BILLING CODE 3510-22-P

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

RIN 0648-XF800

Takes of Marine Mammals Incidental to Specified Activities; Taking Marine Mammals Incidental to Confined Blasting Operations in the East Channel by the U.S. Army Corps of Engineers During the Tampa Harbor Big Bend Channel Expansion Project in Tampa Harbor, Tampa, Florida

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

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

SUMMARY: NMFS has received a request from the U.S. Army Corps of Engineers, Jacksonville District, (USACE) for authorization to take marine mammals incidental to confined blasting in the East Channel of the Big Bend Channel in Tampa Harbor, Tampa, Florida. Pursuant to the Marine Mammal Protection Act (MMPA), NMFS is requesting comments on its proposal to issue an incidental harassment authorization (IHA) to incidentally take marine mammals during the specified activities. NMFS will consider public comments prior to making any final decision on the issuance of the requested MMPA authorizations and agency responses will be summarized in the final notice of our decision.

DATES: Comments and information must be received no later than [*insert date 30 days after date of publication in the FEDERAL REGISTER*].

ADDRESSES: Comments should be addressed to Jolie Harrison, Chief, Permits and Conservation Division, Office of Protected Resources, National Marine Fisheries Service. Physical comments should be sent to 1315 East-West Highway, Silver Spring, MD 20910 and electronic comments should be sent to *ITP.Youngkin@noaa.gov*.

Instructions: NMFS is not responsible for comments sent by any other method, to any other address or individual, or received after the end of the comment period. Comments received electronically, including all attachments, must not exceed a 25-megabyte file size. Attachments to electronic comments will be accepted in Microsoft Word or Excel or Adobe PDF file formats only. All comments received are a part of the public record and will generally be posted online at *www.fisheries.noaa.gov/national/marine-mammal-protection/incidental-take-authorizations-construction-activities* without change. All personal identifying information (*e.g.*, name, address) voluntarily submitted by the commenter may be publicly accessible. Do not submit confidential business information or otherwise sensitive or protected information.

FOR FURTHER INFORMATION CONTACT: Dale Youngkin, Office of Protected Resources, NMFS, (301) 427-8401. Electronic copies of the application and supporting documents, as well as a list of the references cited in this document, may be obtained online at: *www.fisheries.noaa.gov/national/marine-mammal-protection/incidental-take-authorizations-construction-activities*. In case of problems accessing these documents, please call the contact listed above.

SUPPLEMENTARY INFORMATION:

Background

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

An authorization for incidental takings shall be granted if NMFS finds that the taking will have a negligible impact on the species or stock(s), will not have an unmitigable adverse impact on the availability of the species or stock(s) for subsistence uses (where relevant), and if the permissible methods of taking and requirements pertaining to the mitigation, monitoring and reporting of such takings are set forth.

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

The MMPA states that the term "take" means to harass, hunt, capture, kill or attempt to harass, hunt, capture, or kill any marine mammal. 16 U.S.C. 1362(13).

Except with respect to certain activities not pertinent here, the MMPA defines "harassment" as any act of pursuit, torment, or annoyance which (i) has the potential to injure a marine mammal or marine mammal stock in the wild (Level A harassment); or

(ii) has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering (Level B harassment). 16 U.S.C. 1362(18)(A).

National Environmental Policy Act

To comply with the National Environmental Policy Act of 1969 (NEPA; 42 U.S.C. 4321 *et seq.*) and NOAA Administrative Order (NAO) 216-6A, NMFS must review our proposed action (*i.e.*, the issuance of an incidental harassment authorization) with respect to potential impacts on the human environment.

Accordingly, NMFS plans to adopt the USACE's Supplemental Environmental Assessment (EA) (August, 2017), provided our independent evaluation of the document finds that it includes adequate information analyzing the effects on the human environment of issuing the IHA. The USACE's Supplemental EA and Finding of No Significant Impact (FONSI) is available at http://www.saj.usace.army.mil/About/DivisionsOffices/Planning/EnvironmentalBranch/Environ

mentalDocuments.aspx#Hillsborough, and is also available for review on our website at http://www.nmfs.noaa.gov/pr/permits/incidental/construction.htm.

We will review all comments submitted in response to this notice prior to concluding our NEPA process or making a final decision on the IHA request.

Summary of Request

On August 8, 2017, NMFS received a request from USACE for an IHA to take marine mammals incidental to confined blasting within the East Channel of the Tampa

Harbor Big Bend Channel Expansion Project in Tampa, Florida. USACE's request is for take of a small number of the Tampa Bay stock of bottlenose dolphins (*Tursiops truncatus*) by Level B harassment only. Neither USACE nor NMFS expect mortality to result from this activity and, therefore, an IHA is appropriate.

NMFS previously issued an IHA to USACE for similar work in the Miami Harbor (77 FR 49278, August 15, 2012). However, ultimately, USACE did not perform any confined blasting under that IHA. Prior to that, NMFS issued an IHA to the USACE for similar work in the Miami Harbor Phase II Project in 2005 (70 FR 21174, April 25, 2005) and 2003 (68 FR 32016, May 29, 2003).

Description of Proposed Activity

Overview

The proposed Tampa Harbor Big Bend Channel Expansion Project is located within Hillsborough Bay (part of Tampa Bay), Hillsborough County, Florida. The five major features of the entire project include the following (refer to Figure 2 of the application), but only confined underwater blasting associated with Feature 5 is covered in USACE's IHA application.

- Feature 1 of the project will deepen the project depths of the existing Entrance Channel, Turning Basin, East Channel and Inner Channel from 10.36 meters (m) (34 feet (ft)) to 14 m (46 ft).
- Feature 2 of the project will widen the north side of the Entrance Channel by 15.2 m (50 ft), from 61 m (200 ft) to 76.2 m (250 ft) and deepen it from 10.36 m (34 feet) to 14 m (46 feet).

- Feature 3 of the project will widen the Turning Basin approximately 57.9 m(190 ft) to the southwest to provide a 365.8 m (1,200 ft) turning radius and deepen it from 10.36 m (34 ft) to 14 m (46 ft).
- Feature 4 of the project will add a widener at the southeast corner of the intersection of the Turning Basin and East Channel and deepen it from 10.36 m (34 ft) to 14 m (46 ft).
- Feature 5 of the project will deepen local service facilities (non- federal berthing areas) located north, south, and east of the East Channel and at the south end of the Inner Channel from 10.36 m (34 ft) to 14 m (46 ft).

The USACE IHA application is for work associated with Feature 5 of the project, and would involve possible use of confined underwater blasting (placement of an explosive charge into pre-drilled holes approximately 1.5 – 3 m deep and capping the hole with inert materials such as crushed rock in order to break up rock substrate along the bottom) to deepen the project's East Channel. To deepen the Big Bend Channel portion of the Tampa Harbor Federal Navigation Project from 10.36 m (34 ft) to 14 m (46 ft), confined underwater blasting may be necessary to pretreat rock areas within the East Channel, where dredging or other rock removal methods are unsuccessful due to the hardness and massiveness of the rock. Sound and pressure associated with this underwater blasting has the potential to incidentally take marine mammals. The existing East Channel is a man-made channel with a history of maintenance dredging and is approximately 1,450 m (4,757 ft) long and 185 m (607 ft) wide at its widest location. Confined underwater blasting is not proposed within the Entrance Channel, Turning Basin, or Inner Channel, or any project area other than the East Channel.

Dates and Duration

Once a contractor has been selected, a specific blasting plan will be prepared that will specify the charge weights and blasting patterns to be used. However, in accordance with the USACE's Endangered Species Act Section 7 consultation with the U.S. Fish and Wildlife Service (USFWS), confined underwater blasting operations or rock pre-treatment will only be conducted during the months of April through October (tentatively scheduled April 1, 2019 through September 30, 2019) in order to avoid take of the West Indian Manatee (*Trichecus manatus*). The exact duration of blasting will be dependent upon a number of factors including hardness of rock, how close the drill holes are placed in relation to each other, and the type of dredging equipment that will be used to remove the pretreated rock. However, certain restrictions shall be imposed on all blasting operations.

In addition to the blasting window being limited to occur from April through October, the contractor shall not exceed a total of 42 blast events. A blast event may include the detonation of a blast pattern with up to 40 individual charges. If multiple blast events are performed in one day, then the blast events shall be separated by an estimated minimum six hours. When blasting operations are conducted, they will take place 24-hours a day, typically six days a week. The contractor may drill the blast pattern at night and then blast after at least two hours after sunrise (one hour plus one hour of monitoring). After detonation of the first pattern, a second pattern may be drilled and detonated under the following circumstances: (1) it is not less than one hour before sunset, and (2) at least six hours have passed since the previous detonation. Blasting activities normally will not take place on Sundays due to local ordinances.

