DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 96TH AIR BASE WING (AFMC)
EGLIN AIR FORCE BASE FLORIDA

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Jaclyn Daly
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National Marine Fisheries Service (NMFS)
1315 East-West Highway
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Dear Ms. Daly,

This letter is being submitted to the NMFS to request a Letter of Autorization (LOA) associated with the training operations of the Naval Explosive Ordnance Disposal School (NEODS) at Eglin Air Force Base (AFB) property off Santa Rosa Island. Compliance with respect to the Marine Mammal Protection Act of 1972 will be accomplished by updating the LOA with new mission scenarios, numbers of detonations per year, updated marine mammal density data, and securing another LOA.

The NEODS received an IHA on September 19, 2008 for these training operations involving detonation of five pound net explosive weight (NEW) mine countermeasure devices. The IHA was valid from October 5, 2008 to October 4, 2009. However, the missions have been delayed due to safety issues concerning bringing demolition charges under a bridge and no missions have occurred to date. The Navy is currently working to get approval for this and the Air Force would like to request a 5-year Letter of Authorization (LOA). This LOA request includes an update to the mission description, which consists of 1) the addition of 10-pound NEW charges, 2) a decrease in the annual number of detonations, 3) a seasonal breakdown of detonation numbers, and 4) updated marine mammal density estimates as provided by NMFS personnel. Mitigation measures are largely unchanged from the 2008 IHA.

The NMFS will be notified immediately if any of the actions considered in this proposed action are modified. Any modifications or conditions resulting from consultation or permitting with the NMFS will be implemented prior to commencement of activities.

The Natural Resources Section believes this fulfills all requirements for the permitting process to proceed. If you have any questions regarding this letter or any of the proposed activities, please do not hesitate to contact either Mr. Bob Miller (850-883-1153) or myself at (850) 882-8391.

Sincerely

STEPHEN M. SEIBER, YF-02
Chief, Natural Resources Section

REQUEST FOR A LETTER OF AUTHORIZATION FOR THE INCIDENTAL HARASSMENT OF MARINE MAMMALS RESULTING FROM NAVAL EXPLOSIVE ORDNANCE DISPOSAL SCHOOL (NEODS) TRAINING OPERATIONS

EGLIN AIR FORCE BASE, FLORIDA

Submitted To:

Office of Protected Resources
National Marine Fisheries Service (NMFS)
1315 East-West Highway
Silver Spring, MD 20910-3226

Submitted By:

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TABLE OF CONTENTS

Page

List of Tables ii
List of Figures ii
List of Acronyms, Abbreviations, and Symbols iii
Executive Summary 1

1. DESCRIPTION OF ACTIVITIES 1
   1.1 Background 1
   1.2 Proposed NEODS Operations 3
2. DURATION AND LOCATION OF THE ACTIVITIES 4
3. MARINE MAMMALS SPECIES AND NUMBERS 4
4. AFFECTED SPECIES STATUS AND DISTRIBUTION 6
5. TAKE AUTHORIZATION REQUESTED 8
6. NUMBERS AND SPECIES TAKEN 8
7. IMPACTS TO MARINE MAMMAL SPECIES OR STOCKS 13
8. IMPACT ON SUBSISTENCE USE 13
9. IMPACTS TO MARINE MAMMAL HABITAT AND THE LIKELIHOOD OF RESTORATION 13
10. IMPACTS TO MARINE MAMMALS FROM LOSS OR MODIFICATION OF HABITAT 13
11. MEANS OF AFFECTING THE LEAST PRACTICABLE ADVERSE IMPACTS 13
12. MINIMIZATION OF ADVERSE EFFECTS ON SUBSISTENCE USE 17
13. MONITORING AND REPORTING MEASURES 17
14. RESEARCH 18
15. LIST OF PREPARERS 20
16. REFERENCES 21

LIST OF TABLES

Page

Table 1-1. Hand-held Sonar Characteristics 3
Table 3-1. Bottlenose Dolphin Densities for EGTTR Sub-area 197 6
Table 6-1. Threshold Criteria and Metrics Utilized for Impact Analyses 10
Table 6-2. Zones of Influence for Underwater Explosions 11
Table 6-3. Marine Mammal Densities and Risk Estimates for Level A Harassment (205 dB EFD 1/3-Octave Band) Noise Exposure for Summer and Winter 12
Table 6-4. Marine Mammal Densities and Risk Estimates for Level B Harassment (182 dB EFD 1/3-Octave Band) Noise Exposure 12
Table 11-1. Sea State Scale for Marine Mammal and Sea Turtle Observation 14

LIST OF FIGURES

Page

Figure 1-1. NEODS Test Locations in the Eglin Gulf Test and Training Range (EGTTR) 2
Figure 3-1. Map of the Protected Species Habitat Modeling survey area, EGTTR sub-area 197 5

LIST OF ACRONYMS, ABBREVIATIONS, AND SYMBOLS

µPa	MicroPascal
AAC	Air Armament Center
96CEG/CEVSN	96th Civil Engineer Group, Natural Resources Section
AFB	Air Force Base
AN/PQS-2A	Sonar Equipment
CFR	Code of Federal Regulations
dB	Decibels
dB re 1 $\mu Pa^2 \cdot s$	Decibels Referenced to One MicroPascal Squared per Second
EFD	Energy Flux Density
EFDL	Energy Flux Density Level
EGTTR	Eglin Gulf Test and Training Range
EOD	Explosive Ordnance Disposal
ESA	Endangered Species Act
ft	Feet
GOM	Gulf of Mexico
HP	Horsepower
Hz	Hertz
in	Inch
in^2	Square Inch
in-lb	Inch-Pound
KHz	Kilohertz
km^2	Square Kilometers
lb	Pound
LOA	Letter of Authorization
m	Meters
MCM	Mine Countermeasures
MMPA	Marine Mammal Protection Act
NEOD	Navy Explosive Ordnance Disposal
NEODS	Naval Explosive Ordnance Disposal School
NEW	Net Explosive Weight
NM	Nautical Mile
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
PBR	Potential for Biological Removal
Psi	Pounds per Square Inch
PTS	Permanent Threshold Shift
re	Referenced
s	Second
SAIC	Science Applications International Corporation
SERO	Southeast Regional Office
SRI	Santa Rosa Island
TM	Tympanic Membrane
TNT	2, 4, 6-trinitrotoluene
TTS	Temporary Threshold Shift
USAF	U.S. Air Force
USN	U.S. Navy
ZOI	Zone of Influence

EXECUTIVE SUMMARY

With this submittal, Eglin Air Force Base requests a Letter of Authorization (LOA) for the incidental taking (in the form of noise-related harassment), but not intentional taking, of small numbers of marine mammals incidental to the Naval Explosive Ordnance Disposal School (NEODS) testing within the Eglin Gulf Test and Training Range (EGTTR) over the next five years, as permitted by the Marine Mammal Protection Act (MMPA) of 1972, as amended. These tests may expose cetaceans that potentially occur within the EGTTR to noise. Because in-place mitigations would clear the area of any marine mammal before detonation, it is anticipated that no federally protected marine animal takes would result in the form of mortality or injury.

