s) has left the area or relocated. Moreover, marine species observers located in the Eglin control tower would monitor the high-definition video feed from cameras located on the instrument barge anchored on-site for the presence of protected species. Furthermore, Maritime WSEP missions would be delayed or rescheduled if the sea state is greater than a 4 on the Beaufort Scale at the time of the test. In addition, Maritime WSEP missions would occur no earlier than two hours after sunrise and no later than two hours prior to sunset to ensure adequate daylight for pre- and post-mission monitoring.

Based on the analysis contained herein of the likely effects of the specified activity on marine mammals and their habitat, and taking into consideration the implementation of the mitigation and monitoring measures, NMFS preliminarily finds that Eglin AFB's Maritime WSEP operations will result in the incidental take of marine mammals, by Level A and Level

B harassment only, and that the taking from the Maritime WSEP exercises will have a negligible impact on the affected species or stocks.

Impact on Availability of Affected Species or Stock for Taking for Subsistence Uses

There are no relevant subsistence uses of marine mammals implicated by this action. Therefore, NMFS has preliminarily determined that the total taking of affected species or stocks would not have an unmitigable adverse impact on the availability of such species or stocks for taking for subsistence purposes.

Endangered Species Act (ESA)

Eglin AFB initiated consultation with the Southeast Region, NMFS, under section 7 of the ESA regarding the effects of this action on ESA-listed species and critical habitat under the jurisdiction of NMFS. The consultation will be completed and a biological opinion issued prior to any final determinations on the Authorization. Due to the location of the activity, no ESA-listed marine mammal species are likely to be affected; therefore, NMFS has preliminarily determined that this proposed Authorization would have no effect on ESA-listed species. However, prior to the agency's decision on the issuance or denial of this Authorization, NMFS will make a final determination on whether additional consultation is necessary.

National Environmental Policy Act (NEPA)

Eglin AFB released a Draft Environmental Assessment (EA) on the Maritime WSEP Operations. NMFS has made this EA available on its website (See ADDRESSES). Eglin AFB will issue a Final EA and a Finding of No Significant Impact (FONSI) on the Maritime WSEP activities prior to NMFS' final determination on the Authorization.

In accordance with NOAA Administrative Order 216-6 (Environmental Review Procedures for Implementing the National Environmental Policy Act, May 20, 1999), NMFS will review the information contained in Eglin AFB's EA and determine whether the EA accurately and completely describes the preferred action alternative, a reasonable range of alternatives, and the potential impacts on marine mammals, endangered species, and other marine life that could be impacted by the preferred and non-preferred alternatives. Based on this review and analysis, NMFS may adopt Eglin AFB's DEA under 40 CFR 1506.3, and issue its own FONSI statement on issuance of an annual authorization under section 101(a)(5) of the MMPA.

Proposed Authorization

As a result of these preliminary determinations, we propose to issue an Authorization to Eglin AFB for conducting Maritime WSEP activities, for a period of one year from the date of issuance, provided the previously mentioned mitigation, monitoring, and reporting requirements are incorporated. The proposed Authorization language is provided in the next section. The wording contained in this section is proposed for inclusion in the Authorization (if issued).

1. This Authorization is valid for a period of one year from the date of issuance.

2. This Authorization is valid only for activities associated with the Maritme WSEP operations utilizing munitions identified in the Attachment.

3. The incidental taking, by Level A and Level B harassment, is limited to: Atlantic bottlenose dolphin (Tursiops truncatus); and Atlantic spotted dolphin (Stenella frontalis) as specified in the following table:

Species	Level A Harassment	Level B Harassment (TTS)	Level B Harassment (Behavioral)
Bottlenose dolphin	33	405	863
Atlantic spotted dolphin	7	74	146
Unidentified bottlenose dolphin/Atlantic spotted dolphin	1	3	5
TOTAL	41	482	1,014

The taking by serious injury or death of these species, the taking of these species in violation of the conditions of this Incidental Harassment Authorization, or the taking by harassment, serious injury or death of any other species of marine mammal is prohibited and may result in the modification, suspension or revocation of this Authorization.