Specific Geographic Region

The proposed confined underwater blasting activities would be performed only within the East Channel of the Tampa Harbor Big Bend Channel Expansion Project located within Hillsborough Bay (part of Tampa Bay), Hillsborough County, Florida (refer to Figures 1 and 2 of the application). Coordinates for the approximate center of the East Channel are 27° 48' 25.93" N and 82° 24' 24.21" W.

Detailed Description of Specific Activity

The East Channel of Tampa Harbor Big Bend Channel will be deepened by pre-treating the limestone foundation along the bottom of the Channel utilizing confined blasting (the shots will be "confined" within the rock), and after blasting the material will be removed by dredge. As described above, explosive charges will be placed within holes drilled into the limestone. Blast holes will be small in diameter, typically 5–10 centimeters (cm) (2–4 inches (in)), and 1.5–3 m (5–10 ft) deep. Drilling activities will take place for a short duration, with no more than three holes being drilled at the same time. Due to the equipment used and the short duration of the drilling activity, drilling is not anticipated to have the potential to result in take of marine mammals.

Typically, each blast pattern is set up in a square or rectangular area divided into rows and columns, although some blast patterns may consist of a single line (for use near bulkheads, for example). The proposed project will use a maximum of 40 charges per pattern. In confined blasting, each charge is placed in a pre-drilled hole and the hole is then capped with an inert material (known as "stemming the hole"). Studies have shown that stemmed blasts have up to a 60–90 percent decrease in the strength of the pressure released compared to open water blasts of the same charge weight (Nedwell and

Thandavamoorthy, 1992; Hempen *et al.*, 2005; Hempen *et al.*, 2007). However, unlike open water blasts, very little peer-reviewed research exists on the effects on marine animals near a stemmed blast.

A delay is defined as a distinct pause of predetermined time between detonation or initiation impulses to permit the firing of explosive charges separately. Delay blasting is the practice of initiating individual explosive decks, boreholes, or rows of boreholes at predetermined time intervals using delay detonators, as compared to instantaneous blasting where all holes are fired essentially simultaneously. To estimate the maximum poundage of explosives that may be utilized for this project, the USACE has reviewed previous blasting projects that were conducted in San Juan Harbor, Puerto Rico in 2000 and Miami Harbor, Florida in 2005. The San Juan Harbor project's heaviest confined blast was 170.1 kilograms (kg) (375 lbs) per delay and in Miami Harbor it was 60.8 kg (134 lbs) per delay. However, based on discussions with the USACE geotechnical engineers, the blasting energy required to break up rock in the East Channel of the Tampa Harbor Big Bend project will be reduced in effort to minimize impacts to the environment and obtain some fracturing of the rock to aid removal. Therefore, the maximum weight of delays will not exceed 18.1 kg (40 lbs) for this project. Therefore, the proposed project will use a maximum charge weight of 725.7 kg (1,600 lbs) as a conservatively high estimate for the total amount of explosives that may be used in the largest blasting pattern (40 charges of 18.1 kg (40 lbs) each).

The following industry standards and USACE Safety and Health Regulations will be implemented:

- The weight of explosives to be used in each blast event will be limited to the lowest kg (not to exceed 18.1 kg (40 lbs)/delay) of explosives that can adequately break the rock.
- Drill patterns shall be restricted to a minimum of 2.4 m (8 ft) separation from a loaded hole.
- Hours of blasting are restricted to two hours after sunrise until one hour before sunset to allow for adequate observation of the project area for protected species. Blasting hours will also be restricted to periods of good weather (no blasting will commence in rain, fog, or otherwise poor weather conditions, and can only commence when the entire Level B harassment zone is visible to observers).
- Selection of explosive products and their practical application method must address vibration and overpressure control for protection of existing structures and marine wildlife.
- Loaded blast holes will be individually delayed such that larger blasts are broken into smaller blasts with a time break between them that will be determined by the contractor. Loaded blast holes will be individually delayed to reduce the maximum kilograms/pounds per blast event (which will reduce the radius at which marine mammals may be injured or killed).
- The blast design will consider matching the energy in the "work effort" of the borehole to the rock mass or target for minimizing excess energy vented into the water column or hydraulic shock.

- Delay timing adjustments between delay detonations to stagger the blast pressures and prevent cumulative addition of pressures in the water will be determined by the contractor, and will be in compliance with USACE regulations.

Prior to implementing a blasting program, a test blast program will be completed. The test blast program will have all the same protection measures in place for protected species as blasting for construction purposes. The purpose of the text blast program is to demonstrate and/or confirm the following:

- Drill boat capabilities and production rates;
- Ideal drill pattern for typical boreholes;
- Acceptable rock breakage for excavation;
- Tolerable vibration level emitted;
- Directional vibration;
- Calibration of the environment; and
- Sound parameters of the blasting by variables of the test blasting and production blasting.

The test blast program will begin with a single row of individually delayed holes and progress up to the maximum production blast intended for use. The test blast program will take place in the project area and will count toward the pre-treatment of material, so it will be included in the 42-total-blast-events limit. Each test blast is designed to establish the limits of vibration and overpressure, with acceptable rock breakage for excavation. The final test blast event simulates the maximum explosive detonation as to size, overlying water depth, charge configuration, charge separation, initiation methods, and loading conditions anticipated for the typical production blast.

The results of the test blast program will be the basis for developing a completely engineered procedure for the construction blasting plan. Specifically, the test blast program will be used to determine the following:

- Distance between individual charges (minimum 2.4 m (8 ft) requirement);
- Kilograms/pounds per delay (not to exceed 18.1 kg (40 lbs) per delay);
- Peak particle velocities (threshold limit value (TLV));
- Frequencies (TLV);
- Peak vector sum; and
- Overpressure.

Proposed mitigation, monitoring, and reporting measures are described in detail later in this document (please see "Proposed Mitigation" and "Proposed Monitoring and Reporting.")

Description of Marine Mammals in the Area of Specified Activities

Sections 3 and 4 of the USACE IHA application summarize available information regarding status and trends, distribution and habitat preferences, and behavior and life history, of the potentially affected species. Additional information regarding population trends and threats may be found in NMFS's Stock Assessment Reports (SAR; *www.nmfs.noaa.gov/pr/sars/*) and more general information about these species (*e.g.*, physical and behavioral descriptions) may be found on NMFS's website (*www.nmfs.noaa.gov/pr/species/mammals/*).

Table 1 lists all species with known or potential for occurrence in the project area and offshore of the west central Florida coastline, and summarizes information related to the population or stock, including regulatory status under the MMPA and ESA and

potential biological removal (PBR), where known. For taxonomy, we follow Committee on Taxonomy (2016). PBR is defined by the MMPA as the maximum number of animals, not including natural mortalities, that may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population (as described in NMFS's SARs). While no mortality is anticipated or authorized here, PBR and annual serious injury and mortality from anthropogenic sources are included here as gross indicators of the status of the species and other threats.

Table 1. Marine Mammals with Potential Occurrence in the Project Area.

Species	Habitat	Occurrence in Project Area	Stock Population Estimate[1]	ESA status[2]	MMPA status[3]	PBR
Humpback whale (*Megaptera novaengliae*)	Pelagic, nearshore waters and banks	Rare	823 – Gulf of Maine Stock	NL	NC	13
Minke whale (*Balaenoptera acutorostrata*)	Coastal, offshore	Rare	2,591 – Canadian East Coast Stock	NL	NC	14
Bryde's whale (*Balaenoptera brydei*)	Pelagic and coastal	Rare	33 – Northern Gulf of Mexico Stock	NL	S	0.03
Sei whale (*Balaenoptera borealis*)	Primarily offshore, pelagic	Rare	357 – Nova Scotia Stock	EN	S	0.5
Fin whale (*Balaenoptera physalus*)	Slope, mostly pelagic	Rare	1,618 – Western North Atlantic Stock	EN	S	2.5
Blue whale (*Balaenoptera musculus*)	Pelagic and coastal	Rare	440 – Western North Atlantic Stock	EN	S	0.9
Sperm whale	Pelagic,	Rare	763 –	EN	S	1.1