NEODS missions involve underwater detonations of small, live explosive charges adjacent to inert mines. The NEODS may conduct up to eight 2-day demolition training events annually; these missions may occur at any time of the year. Each demolition training event involves a maximum of five detonations. Up to 20 5-lb charges (5 pounds net explosive weight [NEW] per charge) and 20 10-lb charges (10 pounds NEW per charge) would be detonated annually in the Gulf of Mexico (GOM), approximately 3 nautical miles (NM) offshore of Eglin Air Force Base. Detonations would be conducted on the sea floor, adjacent to an inert mine, at a depth of approximately 60 feet.

The potential takes outlined in Section 6 represent the maximum expected number of animals that could be affected. Eglin Air Force Base (AFB) and NEODS have employed a number of mitigation measures in an effort to substantially decrease the number of animals potentially affected. Eglin AFB is committed to assessing the mission activity for opportunities to provide operational mitigations (i.e., visual clearance of the test area). Also, the use of conservative analyses (Section 11) serves as a functional mitigation technique.

Using the best density estimate, the zone of influence (ZOI) of charges employed and the total number of events per year, an annual estimate of the potential number of animals exposed to noise (harassed, injured, or killed) was analyzed. No cetaceans are expected to be within the Level A 205 dB noise zone of influence. Without any mitigation, Level B noise would potentially affect up to approximately ten cetaceans. No strategic marine mammal stocks would be affected. None of the marine mammal species that potentially could be taken are listed as threatened or endangered.

The information and analyses provided in this application are presented to fulfill the LOA requirements in Paragraphs (1) through (11) of 50 Code of Federal Regulations (CFR) 228.4(a).

1. DESCRIPTION OF ACTIVITIES

This section describes the mission activities conducted in the Eglin Gulf Test and Training Range (EGTTR) that could result in takes under the Marine Mammal Protection Act (MMPA) of 1972, as amended. The actions are Navy test missions involving underwater detonations with the potential to affect cetaceans that may occur within the EGTTR.

1.1 BACKGROUND

Potential impacts to listed species and habitat from Naval Explosive Ordnance Disposal School (NEODS) testing are limited to the sites offshore of Eglin Air Force Base shown in Figure 1-1. The EGTTR encompasses approximately 86,000 square miles within the Gulf of Mexico (GOM) and consists of the airspace over the GOM, which is scheduled and operated by Eglin Air Force Base (AFB). NEODS test areas are located approximately 3 nautical miles (NM) from shore, in approximately 60 feet of water and in area W-151 of the EGTTR.

The mission of NEODS is to detect, recover, identify, evaluate, render safe, and dispose of unexploded ordnance (UXO) that constitutes a threat to people, material, installations, ships, aircraft, and operations. The U.S. Navy EOD force of approximately 1,000 men and women has the equipment, mobility, and flexibility to tackle the global spectrum of threats in all world environments. Mine Countermeasures (MCM) detonations is one function of the U.S. Navy EOD force, which involves mine-hunting and mine-clearance operations. The NEODS facilities are located at Eglin AFB, Florida. The proposed training at Eglin AFB involves focused training on basic EOD skills. Examples of these fundamental skills are recognizing ordnance, reconnaissance, measurement, basic understanding of demolition charges, and neutralization of conventional and chemical ordnance.

The NEODS at Eglin AFB proposes to use the Gulf waters off of Santa Rosa Island (SRI) for a portion of the NEODS class. The NEODS would utilize areas approximately 1 to 3 NM offshore of Test Site A-15, A-10 or A-3 for MCM training (Figure 1-1). The goal of the training is to give NEODS students the tools and techniques to implement MCM through real scenarios. The students would be taught established techniques for neutralizing mines by diving and hand-placing charges adjacent to the mines. The detonation of small, live explosive charges adjacent to the mine disables the mine function. Inert mines are utilized for training purposes. This training would occur offshore of SRI up to eight times annually, at varying times within the year.