4. Mitigation

When conducting this activity, the following mitigation measures must be undertaken:

- If daytime weather and/or sea conditions preclude adequate monitoring for detecting marine mammals and other marine life, maritime strike operations must be delayed until adequate sea conditions exist for monitoring to be undertaken. Daytime maritime strike exercises will be conducted only when sea surface conditions do not exceed Beaufort sea state 4 (i.e., wind speed 13-18 mph (11-16 knots); wave height 1 m (3.3 ft)), the visibility is 5.6 km (3 nm) or greater, and the ceiling is 305 m (1,000 ft) or greater.
- On the morning of the maritime strike mission, the test director and safety officer will confirm that there are no issues that would preclude mission execution and that the weather is adequate to support monitoring and mitigation measures.

Two Hours Prior to Mission

- Mission-related surface vessels will be stationed on site.

- Vessel-based observers on board at least one vessel will assess the overall suitability of the test site based on environmental conditions (e.g., sea state) and presence/absence of marine mammal or marine mammal indicators (e.g., large schools of fish, jellyfish, Sargassum rafts, and large flocks of birds feeding at the surface). Observers will relay this information to the safety officer.

One and One-half Hours Prior to Mission

- Vessel-based surveys and video camera surveillance will commence. Vessel-based observers will survey the applicable Zone of Impact (ZOI) and relay all marine mammal and indicator sightings, including the time of sighting and direction of travel (if known) to the safety officer. Surveys will continue for approximately one hour.
- If marine mammals or marine mammal indicators are observed within the applicable ZOI, the test range will be declared "fouled," which will signify to mission personnel that conditions are such that a live ordnance drop cannot occur.
- If no marine mammals or marine mammal indicators are observed, the range will be declared "green," which will signify to mission personnel that conditions are such that a live ordnance drop may occur.

One-half Hour Prior to Mission

- Approximately 30 minutes prior to live weapon deployment, vessel-based observers will be instructed to leave the test site and remain outside the safety zone, which will be 9.5 miles from the detonation point (actual size will be determined by weapon net explosive weight (NEW) and method of delivery) during the conduct of the mission.

- Monitoring for marine mammals will continue from the periphery of the safety zone while the mission is in progress. Other safety boat crews will be instructed to observe for marine mammals during this time.
- After survey vessels have left the test site, marine species monitoring will continue for the Eglin control tower through the video feed received from the high definition cameras on the instrument barge.

Execution of Mission

- Immediately prior to live weapons drop, the test director and safety officer will communicate to confirm the results of the marine mammal survey and the appropriateness of proceeding with the mission. The safety officer will have final authority to proceed with, postpone, move, or cancel the mission.
- The mission will be postponed or moved if: Any marine mammal is visually detected within the applicable ZOI. Postponement will continue until the animal(s) that caused the postponement is confirmed to be outside of the applicable ZOI due to swimming out of the range; or large schools of fish, jellyfish, Sargassum rafts, or large flocks of birds feeding at the surface are observed within the applicable ZOI. Postponement will continue until these potential indicators are confirmed to be outside the applicable ZOI.
- In the event of a postponement, pre-mission monitoring will continue as long as weather and daylight hours allow.

Post Mission

- Post-mission surveys will commence as soon as Explosive Ordnance Disposal (EOD) personnel declare the test area safe. These surveys will be conducted by the same vessel-based observers that conducted the pre-mission surveys.

- Survey vessels will move into the applicable ZOI from outside the safety zone and monitor for at least 30 minutes, concentrating on the area down-current of the test site. Any marine mammals killed or injured as a result of the test will be documented and immediately reported to the NMFS Southeast Region Marine Mammal Stranding Network at 877-433-8299 (Blair.Mase@noaa.gov and Erin.Fougeres@noaa.gov) and the Florida Marine Mammal Stranding Hotline at 888-404-3922. The species, number, location, and behavior of any animals observed will be documented and reported.
- If post-mission surveys determine that an injury or lethal take of a marine mammal has occurred, the next maritime strike mission will be suspended until the test procedure and the monitoring methods have been reviewed with NMFS and appropriate changes made.