(*Physeter macrcephalus*)	deep seas		Northern Gulf of Mexico Stock			
Dwarf sperm whale (Kogia sima)	Offshore, pelagic	Rare	186 – Northern Gulf of Mexico Stock	NL	NC	0.9
Gervais' beaked whale (*Mesoplodon europaeus*)	Pelagic, slope and canyons	Rare	149 – Northern Gulf of Mexico Stock	NL	NC	0.8
Sowerby's beaked whale (*Mesoplodon bidens*)	Pelagic, slope and canyons	Rare	7,092 – Western North Atlantic Stock	NL	NC	0.8
Blainville's beaked whale (*Mesoplodon densirostris*)	Pelagic, slope and canyons	Rare	149 - Northern Gulf of Mexico Stock	NL	NC	0.8
Cuvier's beaked whale (*Ziphius cavirostris*)	Pelagic, slope and canyons	Rare	74 – Northern Gulf of Mexico Stock	NL	NC	0.4
Killer whale (*Orcinus orca*)	Widely distributed	Rare	28 – Northern Gulf of Mexico Stock	NL	NC	0.1
Short-finned pilot whale (*Globicephala macrorhynchus*)	Inshore and offshore	Rare	2,415 – Northern Gulf of Mexico Stock	NL	NC	15
False killer whale (*Pseudorca crassidens*)	Pelagic	Rare	NA – Northern Gulf of Mexico Stock	NL	NC	unknown
Melon-headed whale	Pelagic	Rare	2,335 – Northern	NL	NC	13

(*Peponocephala electra*)			Gulf of Mexico Stock			
Pygmy killer whale (*Feresa attenuata*)	Pelagic	Rare	152 – Northern Gulf of Mexico Stock	NL	NC	0.8
Risso's dolphin (*Grampus griseus*)	Pelagic, shelf	Rare	2,442 – Northern Gulf of Mexico Stock	NL	NC	16
Common bottlenose dolphin (*Tursiops truncatus*)	Offshore, inshore, coastal, and estuaries	Common	564 – Tampa Bay Stock[4]	NL	S	Unknown
Rough-toothed dolphin (*Steno bredanensis*)	Pelagic	Rare	624 – Northern Gulf of Mexico Stock	NL	NC	3
Fraser's dolphin (*Lagenodelphis hosei*)	Shelf and slope	Rare	NA – Northern Gulf of Mexico Stock	NL	NC	unknown
Striped dolphin (*Stenella coeruleoalba*)	Coastal, shelf and slope	Rare	1,849 - Northern Gulf of Mexico Stock	NL	NC	10
Pantropical spotted dolphin (*Stenella attenuata*)	Coastal, shelf and slope	Uncommon	50,880 – Northern Gulf of Mexico Stock	NL	NC	407
Atlantic spotted dolphin (*Stenella frontalis*)	Coastal to pelagic	Uncommon	NA – Northern Gulf of Mexico Stock	NL	NC	unknown
Spinner dolphin (*Stenella longirostris*)	Mostly pelagic	Uncommon	11,441 – Northern Gulf of	NL	NC	62

			Mexico Stock			
Clymene dolphin (*Stenella clymene*)	Coastal, shelf and slope	Uncommon	129 – Northern Gulf of Mexico Stock	NL	NC	0.6
West Indian manatee (Florida manatee) (*Trichechus manatus latirostris*)	Coastal, rivers, and estuaries	Uncommon	6,620 – Florida Stock[5]	T	D	

[1] – NMFS Marine Mammal Stock Assessment Reports (Hayes *et al.*, 2016) unless indicated otherwise

[2] – U.S. Endangered Species Act: EN = endangered; T = threatened; NL = not listed

[3] – U.S. Marine Mammal Protection Act: D = depleted; S = strategic; NC = not classified

[4] – Wells *et al.*, 1995

[5] – Florida Fish and Wildlife Conservation Commission Survey Data (USFWS jurisdiction)

Marine mammal abundance estimates presented in this document represent the total number of individuals that make up a given stock or the total number estimated within a particular study or survey area. NMFS's stock abundance estimates for most species represent the total estimate of individuals within the geographic area, if known, that comprises that stock. For some species, this geographic area may extend beyond U.S. waters. All values presented in Table 1 are the most recent available at the time of publication and are available in the 2016 Atlantic SAR (Hayes *et al.*, 2016) with the exception of common bottlenose dolphin and the Florida manatee. The Florida manatee is not a species under NMFS jurisdiction, so is not included in the SAR. The abundance estimate from Wells *et al.* (1995) was used for bottlenose dolphins since abundance information is not provided for the Tampa Bay stock in the 2016 SAR.

For Tampa Bay, Urian *et al.* (2009) described five discrete communities of common bottlenose dolphins (including the adjacent Sarasota Bay community) that

differed in their social interactions and ranging patterns. Structure was found despite a lack of physiological barriers to movement within this large, open embayment. The authors further suggested that fine-scale structure may be a common element among bottlenose dolphins in the southeastern UNITED STATES and recommended that management should account for fine-scale structure that exists within current stock designations. NMFS is in process of writing individual SARs for each of the 31 bay, sound, and estuary (BSE) stocks of common bottlenose dolphins. Until this effort is complete, Wells *et al.* (1995) provides the best available information regarding the abundance of the Tampa Bay stock of common bottlenose dolphins.

All species under NMFS' jurisdiction that could potentially occur in the proposed survey areas are included in Table 1. However, the temporal and/or spatial occurrence of all species except for common bottlenose dolphins is such that take is not expected to occur, and they are not discussed further beyond the explanation provided here. The confined blasting portion of the project is located within the East Channel of the Big Bend Channel in Tampa Harbor. Although marine mammal species other than common bottlenose dolphins may transit through the area offshore of Tampa Harbor, they are not anticipated to occur within the proposed project area.

In addition to the species under NMFS jurisdiction that may be found in waters off the west central Florida coast, the Florida manatee (managed by USFWS) may also occur in the proposed project area. The USACE has coordinated with the USFWS for avoidance of take for this species. Therefore, the Florida manatee is not considered further in this document.

The status of the common bottlenose dolphin stock in the project area relative to optimum sustainable population is unknown. This species is not listed as threatened or endangered under the Endangered Species Act (ESA). However, the occurrence of 13 Unusual Mortality Events (UME) among this species in the northern Gulf of Mexico coast since 1990 (Litz, *et al.*, 2014) is cause for concern and the effects of the UMEs on stock abundance have not yet been determined for the Gulf of Mexico stocks, including the Tampa Bay stock (in part due to the fact that it has not been possible to assign mortalities to specific stocks because there is a lack of information on stock identification). NMFS considers each of the Gulf of Mexico stocks (including the Tampa Bay stock) to be strategic because most of the stock sizes are currently unknown, but likely small and relatively few mortalities and serious injuries may exceed PBR.

Past studies have documented year-round residency of individual bottlenose dolphins in estuarine waters (Irvine *et al*., 1981; Shane, 1977; and Gruber, 1981). As a result, the expectation of year-round resident populations was extended to BSE waters across the norther Gulf of Mexico. Since these early studies, long-term residency has been reported from nearly every site where photographic identification or tagging studies have been conducted in the Gulf of Mexico, including documentation of long-term residency in Tampa Bay (Wells, 1986; Wells *et al.*, 1996; Urian *et al.*, 2009).

In many cases, residents occur primarily in BSE waters with limited movements through passes to the Gulf of Mexico (Shane, 1977 and 1990; Gruber, 1981; Irvine *et al.*, 1981; Maze and Wursig, 1999; Lynn and Wursig, 2002; Fazioli *et al.*, 2006). However, in some areas, year-round residents may co-occur with nonresident dolphins and mixing of inshore residents and non-residents has been documented in several places (Maze and

Wursig, 1999; Quintana-Rizzo and Wells, 2001; and Shane, 2004). Non-residents exhibit a variety of movement patterns, ranging from apparent nomadism to apparent seasonal or non-seasonal migrations. Passes, especially the mouths of the larger estuaries, serve as mixing areas. For example, dolphins from several different areas were documented at the mouth of Tampa Bay (Wells, 1986).

Seasonal movements of dolphins into and out of some of the bays, sounds, and estuaries have also been documented, and fall/winter increases in abundance have been noted for Tampa Bay (Scott *et al.*, 1989). In another example, Balmer *et al*. (2008) suggested that during summer and winter, St. Josephs Bay hosts dolphins that spend most of their time within this region, and these may represent a resident community, while in spring and fall, St. Joseph Bay is visited by dolphins that range outside of this area.