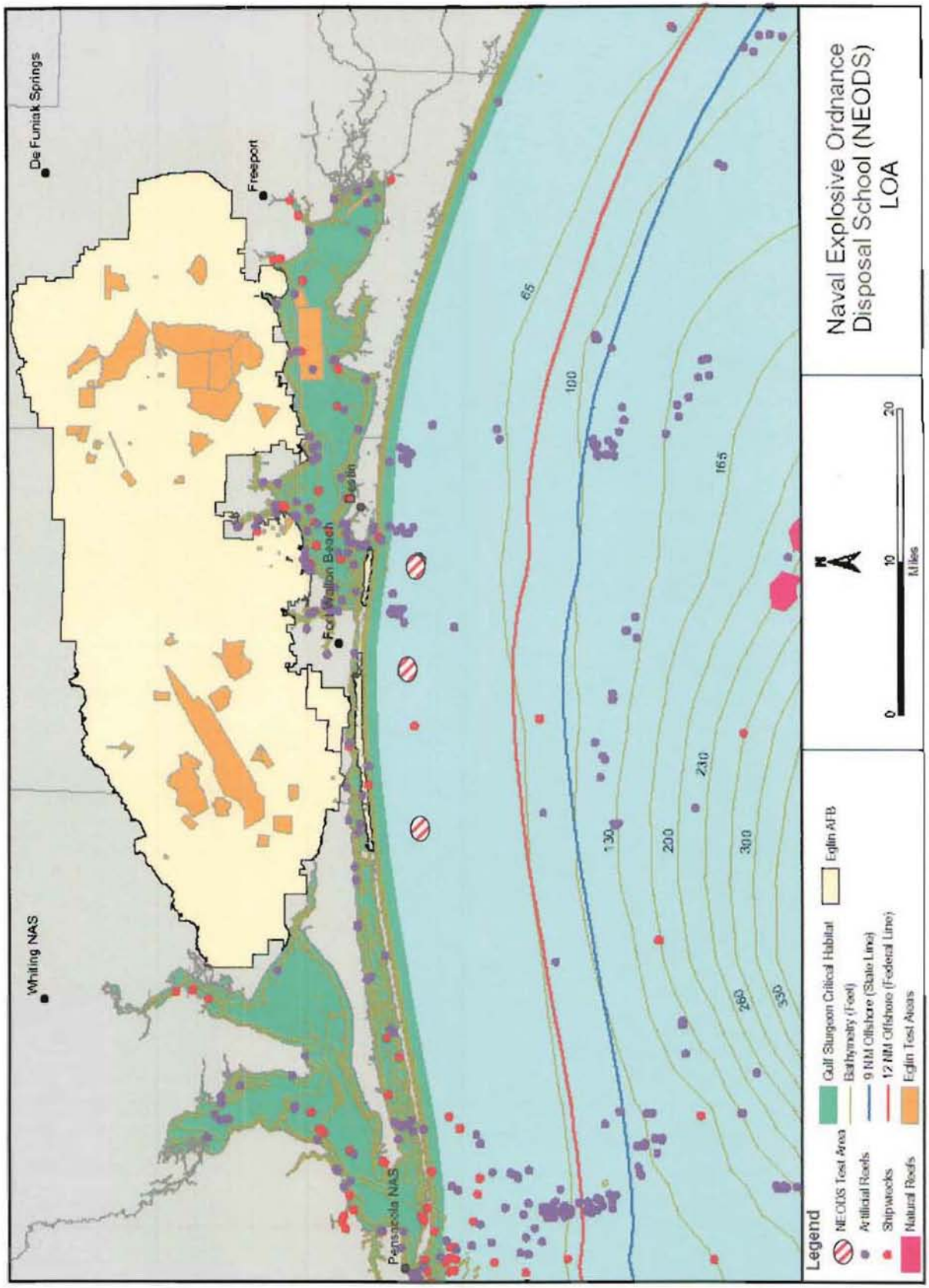

Figure 1-1. NEODS Test Locations in the Eglin Gulf Test and Training Range (EGTTR)

1.2 PROPOSED NEODS OPERATIONS

MCM training classes are 51 days in duration, with four days of on-site training in the Gulf of Mexico. Two of these four days will be utilized to lay the inert mines prior to the training. The other two days will require the use of live detonations in the Gulf of Mexico. One large safety vessel and five MK V inflatable 10-foot rubber boats with 50 horsepower (HP) engines would be used to access the Gulf of Mexico waters during training activities. The training procedures during the two "Live Demolition" days are described as follows.

First Live Demolition Day: Five inert mines will be placed in a compact area on the Gulf floor in approximately 60 feet of water. These five mines will be utilized for the one or two live demolition days. Divers will locate the mines by hand-held sonars (AN/PQS-2A acoustic locator and the Dukane Underwater Acoustic Locator System), which detect the mine casings (mine shape reacquisition). The hand-held sonar would not impact any protected marine species because the sonar ranges are below any current threshold for protected marine species (Table 1-1); therefore, potential noise impacts from sonars are not included in this analysis.

Five charges packed with C-4 explosive material (either 5-lb. NEW or 10-lb. NEW) will be set up adjacent to the mines. A charge includes detonation cord, non-electric caps, time fuses and fuse igniters. No more than five charges will be utilized over the two-day period. Live training events will occur eight times annually, averaging once every six to seven weeks. Four of the training events will involve 5-lb charges, and four events will involve 10-lb charges. Because five detonations (maximum) are expected during each event, there will be up to twenty 5-lb detonations and twenty 10-lb detonations annually, for a total of forty detonations. It is expected that 60 percent of the training events will occur in summer, and 40 percent will occur in winter. Therefore, analyses of potential marine mammal impacts in Section 6 reflect this seasonal tempo. Overpressure from the detonation is intended to disrupt the electrical charge on the mine, rendering it safe. The five charges will be detonated individually with a maximum separation time of 20 minutes between each detonation. The time of detonation will be limited to an hour after sunrise and an hour before sunset. Mine shapes and debris will be recovered and removed from the Gulf waters when training is completed.

Second Live Demolition Day: Each team has two days to complete their entire evolution (detonation of five charges). The second day will be utilized only if the teams cannot complete their evolution on day one.

Table 1-1. Hand-held Sonar Characteristics

	AN/PQS-2A	Dukane
Frequency Operating Range	115 kHz – 145 kHz	30-45 kHz
Audible Frequency Range	n/a	250 Hz – 2500 Hz
Operating Frequency	115 kHz – 145 kHz	37.5 kHz +/- 1 kHz
Sound Pressure Level	178.5 re 1 microPascal @ 1 meter	157 – 160.5 re 1 microPascal @ 1 meter

2. DURATION AND LOCATION OF THE ACTIVITIES

NEODS missions will occur over the next five years utilizing resources within the Eglin Military Complex, including three sites in the EGTTR (Figure 1-1). There will be eight training events annually, with an average of one event occurring every six to seven weeks. Half of the events will involve 5-lb charges and half will involve 10-lb charges.

3. MARINE MAMMALS SPECIES AND NUMBERS

Marine mammal species that potentially occur within the EGTTR include several species of cetaceans and one sirenian, the West Indian manatee. During winter months, manatee distribution in the Gulf of Mexico is generally confined to southern Florida. During summer months, a few may migrate north as far as Louisiana. However, manatees primarily inhabit coastal and inshore waters and rarely venture offshore. NEODS missions would be conducted 1 to 3 NM from shore. Therefore, effects on manatees are considered very unlikely, and the discussion of marine mammal species is confined to cetaceans. The primary cetacean occurring in the NEODS area of interest, EGTTR sub-area 197 (Figure 3-1), is the Atlantic bottlenose dolphin (*Tursiops truncates)* and this analysis will focus on that species.

Bottlenose dolphin density estimates for the study area are derived from Protected Species Habitat Modeling in the Eglin Gulf Test and Training Range (Garrison, 2008). The National Marine Fisheries Service (NMFS) developed habitat models using new aerial survey line transect data collected during the winter and summer of 2007. The winter survey was conducted primarily during the month of February (water temperatures of 12-15°C) while the summer survey was primarily during July (water temperatures >26°C). In combination with remotely sensed habitat parameters (sea surface temperature and chlorophyll), these data were used to develop spatial density models for bottlenose dolphins within the continental shelf and coastal waters of the eastern Gulf of Mexico. Encounter rates during the aerial surveys were corrected for sighting probabilities and the probability that animals were available on the surface to be seen. The models predict the absolute density of bottlenose dolphins within the EGTTR. Given that the survey area (EGTTR sub-area 197, Figure 3-1) completely overlaps the NEODS mission area and that this data is currently the best available survey data, these models best reflect the occurrence of bottlenose dolphins within the EGTTR.