5. Monitoring

The holder of this Authorization is required to cooperate with the National Marine Fisheries Service and any other Federal, state or local agency monitoring the impacts of the activity on marine mammals.

The holder of this Authorization will track their use of the EGTTR for the Maritime WSEP missions and marine mammal observations, through the use of mission reporting forms.

Maritime strike missions will coordinate with other activities conducted in the EGTTR (e.g., Precision Strike Weapon and Air-to-Surface Gunnery missions) to provide supplemental post-mission observations of marine mammals in the operations area of the exercise.

Any dead or injured marine mammals observed or detected prior to testing or injured or killed during live drops, must be immediately reported to the NMFS Southeast Region

Marine Mammal Stranding Network at 877-433-8299 (Blair.Mase@noaa.gov and Erin.Fougeres@noaa.gov) and the Florida Marine Mammal Stranding Hotline at 888-404-3922.

Any unauthorized impacts on marine mammals must be immediately reported to Dr. Roy E. Crabtree, the National Marine Fisheries Service's Southeast Regional Administrator, at 727-842-5312 or Roy.Crabtree@noaa.gov, and Jolie Harrison, Chief, Permits and Conservation Division, Office of Protected Resources at 301-427-8401 or Jolie.Harrison@noaa.gov.

The monitoring team will document any marine mammals that were killed or injured as a result of the test and, if practicable, coordinate with the local stranding network and NMFS to assist with recovery and examination of any dead animals, as needed.

Activities related to the monitoring described in this Authorization, including the retention of marine mammals, do not require a separate scientific research permit issued under section 104 of the Marine Mammal Protection Act.

6. Reporting

A draft report of marine mammal observations and Maritime WSEP mission activities must be submitted to the National Marine Fisheries Service's Southeast Regional Office, Protected Resources Division, 263 13th Ave. South, St. Petersburg, FL 33701 and NMFS's Office of Protected Resources, 1315 East West Highway, Silver Spring, MD 20910. This draft report must include the following information:

- Date and time of each maritime strike mission;

- A complete description of the pre-exercise and post-exercise activities related to mitigating and monitoring the effects of maritime strike missions on marine mammal populations;
- Results of the monitoring program, including numbers by species/stock of any marine mammals noted injured or killed as a result of the maritime strike mission and number of marine mammals (by species if possible) that may have been harassed due to presence within the applicable ZOI; and
- A detailed assessment of the effectiveness of sensor based monitoring in detecting marine mammals in the area of Maritime WSEP operations.

The draft report will be subject to review and comment by the National Marine Fisheries Service. Any recommendations made by the National Marine Fisheries Service must be addressed in the final report prior to acceptance by the National Marine Fisheries Service. The draft report will be considered the final report for this activity under this Authorization if the National Marine Fisheries Service has not provided comments and recommendations within 90 days of receipt of the draft report.

7. Additional Conditions

- The maritime strike mission monitoring team will participate in the marine mammal species observation training. Designated crew members will be selected to receive training as protected species observers. Observers will receive training in protected species survey and identification techniques through a National Marine Fisheries Service-approved training program.

- The holder of this Authorization must inform the Director, Office of Protected Resources, National Marine Fisheries Service, (301-427-8400) or designee (301-427-8401) prior to the initiation of any changes to the monitoring plan for a specified mission activity.
- A copy of this Authorization must be in the possession of the safety officer on duty each day that maritime strike missions are conducted.
- Failure to abide by the Terms and Conditions contained in this Incidental Harassment Authorization may result in a modification, suspension or revocation of the Authorization.

Request for Public Comments

We request comment on our analysis, the draft authorization, and any other aspect of this Notice of Proposed Authorization. Please include with your comments any supporting data or literature citations to help inform our final decision on Eglin AFB's request for an MMPA authorization.

Dated: December 3, 2014.

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Perry F. Gayaldo, Deputy Director,
Office of Protected Resources,
National Marine Fisheries Service.

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