Marine Mammal Hearing

Hearing is the most important sensory modality for marine mammals underwater, and exposure to anthropogenic sound can have deleterious effects. To appropriately assess the potential effects of exposure to sound, it is necessary to understand the frequency ranges marine mammals are able to hear. Current data indicate that not all marine mammal species have equal hearing capabilities (*e.g*., Richardson *et al.*, 1995; Wartzok and Ketten, 1999; Au and Hastings, 2008). To reflect this, Southall *et al.* (2007) recommended that marine mammals be divided into functional hearing groups based on directly measured or estimated hearing ranges on the basis of available behavioral response data, audiograms derived using auditory evoked potential techniques, anatomical modeling, and other data. Note that no direct measurements of hearing ability have been successfully completed for mysticetes (*i.e*., low-frequency cetaceans).

Subsequently, NMFS (2016) described generalized hearing ranges for these marine mammal hearing groups. Generalized hearing ranges were chosen based on the approximately 65 dB threshold from the normalized composite audiograms, with the exception for lower limits for low-frequency cetaceans where the lower bound was deemed to be biologically implausible and the lower bound from Southall *et al*. (2007) retained. The hearing groups and the associated frequencies are indicated below (note that these frequency ranges correspond to the range for the composite group, with the entire range not necessarily reflecting the capabilities of every species within that group):

- Low-frequency cetaceans (mysticetes): generalized hearing is estimated to occur between approximately 7 Hz and 35 kHz, with best hearing estimated to be from 100 Hz to 8 kHz;
- Mid-frequency cetaceans (larger toothed whales, beaked whales, and most delphinids): generalized hearing is estimated to occur between approximately 150 Hz and 160 kHz, with best hearing from 10 to less than 100 kHz;
- High-frequency cetaceans (porpoises, river dolphins, and members of the genera Kogia and Cephalorhynchus; including two members of the genus Lagenorhynchus, on the basis of recent echolocation data and genetic data): generalized hearing is estimated to occur between approximately 275 Hz and 160 kHz;
- Pinnipeds in water; Phocidae (true seals): generalized hearing is estimated to occur between approximately 50 Hz to 86 kHz, with best hearing between 1-50 kHz; and
- Pinnipeds in water; Otariidae (eared seals): generalized hearing is estimated to occur between 60 Hz and 39 kHz, with best hearing between 2-48 kHz.

For more detail concerning these groups and associated frequency ranges, please see NMFS (2016) for a review of available information. Common bottlenose dolphins have the reasonable potential to occur with the proposed survey activities, and are classified as mid-frequency cetaceans (*i.e.*, all delphinid and ziphiid species and the sperm whale). As discussed previously, none of the other species under NMFS' jurisdiction listed in Table 1 are anticipated to occur in the proposed project location.

Potential Effects of Specified Activities on Marine Mammals and their Habitat

This section includes a summary and discussion of the ways that components of the specified activity may impact marine mammals and their habitat. The "Estimated Take by Incidental Harassment" section later in this document includes a quantitative analysis of the number of individuals that are expected to be taken by this activity. The "Negligible Impact Analysis and Determination" section considers the content of this section, the "Estimated Take by Incidental Harassment" section, and the "Proposed Mitigation" section, to draw conclusions regarding the likely impacts of these activities on the reproductive success or survivorship of individuals and how those impacts on individuals are likely to impact marine mammal species or stocks.

Description of Sound Sources and Sound Types Associated with the Proposed Activities

Sound travels in waves, the basic components of which are frequency, wavelength, velocity, and amplitude. Frequency is the number of pressure waves that pass by a reference point per unit of time and is measured in hertz (Hz) or cycles per second. Wavelength is the distance between two peaks of a sound wave. Amplitude is the height of the sound pressure wave or the "loudness" of a sound and is typically measured using the decibel (dB) scale. A dB is the ratio between a measured pressure (with sound)

and a reference pressure (sound at a constant pressure, established by scientific standards). It is a logarithmic unit that accounts for large variations in amplitude; therefore, relatively small changes in dB ratings correspond to large changes in sound pressure. When referring to sound pressure levels (SPLs; the sound force per unit area), sound is referenced in the context of underwater sound pressure to 1 microPascal (µPa). One pascal is the pressure resulting from a force of one newton exerted over an area of one square meter. The source level (SL) represents the sound level at a distance of 1 m from the source (referenced to 1 µPa). The received level is the sound level at the listener's position. Note that we reference all underwater sound levels in this document to a pressure of 1 µPa and all airborne sound levels in this document are referenced to a pressure of 20 µPa.

Root mean square (rms) is the quadratic mean sound pressure over the duration of an impulse. Rms is calculated by squaring all of the sound amplitudes, averaging the squares, and then taking the square root of the average (Urick, 1983). Rms accounts for both positive and negative values; squaring the pressures makes all values positive so that one can account for the values in the summation of pressure levels (Hastings and Popper, 2005). This measurement is often used in the context of discussing behavioral effects, in part because behavioral effects, which often result from auditory cues, may be better expressed through averaged units than by peak pressures.

When underwater objects vibrate or activity occurs, sound-pressure waves are created. These waves alternately compress and decompress the water as the sound wave travels. Underwater sound waves radiate in all directions away from the source (similar to ripples on the surface of a pond), except in cases where the source is directional. The

compressions and decompressions associated with sound waves are detected as changes in pressure by aquatic life and man-made sound receptors such as hydrophones.

Even in the absence of sound from the specified activity, the underwater environment is typically loud due to ambient sound. Ambient sound is defined as environmental background sound levels lacking a single source or point (Richardson *et al*., 1995), and the sound level of a region is defined by the total acoustical energy being generated by known and unknown sources. These sources may include physical (*e.g.*, waves, earthquakes, ice, atmospheric sound), biological (*e.g.*, sounds produced by marine mammals, fish, and invertebrates), and anthropogenic sound (*e.g.*, vessels, dredging, aircraft, construction). A number of sources contribute to ambient sound, including the following (Richardson *et al*., 1995):

- Wind and waves: The complex interactions between wind and water surface, including processes such as breaking waves and wave-induced bubble oscillations and cavitation, are a main source of naturally occurring ambient noise for frequencies between 200 Hz and 50 kHz (Mitson, 1995). In general, ambient sound levels tend to increase with increasing wind speed and wave height. Surf noise becomes important near shore, with measurements collected at a distance of 8.5 km from shore showing an increase of 10 dB in the 100 to 700 Hz band during heavy surf conditions;
- Precipitation: Sound from rain and hail impacting the water surface can become an important component of total noise at frequencies above 500 Hz, and possibly down to 100 Hz during quiet times;

- Biological: Marine mammals can contribute significantly to ambient noise levels, as can some fish and shrimp. The frequency band for biological contributions is from approximately 12 Hz to over 100 kHz; and
- Anthropogenic: Sources of ambient noise related to human activity include transportation (surface vessels and aircraft), dredging and construction, oil and gas drilling and production, seismic surveys, sonar, explosions, and ocean acoustic studies. Shipping noise typically dominates the total ambient noise for frequencies between 20 and 300 Hz. In general, the frequencies of anthropogenic sounds are below 1 kHz and, if higher frequency sound levels are created, they attenuate rapidly (Richardson *et al*., 1995). Sound from identifiable anthropogenic sources other than the activity of interest (*e.g.*, a passing vessel) is sometimes termed background sound, as opposed to ambient sound.

The sum of the various natural and anthropogenic sound sources at any given location and time – which comprise "ambient" or "background" sound – depends not only on the source levels (as determined by current weather conditions and levels of biological and shipping activity) but also on the ability of sound to propagate through the environment. In turn, sound propagation is dependent on the spatially and temporally varying properties of the water column and sea floor, and is frequency-dependent. As a result of the dependence on a large number of varying factors, ambient sound levels can be expected to vary widely over both coarse and fine spatial and temporal scales. Sound levels at a given frequency and location can vary by 10-20 dB from day to day (Richardson *et al*., 1995). The result is that, depending on the source type and its

intensity, sound from the specified activity may be a negligible addition to the local environment or could form a distinctive signal that may affect marine mammals.

The sounds produced by the proposed confined blasting activities are considered impulsive, which is one of two general sound types, the other being non-pulsed. The distinction between these two sound types is important because they have differing potential to cause physical effects, particularly with regard to hearing (*e.g.*, Ward, 1997 in Southall *et al*., 2007). Please see Southall *et al*. (2007) for an in-depth discussion of these concepts.

Impulsive sound sources (*e.g.*, explosions, gunshots, sonic booms, impact pile driving) produce signals that are brief (typically considered to be less than one second), broadband, atonal transients (ANSI, 1986; Harris, 1998; NIOSH, 1998; ISO, 2003) and occur either as isolated events or repeated in some succession. These sounds have a relatively rapid rise from ambient pressure to a maximal pressure value followed by a rapid decay period that may include a period of diminishing, oscillating maximal and minimal pressures, and generally have an increased capacity to induce physical injury as compared with sounds that lack these features.