Table 3-1 provides median and adjusted bottlenose dolphin densities in EGTTR sub-area 197. These absolute estimates of density (animals per square kilometer, or km^2) were produced by combining the spatial density model, sighting probability, and availability model (Garrison, 2008). All environmental terms were retained in the species-habitat model for the winter survey and the summer survey with the exception of glare for the summer survey. The model fits for the winter and summer were highly significant, explained a significant portion of the variability in the data, and resulted in effective predictions of the spatial distribution of bottlenose dolphins.

NEODS missions may be executed at any time during the year. It is anticipated that approximately 60 percent of missions will be executed during summer months, and 40 percent

executed during winter months. Separate summer and winter density estimates are provided in Table 3-1. Months with high CV values (greater than 1) have high degrees of uncertainty in the model predictions. These months include May, June, September, October, and November where density was unknown. In order to compensate for the months without good estimates, interpolation was used between the available months by providing a means of estimating the function at intermediate points through presuming that there were linear seasonal trends. Interpolation assumes that the poorly estimated periods lie somewhere in the middle of the well estimated periods. Adjusted densities for each month were reached after interpolation calculations (Table 3-1). Based on the adjusted densities, January, March, and July have the highest bottlenose dolphin densities while August-December months have the lowest densities. On average, there are 0.81 bottlenose dolphins/km^2 throughout the year in EGTTR sub-area 197. Seasonally, there are on average 0.84 dolphins/km^2 during summer and 0.78 dolphins/km^2 during winter in sub-area 197.

Figure 3-1. Map of the Protected Species Habitat Modeling survey area, EGTTR sub-area 197.

Table 3-1. Bottlenose Dolphin Densities for EGTTR Sub-area 197

Month	Median Density (Individuals/km^2)	CV	Valid	Adjusted density (Individuals/km^2) [a]
November	0.00	31.62	0	0.51
December	0.52	0.25	1	0.52
January	1.24	0.22	1	1.24
February	0.73	0.20	1	0.73
March	1.22	0.28	1	1.22
April	0.84	0.46	1	0.84
Average Winter Density				**0.84**
May	0.00	22.41	0	0.95
June	0.00	4.47	0	1.06
July	1.17	0.24	1	1.17
August	0.48	0.22	1	0.48
September	0.01	3.02	0	0.49
October	0.00	20.43	0	0.50
Average Summer Density				**0.78**
Overall Average Density				**0.81**

[a]Adjusted through interpolation

4. AFFECTED SPECIES STATUS AND DISTRIBUTION

In fulfillment of the MMPA, the NMFS has identified certain cetacean stocks as strategic. A strategic stock is defined by the MMPA as a marine mammal stock for which the level of direct human-caused mortality exceeds the potential biological removal level; which, based on the best available scientific information, is declining and is likely to be listed as a threatened species under the ESA within the foreseeable future; or which is listed as a threatened or endangered species under the ESA, or is designated depleted under the MMPA. The "maximum number of animals that may be removed from a stock while allowing the stock to maintain its optimal sustainable population is termed *potential for biological removal*," or PBR (Code of Federal Regulations, 1994). This metric is included for the affected species described below.

The marine mammal species potentially affected is the ***Atlantic bottlenose dolphin***.

Description – Atlantic bottlenose dolphins (*Tursiops truncatus*) are distributed worldwide in tropical and temperate waters. Atlantic bottlenose dolphins occur in slope, shelf, and inshore waters of the entire Gulf of Mexico, and their diet consists mainly of fish, crabs, squid, and shrimp

(Caldwell and Caldwell, 1983). In addition, a coastal and an offshore form of the bottlenose dolphin have been suggested. Baumgartner et al. (2001) suggest a bimodal distribution in the northern Gulf of Mexico, with a shelf population occurring out to the 150-meter isobath and a shelf break population out to the 750-meter isobath. Occurrence in water with depth greater than 1,000 meters is not considered likely and not applicable to this assessment. Migratory patterns from inshore to offshore are likely associated with the movements of prey rather than a preference for a particular habitat characteristic (such as surface water temperature) (Ridgeway, 1972; Irving, 1973; Jefferson et al., 1992).

Status – Within the EGTTR, there are 4 defined stocks of bottlenose dolphins: the Northern Gulf of Mexico Oceanic Stock, the Northern Gulf of Mexico Continental Shelf stock, the Eastern Gulf of Mexico Coastal Stock and the Northern Gulf of Mexico Coastal stock. In addition, there are 33 stocks of bottlenose dolphins inhabiting the bays, sounds, and estuaries along the Gulf coast (Waring et al., 2007). Prior to the 2007 Garrison survey and model predictions, the best estimates of abundance were between 7-15 years old, occurred during different seasons, and each of the surveys suffered from differing degrees of negative bias in abundance estimates because all surveys assumed that all animals on the trackline were seen. Therefore, estimates based on those surveys would be highly uncertain. Based on data from the Protected Species Habitat Modeling in the EGTTR, the total estimate of abundance of bottlenose dolphins from the winter 2007 survey was 65,861 (95% CI 36,699-118,200) and for the summer 2007 survey was 11,433 (95% CI 7,346-17,793) (Garrison, 2008). For both the summer and winter surveys, the highest density of bottlenose dolphins occurred in the northern inshore stratum. The summer survey overall abundance estimate for bottlenose dolphins was approximately 50% lower than the winter survey (Garrison, 2008).

Bottlenose stocks for the shelf edge and slope are not considered strategic. The PBR for shelf and slope stocks is 45 dolphins (Waring et al., 2001).

Diving Behavior –The presence of deep-sea fish in the stomachs of some individual offshore bottlenose dolphins suggests that they dive to depths of more than 500 m (1,640 ft). A tagged individual near Bermuda had maximum recorded dives of 600 to 700 m (1,969 to 2,297 ft) and durations of 11 to 12 min. Dive durations up to 15 min have been recorded for trained individuals. Typical dives, however, are more shallow and of a much shorter duration. Data from a tagged individual off Bermuda indicated a possible diel dive cycle (i.e., a regular daily dive cycle) in search of mesopelagic (living at depths between 180 and 900 m [591 and 2,953 ft] prey in the deep scattering layer.

Occurrence in NEODS Study Area – In the EGTTR as a whole, there were a total of 281 groups of bottlenose dolphins during the winter survey and 162 groups during the summer survey. According to the species-habitat model for bottlenose dolphins, densities were predicted to be highest in relatively shallow water, with an offshore peak in density between 40-60 m depth and in waters ranging between 27.5 to 28.5°C (Garrison, 2008).