Acoustic Impacts

Please refer to the information given previously (*Description of Sound Sources*) regarding sound, characteristics of sound types, and metrics used in this document. Anthropogenic sounds cover a broad range of frequencies and sound levels and can have a range of highly variable impacts on marine life, from none or minor to potentially severe responses, depending on received levels, duration of exposure, behavioral context, and various other factors. The potential effects of underwater sound from active acoustic

sources can potentially result in one or more of the following: temporary or permanent hearing impairment, non-auditory physical or physiological effects, behavioral disturbance, stress, and masking (Richardson *et al*., 1995; Gordon *et al*., 2004; Nowacek *et al*., 2007; Southall *et al*., 2007; Götz *et al*., 2009). The degree of effect is intrinsically related to the signal characteristics, received level, distance from the source, and duration of the sound exposure. In general, sudden, high level sounds can cause hearing loss, as can longer exposures to lower level sounds. Temporary or permanent loss of hearing will occur almost exclusively for noise within an animal's hearing range. We first describe specific manifestations of acoustic effects before providing discussion specific to the confined blasting activities.

Richardson *et al*. (1995) described zones of increasing intensity of effect that might be expected to occur, in relation to distance from a source and assuming that the signal is within an animal's hearing range. First is the area within which the acoustic signal would be audible (potentially perceived) to the animal, but not strong enough to elicit any overt behavioral or physiological response. The next zone corresponds with the area where the signal is audible to the animal and of sufficient intensity to elicit behavioral or physiological responsiveness. Third is a zone within which, for signals of high intensity, the received level is sufficient to potentially cause discomfort or tissue damage to auditory or other systems. Overlaying these zones to a certain extent is the area within which masking (*i.e.*, when a sound interferes with or masks the ability of an animal to detect a signal of interest that is above the absolute hearing threshold) may occur; the masking zone may be highly variable in size.

We describe the more severe effects (*i.e.*, certain non-auditory physical or physiological effects and mortality) only briefly as we do not expect that there is a reasonable likelihood that USACE's confined blasting activities may result in such effects (see below for further discussion). Marine mammals exposed to high-intensity sound, or to lower-intensity sound for prolonged periods, can experience hearing threshold shift (TS), which is the loss of hearing sensitivity at certain frequency ranges (Kastak *et al*., 1999; Schlundt *et al*., 2000; Finneran *et al*., 2002, 2005). TS can be permanent (PTS), in which case the loss of hearing sensitivity is not fully recoverable, or temporary (TTS), in which case the animal's hearing threshold would recover over time (Southall *et al*., 2007). Repeated sound exposure that leads to TTS could cause PTS. In severe cases of PTS, there can be total or partial deafness, while in most cases the animal has an impaired ability to hear sounds in specific frequency ranges (Kryter, 1985).

When PTS occurs, there is physical damage to the sound receptors in the ear (*i.e.*, tissue damage), whereas TTS represents primarily tissue fatigue and is reversible (Southall *et al*., 2007). In addition, other investigators have suggested that TTS is within the normal bounds of physiological variability and tolerance and does not represent physical injury (*e.g.*, Ward, 1997). Therefore, NMFS does not consider TTS to constitute auditory injury.

Relationships between TTS and PTS thresholds have not been studied in marine mammals—PTS data exists only for a single harbor seal (Kastak *et al*., 2008)—but are assumed to be similar to those in humans and other terrestrial mammals. PTS typically occurs at exposure levels at least several decibels above that which induces mild TTS: a 40-dB threshold shift approximates PTS onset (*e.g.*, Kryter *et al*., 1966; Miller, 1974),

whereas a 6-dB threshold shift approximates TTS onset (*e.g.*, Southall *et al*., 2007). Based on data from terrestrial mammals, a precautionary assumption is that the PTS thresholds for impulse sounds (such as bombs) are at least 6 dB higher than the TTS threshold on a peak-pressure basis and PTS cumulative sound exposure level thresholds are 15 to 20 dB higher than TTS cumulative sound exposure level thresholds (Southall *et al*., 2007). Given the higher level of sound or longer exposure duration necessary to cause PTS as compared with TTS, it is considerably less likely that PTS could occur.

TTS is the mildest form of hearing impairment that can occur during exposure to sound (Kryter, 1985). While experiencing TTS, the hearing threshold rises, and a sound must be at a higher level in order to be heard. In terrestrial and marine mammals, TTS can last from minutes or hours to days (in cases of strong TTS). In many cases, hearing sensitivity recovers rapidly after exposure to the sound ends. Few data on sound levels and durations necessary to elicit mild TTS have been obtained for marine mammals, and none of the data published at the time of this writing concern TTS elicited by exposure to multiple pulses of sound.

Marine mammal hearing plays a critical role in communication with conspecifics, and interpretation of environmental cues for purposes such as predator avoidance and prey capture. Depending on the degree (elevation of threshold in dB), duration (*i.e.*, recovery time), and frequency range of TTS, and the context in which it is experienced, TTS can have effects on marine mammals ranging from discountable to serious. For example, a marine mammal may be able to readily compensate for a brief, relatively small amount of TTS in a non-critical frequency range that occurs during a time where ambient noise is lower and there are not as many competing sounds present.

Alternatively, a larger amount and longer duration of TTS sustained during time when communication is critical for successful mother/calf interactions could have more serious impacts.

Currently, TTS data only exist for four species of cetaceans (bottlenose dolphin, beluga whale (*Delphinapterus leucas*), harbor porpoise (*Phocoena phocoena*), and Yangtze finless porpoise (*Neophocoena asiaeorientalis*)) and three species of pinnipeds (northern elephant seal (*Mirounga angustirostris*), harbor seal (*Phoca vitulina*), and California sea lion (*Zalophus californianus*)) exposed to a limited number of sound sources (*i.e.*, mostly tones and octave-band noise) in laboratory settings (*e.g.*, Finneran *et al*., 2002; Nachtigall *et al*., 2004; Kastak *et al*., 2005; Lucke *et al*., 2009; Popov *et al*., 2011). Additionally, the existing marine mammal TTS data come from a limited number of individuals within these species. For summaries of data on TTS in marine mammals or for further discussion of TTS onset thresholds, please see Southall *et al*. (2007) and Finneran and Jenkins (2012).

Behavioral disturbance may include a variety of effects, including subtle changes in behavior (*e.g.*, minor or brief avoidance of an area or changes in vocalizations), more conspicuous changes in similar behavioral activities, and more sustained and/or potentially severe reactions, such as displacement from or abandonment of high-quality habitat. Behavioral responses to sound are highly variable and context-specific and any reactions depend on numerous intrinsic and extrinsic factors (*e.g.*, species, state of maturity, experience, current activity, reproductive state, auditory sensitivity, time of day), as well as the interplay between factors (*e.g.*, Richardson *et al*., 1995; Wartzok *et al*., 2003; Southall *et al*., 2007; Weilgart, 2007; Archer *et al*., 2010). Behavioral reactions

can vary not only among individuals but also within an individual, depending on previous experience with a sound source, context, and numerous other factors (Ellison *et al*., 2012), and can vary depending on characteristics associated with the sound source (*e.g.*, whether it is moving or stationary, number of sources, distance from the source). Please see Appendices B-C of Southall *et al*. (2007) for a review of studies involving marine mammal behavioral responses to sound.

Habituation can occur when an animal's response to a stimulus wanes with repeated exposure, usually in the absence of unpleasant associated events (Wartzok *et al*., 2003). Animals are most likely to habituate to sounds that are predictable and unvarying. It is important to note that habituation is appropriately considered as a "progressive reduction in response to stimuli that are perceived as neither aversive nor beneficial," rather than as, more generally, moderation in response to human disturbance (Bejder *et al*., 2009).

The opposite process is sensitization, when an unpleasant experience leads to subsequent responses, often in the form of avoidance, at a lower level of exposure. As noted, behavioral state may affect the type of response. For example, animals that are resting may show greater behavioral change in response to disturbing sound levels than animals that are highly motivated to remain in an area for feeding (Richardson *et al*., 1995; NRC, 2003; Wartzok *et al*., 2003). Controlled experiments with captive marine mammals have shown pronounced behavioral reactions, including avoidance of loud sound sources (Ridgway *et al*., 1997; Finneran *et al*., 2003). Observed responses of wild marine mammals to loud pulsed sound sources (typically seismic airguns or acoustic harassment devices) have been varied but often consist of avoidance behavior or other

behavioral changes suggesting discomfort (Morton and Symonds, 2002; see also Richardson *et al*., 1995; Nowacek *et al*., 2007).