5. TAKE AUTHORIZATION REQUESTED

A Letter of Authorization (LOA) for the incidental taking (but not intentional taking) of small numbers of marine mammals is requested. It is understood that an LOA is applicable to activities that may cause mortality, injury, and harassment to marine mammal species. The subsequent analyses in this request will identify Level B noise harassment as the primary form of take; however, there is a slight potential, before any mitigations, that small numbers of marine mammals may be injured or killed due to the energy generated from an explosive source on the sea floor.

6. NUMBERS AND SPECIES TAKEN

Marine mammals potentially may be harassed due to noise from NEODS missions involving underwater detonations. The potential numbers and species taken by noise are assessed in this section. A NEODS mission has been described in Section 1. Three key sources of information are necessary for estimating potential noise effects on marine resources: (1) the number of distinct firing or test events; (2) the zone of influence (ZOI) for noise exposure; and (3) the density of animals that potentially reside within the zone of influence.

For the acoustic analysis, the exploding charge is characterized as a point source. The impact thresholds used for marine mammals relate to potential effects on hearing from underwater detonation noise. All marine mammals are protected under the MMPA. The same noise thresholds will also be applied to Endangered Species Act (ESA)-listed species of sea turtles. No ESA-listed marine mammals would be affected given the location of the Proposed Action in nearshore waters. The only ESA-listed marine mammal likely to be found in the northeastern Gulf of Mexico, the federal and state-listed endangered sperm whale, occurs farther out on the continental slope in water generally deeper than 600 meters. Manatees are not considered likely to occur in the mission areas (Figure 1-1) and are not considered in this analysis.

For the explosives in question, actual detonation depths would occur at 60 feet near the sand bottom. Potentially, the inert mines and sea floor may interact with the propagation of noise into the water. However, effects on the propagation of noise into the water column cannot be determined without in-water noise monitoring at the time of detonation. Potential exposure of a sensitive species to detonation noise could theoretically occur at the surface or at any number of depths with differing consequences. A conservative acoustic analysis was selected to ensure the greatest direct path for the harassment ranges and to give the greatest impact range for the injury thresholds.

Criteria and Thresholds for Impact of Noise on Protected Species

Criteria and thresholds that are the basis of the analysis of NEODS noise impacts to cetaceans were initially used in U.S. Navy Environmental Impact Statements for ship shock trials of the SEAWOLF submarine and the WINSTON S. CHURCHILL vessel (DoN, 1998; DoN, 2001) and adopted by the National Marine Fisheries Service (NMFS, 2001). Supplemental criteria and thresholds have been introduced in the Eglin Gulf Test and Training (EGTTR) Programmatic Environmental Assessment (U.S. Air Force, 2002), subsequent EGTTR LOA (U.S. Air Force,

2003) permit request, Precision Strike Weapons (PSW) LOA (U.S. Air Force, 2004), and Naval Surface Warfare Center Panama City Division LOA (U.S. Navy, 2008).

Metrics

Standard impulsive and acoustic metrics were used for the analysis of underwater pressure waves in this document.

- *Energy flux density (EFD)* is the time integral of the squared pressure divided by the impedance. EFD levels have units of dB re 1 $\mu Pa^2 \cdot s$.
- *1/3-Octave EFD* is the energy flux density in a 1/3-octave frequency band; the 1/3 octave selected is the hearing range at which the subject animals' hearing is believed to be most sensitive.
- Peak Pressure is the maximum positive pressure for an arrival of a sound pressure wave that a marine mammal would receive at some distance away from a detonation. Units used here are pounds per square inch (psi) and dB levels.

Criteria and Thresholds: Injury (Level A Harassment)

Non-lethal injurious impacts are defined in this document as eardrum rupture (i.e., tympanic-membrane (TM) rupture) and the onset of slight lung injury. These are considered indicative of the onset of injury. The threshold for TM rupture corresponds to a 50 percent rate of rupture (i.e., 50 percent of animals exposed to the level are expected to suffer TM rupture); this is stated in terms of an EFD value of 1.17 in-lb/in^2, which is about 205 dB re 1 $\mu Pa^2 \cdot s$. This recognizes that TM rupture is not necessarily a life-threatening injury, but is a useful index of possible injury that is well-correlated with measures of permanent hearing impairment (e.g., Ketten (1998) indicates a 30 percent incidence of permanent threshold shift (PTS) at the same threshold). 205 dB re 1 $\mu Pa^2 \cdot s$ has been requested by NOAA to calculate harassment distances for Level A Harassment (NMFS, 2008).

Criterion and Thresholds: Non-Injurious Impacts (Level B Harassment)

Public Law (PL) 108-136 (2004) amended the definition of Level B harassment under the MMPA for military readiness activities, such as this action (and also for scientific research on marine mammals conducted by or on the behalf of the federal government). For military readiness activities, Level B harassment is now defined as "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." Unlike Level A harassment, which is solely associated with physiological effects, both physiological and behavioral effects may cause Level B harassment.

NMFS (2008) requested a dual criterion be used to calculate Level B harassment. Since the mission (5 detonations over one or two days) does not meet multiple explosion criteria and the potential for significant alteration of behavior will not be expected for the short duration of noise produced from single detonations from NEODS missions, thresholds for behavioral effects to explosive sound will not be analyzed. The first criterion for non-injurious harassment is TTS,

which is defined as a temporary, recoverable loss of hearing sensitivity (NMFS, 2001; DON, 2001). The criterion for TTS is 182 dB re 1 μPa2-s. The potential for significant alteration of behavior described below will not be expected for the short, duration of noise produced from single detonations from NEODS tests.

The second criterion for estimating TTS threshold applies to all cetacean species and is stated in terms of peak pressure at 23 psi. The threshold is derived from the Churchill threshold which was subsequently adopted by NMFS in its Final Rule on the unintentional taking of marine animals incidental to the shock testing (NMFS, 2001). The original criteria in Churchill incorporated 12 psi. The current criteria and threshold for peak pressure over all exposures was updated from 12 psi to 23 psi for explosives less than 907 kg (2,000 lb) based on an IHA issued to the Air Force for a similar action (NOAA, 2006a). Peak pressure and energy scale at different rates with charge weight, so that ranges based on the peak-pressure threshold are much greater than those for the energy metric when charge weights are small, even when source and animal are away from the surface. In order to more accurately estimate TTS for smaller shots while preserving the safety feature provided by the peak pressure threshold, the peak pressure threshold is appropriately scaled for small shot detonations. This scaling is based on the similitude formulas (e.g., Urick, 1983) used in virtually all compliance documents for short ranges. Further, the peak-pressure threshold for marine mammal TTS for explosives offers a safety margin for source or animal near the ocean surface.

The more conservative isopleth of the criterion for estimating Level B harassment will be used in take analysis. Table 6-1 provides a summary of threshold criteria and metrics for potential noise impacts to sensitive species.

Table 6-1. Threshold Criteria and Metrics Utilized for Impact Analyses

Level A Harassment	Level B Harassment	
Injurious; eardrum rupture (for 50% of animals exposed)	Non-injurious; temporary threshold shift (TTS) (temporary hearing loss)	Non-injurious peak-pressure threshold for TTS
205 dB re 1 $\mu Pa^2 \cdot s$ EFD	182 dB re 1 $\mu Pa^2 \cdot s$ EFD* and/or 12 psi	23 psi

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

Risk Estimates

Methodology for Take Estimation

Noise ZOIs were calculated for bottom detonation scenarios at 60 feet for both lethality and harassment (Level A and Level B). To determine the number of potential "takes" or animals affected, cetacean population information from surveys was applied to the various ZOIs. The impact calculations for this section utilize marine mammal density estimates that have been derived from a Legacy funded NMFS/Air Force project (Garrison, 2008). The species density estimate data were adjusted to reflect the best available data and more realistic encounters of these animals in their natural environment (Garrison, 2008). These calculations and estimates are explained in detail in Section 3, and adjusted density estimates are provided in Table 3-1.

Given the variability in mission schedules (any time during the year), an overall average of bottlenose dolphin density of 0.81 individuals/km^2 is used for take analysis.

Table 6-2 gives the estimated impact ranges for the two explosive weights. The proposed test locations are 1 to 3 NM south of Santa Rosa Island. NEODS detonations were modeled for bottom detonations at 60 feet.

No behavioral impacts (176 dB re 1 $\mu Pa^2 \cdot s$) are anticipated with the NEODS test activities and are not considered in this analysis. Repetitive exposures (below TTS) to the same resident animals are highly unlikely due to the infrequent test events (no more than 5 detonations over a one or two day period), the potential variability in target locations, and the continuous movement of marine mammals in the northern Gulf.

Table 6-2. Zones of Influence for Underwater Explosions

Ordnance	NEW (lbs)	Depth of Explosion (m)	Ranges for EFDL > 205 dB (m)	Ranges for 182 dB EFDL in 1/3-Octave Band (m)	23 psi (m)
Summer					
NEODS MCM 5-lb charge	5	18	52.1	227.5	222
NEODS MCM 10-lb charge	10	18	77.0	385	280
Winter					
NEODS MCM 5-lb charge	5	18	52.2	229.8	222
NEODS MCM 10-lb charge	10	18	77.0	389	280

EFDL = Energy Flux Density Level

Applying the harassment ranges in Table 6-2 to the species densities of Table 3-1, the number of animals potentially occurring within the zones of influence was estimated. These results are presented in Tables 6-3 and 6-4. For Level B harassment calculations (Table 6-4), the ZOI corresponding to the 182 db re 1$\mu Pa^2 \cdot s$ metric is used because this radius is in all cases greater than the radius corresponding to 23 psi. The total number of animals potentially exposed annually is in bold. A whole animal (and potential take) is defined as 0.5 or greater, where calculation totals result in fractions of an animal. Where less than 0.5 animals are affected, no take is assumed. The calculations in Tables 6-3 and 6-4 are based on the expected tempo of: 1) 40 total detonations per year, 2) one-half of detonations are of 5-1b charges, and one-half are of 10-lb charges, and 3) 60 percent of detonations occur in summer, and 40 percent occur in winter.

Table 6-3. Marine Mammal Densities and Risk Estimates for Level A Harassment (205 dB EFD 1/3-Octave Band) Noise Exposure for Summer and Winter

Species	Density (animals/km2)	ZOI (km)		Number Of Animals Exposed To Level A Harassment	
		5-lb Charge	10-lb Charge	5-lb Charge	10-lb Charge
Summer					
Bottlenose Dolphin	0.78	0.0521	0.0770	0.08 (12 detonations)	0.17 (12 detonations)
Winter					
Bottlenose Dolphin	0.84	0.0522	0.0770	0.06 (8 detonations)	0.13 (8 detonations)
Total Number Animals Potentially Exposed To Level A Harassment Annually				**0.44**	

Table 6-4. Marine Mammal Densities and Risk Estimates for Level B Harassment (182 dB EFD 1/3-Octave Band) Noise Exposure

Species	Density (animals/km2)	ZOI (km)		Number Of Animals Exposed To Level B Harassment	
		5-lb Charge	10-lb Charge	5-lb Charge	10-lb Charge
Summer					
Bottlenose Dolphin	0.78	0.2275	0.385	1.52 (12 detonations)	4.36 (12 detonations)
Winter					
Bottlenose Dolphin	0.84	0.2298	0.389	1.11 (8 detonations)	3.19 (8 detonations)
Total Number Animals Potentially Exposed To Level B Harassment Annually				**10.18**	

Noise Effects Summary

The tables above indicate that the potential for non-injurious (Level B) harassment, as well as the onset of injury (Level A) harassment to cetaceans is possible but unlikely even without any mitigation measures. Wintertime ZOIs are generally slightly larger but do not significantly affect the numbers of animals potentially exposed to noise.

Less than 0.5 cetaceans are estimated to be exposed to a Level A Harassment (205 dB re 1 $\mu Pa^2 \cdot s$) zone of influence. Therefore, as discussed above, no potential Level A exposures are anticipated. Level B Harassment (182 dB re 1 $\mu Pa^2 \cdot s$) noise would potentially affect approximately ten cetaceans. None of the above impact estimates consider mitigation measures that will be employed by the proponent to minimize potential impacts to protected species. These mitigation measures are described in Section 11 and are anticipated to greatly reduce potential impacts to marine mammals.

7. IMPACTS TO MARINE MAMMAL SPECIES OR STOCKS

Based on the analyses and results provided in Section 6, no strategic marine mammal stocks would be affected, and none of the marine mammal species that could potentially be taken is listed as threatened or endangered. The PBR for each species is: bottlenose dolphin (45) and Atlantic spotted dolphin (23). No strategic marine mammal stocks would be affected.

8. IMPACT ON SUBSISTENCE USE

Potential impacts resulting from the Proposed Action will be limited to individuals of marine mammal species located in the Gulf of Mexico that have no subsistence requirements. Therefore, no impacts on the availability of species or stocks for subsistence use are considered.