Available studies show wide variation in response to underwater sound; therefore, it is difficult to predict specifically how any given sound in a particular instance might affect marine mammals perceiving the signal. If a marine mammal does react briefly to an underwater sound by changing its behavior or moving a small distance, the impacts of the change are unlikely to be significant to the individual, l*et al*one the stock or population. However, if a sound source displaces marine mammals from an important feeding or breeding area for a prolonged period, impacts on individuals and populations could be significant (*e.g.*, Lusseau and Bejder, 2007; Weilgart, 2007; NRC, 2005). However, there are broad categories of potential response, which we describe in greater detail here, that include alteration of dive behavior, alteration of foraging behavior, effects to breathing, interference with or alteration of vocalization, avoidance, and flight.

Changes in dive behavior can vary widely and 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 (*e.g.*, Frankel and Clark, 2000; Costa *et al*., 2003; Ng and Leung, 2003; Nowacek *et al*.; 2004; Goldbogen *et al.*, 2013a,b). Variations in dive behavior may reflect interruptions in biologically significant activities (*e.g.*, foraging) or they may be of little biological significance. The impact of an alteration to dive behavior 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.

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. As for other types of behavioral response, the frequency, duration, and temporal pattern of signal presentation, as well as differences in species sensitivity, are likely contributing factors to differences in response in any given circumstance (*e.g.*, Croll *et al*., 2001; Nowacek *et al*.; 2004; Madsen *et al*., 2006; Yazvenko *et al*., 2007). A determination of whether foraging disruptions incur fitness consequences would require information on or estimates of the energetic requirements of the affected individuals and the relationship between prey availability, foraging effort and success, and the life history stage of the animal.

Variations in respiration naturally vary with different behaviors and alterations to breathing rate as a function of acoustic exposure can be expected to co-occur with other behavioral reactions, such as a flight response or an alteration in diving. However, respiration rates in and of themselves may be representative of annoyance or an acute stress response. Various studies have shown that respiration rates may either be unaffected or could increase, depending on the species and signal characteristics, 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 (*e.g.*, Kastelein *et al*., 2001, 2005b, 2006; Gailey *et al*., 2007).

Marine mammals vocalize for different purposes and across multiple modes, such as whistling, echolocation click production, calling, and singing. Changes in vocalization behavior in response to anthropogenic noise can occur for any of these modes and may result from a need to compete with an increase in background noise or may reflect

increased vigilance or a startle response. For example, in the presence of potentially masking signals, humpback whales and killer whales have been observed to increase the length of their songs (Miller *et al*., 2000; Fristrup *et al*., 2003; Foote *et al*., 2004), while right whales have been observed to shift the frequency content of their calls upward while reducing the rate of calling in areas of increased anthropogenic noise (Parks *et al*., 2007b). In some cases, animals may cease sound production during production of aversive signals (Bowles *et al*., 1994).

Avoidance is the displacement of an individual from an area or migration path as a result of the presence of a sound or other stressors, and is one of the most obvious manifestations of disturbance in marine mammals (Richardson *et al*., 1995). For example, gray whales are known to change direction – deflecting from customary migratory paths – in order to avoid noise from seismic surveys (Malme *et al*., 1984). Avoidance may be short-term, with animals returning to the area once the noise has ceased (*e.g.*, Bowles *et al*., 1994; Goold, 1996; Stone *et al*., 2000; Morton and Symonds, 2002; Gailey *et al*., 2007). Longer-term displacement is possible, however, which may lead to changes in abundance or distribution patterns of the affected species in the affected region if habituation to the presence of the sound does not occur (*e.g.*, Blackwell *et al*., 2004; Bejder *et al*., 2006; Teilmann *et al*., 2006).

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. The flight response differs from other avoidance responses in the intensity of the response (*e.g.*, directed movement, rate of travel). 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). The result of a flight response could range from brief, temporary exertion and displacement from the area where the signal provokes flight to, in extreme cases, marine mammal strandings (Evans and England, 2001). However, it should be noted that response to a perceived predator does not necessarily invoke flight (Ford and Reeves, 2008), and whether individuals are solitary or in groups may influence the response.

Behavioral disturbance can also impact marine mammals in more subtle ways. Increased vigilance may result in costs related to diversion of focus and attention (*i.e.*, when a response consists of increased vigilance, it may come at the cost of decreased attention to other critical behaviors such as foraging or resting). These effects have generally not been demonstrated for marine mammals, but studies involving fish and terrestrial animals have shown that increased vigilance may substantially reduce feeding rates (*e.g.*, Beauchamp and Livoreil, 1997; Fritz *et al*., 2002; Purser and Radford, 2011). In addition, chronic disturbance can cause population declines through reduction of fitness (*e.g.*, decline in body condition) and subsequent reduction in reproductive success, survival, or both (*e.g.*, Harrington and Veitch, 1992; Daan *et al*., 1996; Bradshaw *et al*., 1998). However, Ridgway *et al*. (2006) reported that increased vigilance in bottlenose dolphins exposed to sound over a five-day period did not cause any sleep deprivation or stress effects.

Many animals perform vital functions, such as feeding, resting, traveling, and socializing, on a diel cycle (24-hour cycle). Disruption of such functions resulting from reactions to stressors such as sound exposure are more likely to be significant if they last more than one diel cycle or recur on subsequent days (Southall *et al*., 2007).

Consequently, a behavioral response lasting less than one day and not recurring on subsequent days is not considered particularly severe unless it could directly affect reproduction or survival (Southall *et al*., 2007). Note that there is a difference between multi-day substantive behavioral reactions and multi-day anthropogenic activities. For example, just because an activity lasts for multiple days does not necessarily mean that individual animals are either exposed to activity-related stressors for multiple days or, further, exposed in a manner resulting in sustained multi-day substantive behavioral responses.

An animal's perception of a threat may be sufficient to trigger stress responses consisting of some combination of behavioral responses, autonomic nervous system responses, neuroendocrine responses, or immune responses (*e.g.*, Seyle, 1950; Moberg, 2000). In many cases, an animal's first and sometimes most economical (in terms of energetic costs) response is behavioral avoidance of the potential stressor. Autonomic nervous system responses to stress typically involve changes in heart rate, blood pressure, and gastrointestinal activity. These responses have a relatively short duration and may or may not have a significant long-term effect on an animal's fitness.

Neuroendocrine stress responses often involve the hypothalamus-pituitary-adrenal system. Virtually all neuroendocrine functions that are affected by stress—including immune competence, reproduction, metabolism, and behavior—are regulated by pituitary hormones. Stress-induced changes in the secretion of pituitary hormones have been implicated in failed reproduction, altered metabolism, reduced immune competence, and behavioral disturbance (*e.g.*, Moberg, 1987; Blecha, 2000). Increases in the circulation of glucocorticoids are also equated with stress (Romano *et al*., 2004).

The primary distinction between stress (which is adaptive and does not normally place an animal at risk) and "distress" is the cost of the response. During a stress response, an animal uses glycogen stores that can be quickly replenished once the stress is alleviated. In such circumstances, the cost of the stress response would not pose serious fitness consequences. However, "distress" occurs when an animal does not have sufficient energy reserves to satisfy the energetic costs of a stress response. In that case, energy resources must be diverted from other functions. This state of distress will last until the animal replenishes its energetic reserves sufficient to restore normal function.

Relationships between these physiological mechanisms, animal behavior, and the costs of stress responses are well-studied through controlled experiments and for both laboratory and free-ranging animals (Holberton *et al*., 1996; Hood *et al*., 1998; Jessop *et al*., 2003; Krausman *et al*., 2004; Lankford *et al*., 2005). Stress responses due to exposure to anthropogenic sounds or other stressors and their effects on marine mammals have also been reviewed (Fair and Becker, 2000; Romano *et al*., 2002b) and, more rarely, studied in wild populations (*e.g.*, Romano *et al*., 2002a). For example, Rolland *et al*. (2012) found that noise reduction from reduced ship traffic in the Bay of Fundy was associated with decreased stress in North Atlantic right whales. These and other studies lead to a reasonable expectation that some marine mammals will experience physiological stress responses upon exposure to acoustic stressors and that it is possible that some of these would be classified as "distress." In addition, any animal experiencing TTS would likely also experience stress responses (NRC, 2003).