9. IMPACTS TO MARINE MAMMAL HABITAT AND THE LIKELIHOOD OF RESTORATION

The primary source of marine mammal habitat impact is noise resulting from live NEODS missions. However, the noise does not constitute a long-term physical alteration of the water column or bottom topography, as the occurrences are of limited duration and are intermittent in time. Surface vessels associated with the missions are present in limited duration and are intermittent as well.

Other sources that may affect marine mammal habitat were considered and potentially include the introduction of fuel, debris, ordnance, and chemical residues into the water column. The effects of each of these components were considered in the NEODS BA and were determined to not likely adversely affect protected marine species. Marine mammal habitat would not be affected.

10. IMPACTS TO MARINE MAMMALS FROM LOSS OR MODIFICATION OF HABITAT

Based on the discussions in Section 9, marine mammal habitat will not be lost or modified.

11. MEANS OF AFFECTING THE LEAST PRACTICABLE ADVERSE IMPACTS

The potential takes outlined in Section 6 represent the maximum expected number of animals that could be exposed to noise. None of the above impact estimates take into consideration measures that will be employed by the Proponent primarily to ensure the safety of test participants and non-participants alike, and secondly, to minimize impacts to protected species. The NEODS has employed a number of mitigation measures, which are discussed below, in an

effort to substantially decrease the number of animals potentially affected. Eglin AFB is committed to assessing the mission activity for opportunities to provide operational mitigations while potentially sacrificing some mission flexibility.

Impact Minimization Measures and Proposed Management Practices

Prior to the mission, a trained observer aboard the largest surface support vessel will survey (visually monitor) the test area for the presence of sea turtles and cetaceans. The area to be surveyed will be 230 meters (~ 0.15 NM) every direction from the target, which is approximately the size of the largest harassment ZOI. The trained observer will conduct ship-based monitoring for non-participating vessels as well as protected species. Surface observation would be effective out to several kilometers.

Weather that supports the ability to sight small marine life (e.g., sea turtles) is required in order to mitigate the test site effectively (DoN, 1998). Wind, visibility, and surface conditions of the Gulf of Mexico are the most critical factors affecting mitigation operations. Higher winds typically increase wave height and create "white cap" conditions, limiting an observer's ability to locate surfacing marine mammals and sea turtles. NEODS missions would be delayed if the sea state were greater than the Scale Number 3 described on Table 11-1 below. Such a delay would maximize detection of marine mammals and sea turtles.

Table 11-1. Sea State Scale for Marine Mammal and Sea Turtle Observation

Scale Number	Sea Conditions
0	Flat calm, no waves or ripples
1	Small wavelets, few if any whitecaps
2	Whitecaps on 0-33% of surface; 0.3 to 0.6 m (1 to 2 feet) waves
3	Whitecaps on 33-50% of surface; 0.6 to 0.9 m (2 to 3 feet) waves
4	Whitecaps on greater than 50% of surface; greater than 0.9 m (3 feet) waves

Shipboard Monitoring Team

Shipboard monitoring would be staged from the highest point possible on a support ship. The trained marine observer will be experienced in shipboard surveys and be familiar with the marine life of the area. The observer on the vessel must be equipped with optical equipment with sufficient magnification (e.g., binoculars, as these have been successfully used in monitoring activities from ships), which should allow the observer to sight surfacing mammals from a significant distance past the safety zone of 230 meters. The trained observer would be responsible for reporting sighting locations, which would be based on bearing and distance.

The trained observer will have proper lines of communication to avoid communication deficiencies to make Go/No-Go recommendations for the detonations. The observer recommends the Go/No-Go decision to the Officer in Tactical Command, who makes the final Go/No-Go decision.

Mitigation Procedures Plan

Stepwise mitigation procedures for NEODS missions are outlined below. All zones (TTS, injury, and safety zones) are monitored, plus a buffer area that is twice the size of the largest ZOI (460 meters or 0.25 nautical miles).

Pre-mission Monitoring: The purposes of pre-mission monitoring are to (1) evaluate the test site for environmental suitability of the mission (e.g., relatively low numbers of marine mammals and turtles, few or no patches of *Sargassum*, etc.) and (2) verify that the ZOI is free of visually detectable marine mammals, sea turtles, large schools of fish, large flocks of birds, large *Sargassum* mats, and large concentrations of jellyfish (both are possible indicators of turtle presence). On the morning of the test, the Officer in Tactical Command would confirm that the test sites can still support the mission and that the weather is adequate to support mitigation.

(a) Two Hours Prior to Mission

Approximately two hours prior to the mission, or at daybreak, the appropriate vessel(s) would be on-site near the location of the earliest planned detonation point. Observers onboard the vessels and the trained marine observer would assess the suitability of the test site, based on visual observation of marine mammals and sea turtles, the presence of large *Sargassum* mats, and overall environmental conditions (visibility, sea state, etc.). This information would be relayed to the Officer in Tactical Command.

(b) One Hour Prior to Mission

One hour prior to the mission, monitoring would commence within the test site to evaluate the test site for environmental suitability. The observer would monitor the area around the detonation site, out to 0.25 NM from the site, and record in a database all marine mammals and sea turtle sightings, including the time of each sighting.

(c) Five Minutes Prior to Mission

Visual monitoring would continue to document any protected animals seen inside the ZOI and farther out to 0.25 NM. If a marine mammal is traveling toward the test area, the time and distance can be calculated to determine if it will enter the test area during detonation.

(d) Go/No-Go Decision Process

The observer would plot and record sightings and bearing for all marine animals detected. This would depict animal sightings relative to the mission area. The observer would have the authority to declare the range fouled and recommend a hold until monitoring indicates that the test area is and will remain clear of detectable marine mammals or sea turtles.

(e) Throughout the Mission

Monitoring of the test area will continue until the last detonation is complete. If any change in the status of the test area is observed or a protected marine mammal is sighted, the mission will be postponed until the area can be certified clear of protected marine mammals.

The mission would be postponed if:

1. Any marine mammal or sea turtle is visually detected within the ZOI. The delay would continue until the marine mammal or sea turtle that caused the postponement is confirmed to be outside of the ZOI due to the animal swimming out of the range.
2. Any marine mammal or sea turtle is detected in the ZOI (230 meter radius) and subsequently cannot be reacquired. The mission would not continue until the last verified location is outside of the ZOI and the animal is moving away from the mission area.
3. Large *Sargassum* rafts or large concentrations of jellyfish are observed within the ZOI. The delay would continue until the *Sargassum* rafts or jellyfish that caused the postponement are confirmed to be outside of the ZOI either due to the current and/or wind moving them out of the mission area.
4. Large schools of fish are observed in the water within 230 meters of the mission area. The delay would continue until the large fish schools are confirmed to be outside the ZOI.