Sound can disrupt behavior through masking, or interfering with, an animal's ability to detect, recognize, or discriminate between acoustic signals of interest (*e.g.*,

those used for intraspecific communication and social interactions, prey detection, predator avoidance, navigation) (Richardson *et al.*, 1995). Masking occurs when the receipt of a sound is interfered with by another coincident sound at similar frequencies and at similar or higher intensity, and may occur whether the sound is natural (*e.g.*, snapping shrimp, wind, waves, precipitation) or anthropogenic (*e.g.*, shipping, sonar, seismic exploration) in origin. The ability of a noise source to mask biologically important sounds depends on the characteristics of both the noise source and the signal of interest (signal-to-noise ratio, temporal variability, direction), in relation to each other and to an animal's hearing abilities (sensitivity, frequency range, critical ratios, frequency discrimination, directional discrimination, age or TTS hearing loss), and existing ambient noise and propagation conditions.

Under certain circumstances, marine mammals experiencing significant masking could also be impaired from maximizing their performance fitness in survival and reproduction. Therefore, when the coincident (masking) sound is man-made, it may be considered harassment when disrupting or altering critical behaviors. It is important to distinguish TTS and PTS, which persist after the sound exposure, from masking, which occurs during the sound exposure. Because masking (without resulting in TS) is not associated with abnormal physiological function, it is not considered a physiological effect, but rather a potential behavioral effect.

The frequency range of the potentially masking sound is important in determining any potential behavioral impacts. For example, low-frequency signals may have less effect on high-frequency echolocation sounds produced by odontocetes but are more likely to affect detection of mysticete communication calls and other potentially

important natural sounds such as those produced by surf and some prey species. The masking of communication signals by anthropogenic noise may be considered as a reduction in the communication space of animals (*e.g.*, Clark *et al*., 2009) and may result in energetic or other costs as animals change their vocalization behavior (*e.g.*, Miller *et al*., 2000; Foote *et al*., 2004; Parks *et al*., 2007b; Di Iorio and Clark, 2009; Holt *et al*., 2009). Masking can be reduced in situations where the signal and noise come from different directions (Richardson *et al*., 1995), through amplitude modulation of the signal, or through other compensatory behaviors (Houser and Moore, 2014). Masking can be tested directly in captive species (*e.g.*, Erbe, 2008), but in wild populations it must be either modeled or inferred from evidence of masking compensation. There are few studies addressing real-world masking sounds likely to be experienced by marine mammals in the wild (*e.g.*, Branstetter *et al*., 2013).

Masking affects both senders and receivers of acoustic signals and can potentially have long-term chronic effects on marine mammals at the population level as well as at the individual level. Low-frequency ambient sound levels have increased by as much as 20 dB (more than three times in terms of SPL) in the world's ocean from pre-industrial periods, with most of the increase from distant commercial shipping (Hildebrand, 2009). All anthropogenic sound sources, but especially chronic and lower-frequency signals (*e.g.*, from vessel traffic), contribute to elevated ambient sound levels, thus intensifying masking.

Non-auditory physiological effects or injuries that theoretically might occur in marine mammals exposed to high level underwater sound, or as a secondary effect of extreme behavioral reactions (*e.g.*, change in dive profile as a result of an avoidance

reaction) caused by exposure to sound include neurological effects, bubble formation, resonance effects, and other types of organ or tissue damage (Cox *et al*., 2006; Southall *et al*., 2007; Zimmer and Tyack, 2007). USACE's activities involve the use of explosives that are associated with these types of effects; however, severe injury to marine mammals is not anticipated from these activities due to the mitigation measures in place to avoid these types of impacts.

When a marine mammal swims or floats onto shore and is incapable of returning to sea, the event is termed a "stranding" (16 U.S.C. 1421h(3)). Marine mammals are known to strand for a variety of reasons, such as infectious agents, biotoxicosis, starvation, fishery interaction, ship strike, unusual oceanographic or weather events, sound exposure, or combinations of these stressors sustained concurrently or in series (*e.g.*, Geraci *et al*., 1999). However, the cause or causes of most strandings is unknown (*e.g.*, Best, 1982). Combinations of dissimilar stressors may combine to kill an animal or dramatically reduce its fitness, even though one exposure without the other would not be expected to produce the same outcome (*e.g.*, Sih *et al*., 2004). For further description of stranding events see, *e.g.*, Southall *et al*., 2006; Jepson *et al*., 2013; Wright *et al*., 2013.

The USACE's proposed confined blasting activities have the potential to take marine mammals by exposing them to impulsive noise and pressure waves generated by detonations of explosives. Exposure to energy, pressure, or direct strike has the potential to result in non-lethal injury (Level A harassment), disturbance (Level B harassment), serious injury, and/or mortality. 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 (though this energy

is reduced by as much as 60-90 percent by confining the blast as discussed above). 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.

The effects of underwater detonations on marine mammals are dependent on several factors, including the size, type, and depth of the animal; the depth, intensity, and duration of the sound; the depth of the water column; the substrate of the habitat; the standoff distance between activities and the animal; and the sound propagation properties of the environment. Thus, we expect impacts to marine mammals from the confined blasting activities to result primarily from acoustic pathways. As such, the degree of the effect relates to the received level and duration of the sound exposure, as influenced by the distance between the animal and the source. The further away from the source, the less intense the exposure should be.

The potential effects of underwater detonations from the proposed confined blasting activities may include one or more of the following: temporary or permanent hearing impairment, non-auditory physical or physiological effects, behavioral disturbance, and masking (Richardson *et al*., 1995; Gordon *et al*., 2004; Nowacek *et al*., 2007; Southall *et al*., 2007). However, the effects of noise on marine mammals are highly variable, often depending on species and contextual factors (based on Richardson *et al*., 1995).

In the absence of mitigation, impacts to marine species as a result of the USACE confined blasting could result from physiological and behavioral responses to both the type and strength of the acoustic signature (Viada *et al*., 2008). The type and severity of behavioral impacts are more difficult to define due to limited studies addressing the behavioral effects of impulsive sounds on marine mammals.

Disturbance Reactions

Disturbance includes a variety of effects, including subtle changes in behavior, more conspicuous changes in activities, and displacement. 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 impulsive sources, 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; MacLean and Koski, 2005; Miller *et al*., 2005; Bain and Williams, 2006).

Controlled experiments with captive marine mammals showed pronounced behavioral reactions, including avoidance of loud sound sources (Ridgway *et al*., 1997; Finneran *et al*., 2003). Observed responses of wild marine mammals to loud pulsed sound sources (typically seismic guns or acoustic harassment devices) have been varied but

often consist of avoidance behavior or other behavioral changes suggesting discomfort (Morton and Symonds, 2002; Thorson and Reyff, 2006; see also Gordon *et al*., 2004; Wartzok *et al*., 2003; Nowacek *et al*., 2007).

Because the few available studies show wide variation in response to underwater sound, it is difficult to quantify exactly how sound from the USACE confined blasting activities would affect marine mammals. It is likely that the onset of confined detonations could result in temporary, short term changes in an animal's typical behavior and/or avoidance of the affected area. These behavioral changes may include: changing durations of surfacing and dives, number of blows per surfacing, or moving direction and/or speed; reduced/increased vocal activities; changing/cessation of certain behavioral activities (such as socializing or feeding); visible startle response or aggressive behavior (such as tail/fluke slapping or jaw clapping); or avoidance of areas where sound sources are located (Richardson *et al*., 1995).

The biological significance of any of these behavioral disturbances is difficult to predict, especially if the detected disturbances appear minor. However generally, one could expect the consequences of behavioral modification to be biologically significant if the change affects growth, survival, or reproduction. Significant behavioral modifications that could potentially lead to effects on growth, survival, or reproduction include:

- Drastic changes in diving/surfacing patterns (such as those thought to cause beaked whale stranding due to exposure to military mid-frequency tactical sonar);
- Habitat abandonment due to loss of desirable acoustic environment; and
- Cessation of feeding or social interaction.

The onset of behavioral disturbance from anthropogenic sound depends on both external factors (characteristics of sound sources and their paths) and the specific characteristics of the receiving animals (hearing, motivation, experience, demography) and is difficult to predict (Southall *et al*., 2007).

Auditory Masking

Natural and artificial sounds can disrupt behavior by masking, or interfering with, a marine mammal's ability to hear other sounds. Masking occurs when the receipt of a sound interferes with by another coincident sound at similar frequencies and at similar or higher levels (Clark *et al*., 2009). While it may occur temporarily, we do not expect auditory masking to result in detrimental impacts to an individual's or population's survival, fitness, or reproductive success. As no blasting would commence if dolphins (or any other protected species) are located within the East Channel (see discussion of Mitigation, below), dolphin movement would not be restricted within the proposed project area, allowing for movement out of the area to avoid masking impacts and the sound resulting from the detonations is short in duration. 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 proposed project area.