In the event of a postponement, pre-mission monitoring would continue as long as weather and daylight hours allow. If a charge failed to explode, operations would attempt to recognize and solve the problem while continuing with all mitigation measures in place. The probability of this occurring is very remote but the possibility still exits. Should a charge fail to explode, the Proponent would attempt to identify the problem and detonate the charge with all marine mammal and sea turtle mitigation measures in place as described.

Post-mission monitoring: Post-mission monitoring is designed to determine the effectiveness of pre-mission mitigation by reporting any sightings of dead or injured marine mammals or sea turtles. Post-detonation monitoring would commence immediately following each detonation and would be concentrated on the area down current of the test site.

Marine mammals or sea turtles killed by an explosion would likely suffer lung rupture, which would cause them to float to the surface immediately due to air in the blood stream. Animals that were not killed instantly but were mortally wounded would likely resurface within a few days, though this would depend on the size and type of animal, fat stores, depth, and water temperature (DoN, 2001). The monitoring team would attempt to document any marine mammals or turtles that were killed or injured as a result of the test and, if practicable, recover and examine any dead animals. The species, number, location, and behavior of any animals observed by the observation teams would be documented and reported to the Officer in Tactical Command.

The NMFS maintains stranding networks along coasts to collect and circulate information about marine mammal and sea turtle standings. Local coordinators report stranding data to state and regional coordinators. Any observed dead or injured marine mammal or sea turtle would be reported to the appropriate coordinator.

Summary of Mitigation Plan

In the event either any human safety concerns arise or protected species are sighted within the ZOI, the test will be postponed. The area to be surveyed will be 0.15 NM in every direction from the target (approximately the size of the largest harassment ZOI.). Additionally, a buffer area (0.25 NM) will be surveyed for protected marine animals moving toward the ZOI. The total area to be monitored is 0.2 NM^2. The survey vessel will leave the safety footprint immediately prior to detonation; however, given the relatively small impact area, visual observation of the ZOI will be ongoing.

Avoidance of impacts to schools of cetaceans will most likely be realized through visual monitoring since groups of dolphins are relatively easy to spot with the survey distances and methods that will be employed. Typically, solitary marine animals such as sea turtles, while more challenging to detect, will also be afforded substantial protection through pre-mission monitoring.

Post-mission monitoring would be conducted after each mission and would attempt to document any marine mammals or turtles that were killed or injured as a result of the test and, if practicable, recover and examine any dead animals. Post-mission monitoring activities may include coordination with marine animal stranding networks if any dead or injured marine mammal or sea turtles are observed.

Hardbottom habitats and artificial reefs would be avoided to alleviate any potential impacts to protected habitat. NEODS testing would be delayed if large *Sargassum* mats or large schools of fish or jellyfish were found in the ZOI. Testing would resume only when the mats or schools move outside of the largest ZOI. The NEODS personnel will recover all debris from the targets and charges following test activities.

12. MINIMIZATION OF ADVERSE EFFECTS ON SUBSISTENCE USE

Based on the discussions in Section 8, there are no impacts on the availability of species or stocks for subsistence use.

13. MONITORING AND REPORTING MEASURES

Mitigations may include any supplemental activities that are designed, proposed, and exercised to help reduce or eliminate the potential impacts to the marine resources. The Air Force recognizes the importance of such "in-place" mitigations and is aware that NMFS recommends an approved mitigation plan that outlines the scope and effectiveness of the Proposed Action's mitigations.

The risk of harassment (Levels A & B) to marine mammals has been determined to be relatively small (Section 6). Eglin AFB has determined that with the implementation and commitment to utilizing the "visual monitoring" mitigations (Section 11), potential takes are greatly reduced.

For NEODS testing, areas to be used in missions are visually monitored for marine mammal presence from a surface vessel prior to detonation of mine neutralization charges. Monitoring would be conducted before missions to clear marine mammals and sea turtles within the ZOI. If protected animals are inside the ZOI, firing would be postponed until they left the area. The following procedures may be feasible during the mission activities using the operational aircraft.

- Conduct survey clearance procedures using best operational methods possible.
- Clear ZOI and avoid all protected species and *Sargassum* rafts to the maximum extent possible.
- Reconduct clearance procedures if dolphins, turtles, or *Sargassum* rafts are encountered.
- Conduct post-mission observation and report operations data as required by Eglin's Natural Resources Section, 96 CEG/CEVSN.
- Submit an annual summary (coordinated through 96 CEG/CEVSN) of mission observations to:

National Marine Fisheries Service
Southeast Regional Office (SERO)
Protected Resources Division
9721 Executive Center Drive North
St. Petersburg, FL 33702

14. RESEARCH

Although Eglin AFB does not currently conduct independent Air Force monitoring efforts, Eglin's Natural Resources Section does participate in marine animal tagging and monitoring programs lead by other agencies. Additionally, the Natural Resources Section also supports participation in annual surveys of marine mammals in the Gulf of Mexico with NOAA Fisheries. From 1999 to 2002, Eglin's Natural Resources Section, through a contract representative, participated in summer cetacean monitoring and research opportunities. The contractor participated in visual surveys in 1999 for cetaceans in Gulf of Mexico, photographic identification of sperm whales in the northeastern Gulf in 2001, and as a visual observer during the 2000 Sperm Whale Pilot Study and the 2002 sperm whale Satellite-tag (S-tag) cruise. Support for these research efforts is anticipated to continue. In addition, Eglin's Natural Resources Section has obtained Department of Defense funding for two marine mammal habitat modeling projects. The latest such project (2008) included funding and extensive involvement of NOAA Fisheries personnel so that the most recent aerial survey data could be utilized for habitat modeling and animal density estimates in the northeastern Gulf of Mexico.

Eglin AFB conducts other research efforts that utilize marine mammal stranding information as a means of ascertaining the effectiveness of mitigation techniques. Stranding data is collected and maintained for the Florida panhandle and Gulf-wide areas. This is undertaken through the establishment and maintenance of contacts with local, state, and regional stranding networks.

Eglin AFB assists with stranding data collection by maintaining its own team of stranding personnel. In addition to simply collecting stranding data, various analyses are performed. Stranding events are tracked by year, season, and NMFS statistical zone, both Gulf-wide and on the coastline in proximity to Eglin AFB. Stranding data is combined with records of EGTTR mission activity in each water range and analyzed for any possible correlation. In addition to being used as a measure of the effectiveness of mission mitigations, stranding data can yield insight into the species composition of cetaceans in the region.

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