Anticipated Effects on Habitat

Confined detonations would result in temporary changes to the water environment. Explosions 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. In addition, as discussed above, due to the fact that the blasts will be confined, the energy would be reduced by 60 to 90 percent compared to open water blasting, so these effects would be lessened significantly. USACE does not expect any long-term impacts with regard to hazardous constituents to occur, as the explosives utilized are water-soluble and non-toxic. In the event that a charge is unable to be fired and must be left in the drillhole, it is designed to break down as it is made of ammonium nitrate in a fluid gel format. Any material left in the drill hole after blasting would be recovered through the dredging process. USACE considered water quality impacts within its EA and determined the primary anticipated change in water quality at the expansion and maintenance dredging areas would be a temporary increase in turbidity.

According to the State of Florida's Class III water quality standards, turbidity levels during dredging are not to exceed 29 nephelometric turbidity units (NTUs) above background levels at the edge of normally a 150-meter mixing zone. Turbidity will be monitored according to State protocols and work would cease if at any time the turbidity exceeded this standard.

The bottom of the East Channel consists of previously dredged rock and unconsolidated sediment, as the proposed project area is a historically a manmade channel that has been deepened and maintenance dredged. With exception of the proposed deepening, the physical nature of the habitat is not expected to significantly change and should continue to be utilized by dolphins in a similar manner as currently utilized (assumed to be socializing, feeding, resting, etc., though the Channel is not an area of known biological importance for any of these uses). With regard to prey species

(mainly fish), a very small number of fish are expected to be impacted by the proposed project. Based on the results of the 2005 blasting project at Miami Harbor, the blasting consisted of 40 blast events over a 38-day time period. Of these 40 blast events, 23 (57.5 percent) were monitored by the State and had injured and dead fish collected after the "all clear" was given following blasting (note that this is normally at least 2–3 minutes after the shot, and seagulls and frigate birds quickly learned to approach the blast site and forage on some of the stunned, injured, and dead fish floating at the surface). Volunteers collected carcasses of floating fish (also noting that not all fish float after a blast but due to safety concerns, there was no method to collect non-floating carcasses). A summary of the data showed that 24 different genera were collected during the Miami Harbor blasting events and the total number of fish collected was 288, or an average of 12.5 fish per blast (ranging from 3 to 38). Factors that affect fish mortality include, but are not limited to fish size, body shape (fusiform, etc.), proximity of the blast to a vertical structure (smaller charge weights resulted in high fish kills when close to a bulkhead).

To reduce the potential for fish to be injured or killed, the USACE has previously utilized a small, unconfined explosive charge (usually 0.45 kg (1 lb)) to be detonated approximately 30 seconds before the main blast to drive fish away from the blasting zone. It is assumed that noise or pressure generated by the small charge would drive fish from the immediate area, thereby reducing impacts from the larger and potentially more damaging blast. There is limited data available on the effectiveness of fish-scare charges at actually reducing the magnitude of fish kills, and the effectiveness may be based on the fish's life history. However, based on the monetary value of fish, including high value commercial or recreational species like snook and tarpon that can be found in west

central Florida inlets like Tampa Bay, the low cost associated with the repelling charge use would be offset even if only a few fish were moved from the kill zone (Keevin *et al.*, 1997).

To calculate the potential loss of prey species from the proposed project area as a result of the confined blasting, a 12.5 per-blast kill estimate (based on the Miami Harbor blast study discussed above) was used. It is estimated that approximately 525 fish would be killed by the proposed confined blasting within the East Channel (12.5 fish/blast multiplied by 42 detonations). Therefore, prey availability would not be significantly impacted due to the proposed project.

While we anticipate 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 detonations. However, these events are usually of short duration, and we anticipate that animals will return to the activity area during periods of non-activity. Thus, based on the preceding discussion, we do 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.

No takes of marine mammals are anticipated, nor are any being proposed for authorization, related to the dredging activities within the Big Bend Channel (including within the East Channel, where the proposed confined blasting will occur). Various types

of dredging equipment are anticipated to be utilized in the course of this construction dredging project and may include Mechanical (Clamshell and/or Backhoe) and Hydraulic (Hopper and/or Cutter-Suction). Dredging and direct pumping of material to the placement site is expected, and there will likely be a need for a pipeline to cross the channel at certain locations in order to pump material into the upland placement area. Any such crossing would require that the top of the pipeline remain below -12.5 m (41 ft) mean lower low water (MLLW), which is the lowest height of the average tide recorded for a given location. Placement of the pipeline below -12.5 m MLLW would allow dolphins to transit through this portion of the project area unimpeded and is not anticipated to cause take.

In general, potential impacts to marine mammals from explosive detonations could include mortality, serious injury, as well as Level A harassment (non-lethal injury/permanent threshold shift (PTS)) and Level B harassment (temporary threshold shift (TTS)/behavioral harassment). In the absence of mitigation, marine mammals could be killed or injured as a result of an explosive detonation due to the response of air cavities in the body, such as the lungs and bubbles in the intestines. A second potential possible cause of mortality (in the absence of mitigation) is the onset of extensive lung hemorrhage. Extensive lung hemorrhage is considered 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 2 provides criteria and thresholds related to auditory impacts as well as non-auditory impacts based on NMFS Acoustic Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (NMFS 2016), and Finneran and Jenkins (2012). Acoustic thresholds related to TTS and PTS onset are also provided in Table 2 based on NMFS 2016 Acoustic Technical Guidance. For impulse sources (such as explosives), NMFS 2016 includes thresholds expressed as weighted, cumulative sound exposure levels (SELcum) and unweighted peak sound pressure levels (PK). Because of limited data on behavioral reactions of marine mammals to multiple detonations, behavioral thresholds are derived directly from TTS onset thresholds (*i.e.*, behavioral thresholds are five dB lower than TTS onset thresholds).

Estimated Take

This section provides an estimate of the number of incidental takes proposed for authorization through this IHA, which will inform both NMFS' consideration of whether the number of takes is "small" and the negligible impact determination.

Harassment is the only type of take expected to result from these activities. Except with respect to certain activities not pertinent here, section 3(18) of the MMPA defines "harassment" as: any act of pursuit, torment, or annoyance which (i) has the potential to injure a marine mammal or marine mammal stock in the wild (Level A harassment); or (ii) has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering (Level B harassment).

Authorized takes would be by Level B harassment only, in the form of disruption of behavioral patterns and/or TTS for individual marine mammals resulting from

exposure to noise from underwater confined blasting in the East Channel of the Big Bend Channel, Tampa Harbor. Based on the nature of the activity and the anticipated effectiveness of the mitigation measures (*i.e.*, no blasting if marine mammals (or any protected species) are within the East Channel, which encompasses the entirety of the Level A take zone, as discussed in detail below in Proposed Mitigation section), Level A harassment is neither anticipated nor proposed to be authorized.

As described previously, no mortality is anticipated or proposed to be authorized for this activity. Below we describe how the take is estimated.

Described in the most basic way, we estimate take by considering: 1) thresholds above which NMFS believes the best available science indicates marine mammals will be behaviorally harassed or incur some degree of permanent hearing impairment or tissue damage; 2) the area or volume of water that will be ensonified above these levels in a day; 3) the density or occurrence of marine mammals within these ensonified areas; and, 4) and the number of days of activities. Below, we describe these components in more detail and present the proposed take estimate.

Acoustic Thresholds

Using the best available science, NMFS has developed acoustic thresholds that identify the received level of underwater sound above which exposed marine mammals would be reasonably expected to be behaviorally harassed (equated to Level B harassment) or to incur PTS of some degree (equated to Level A harassment). Thresholds have also been developed to identify the pressure levels above which animals may incur different types of tissue damage from exposure to pressure waves from explosive detonation.

These thresholds were developed by compiling and synthesizing the best available science and soliciting input multiple times from both the public and peer reviewers to inform the final product, and are provided in the table below. The references, analysis, and methodology used in the development of the thresholds are described in NMFS 2016 Technical Guidance, which may be accessed at:

http://www.nmfs.noaa.gov/pr/acoustics/guidelines.htm.

Table 2. NMFS' Current Thresholds and Criteria for Impact Analysis from the Use of Explosives for Mid-Frequency Cetaceans.

Hearing Group	Species	Behavioral	TTS	PTS	GI Tract Injury	Lung Injury	Mortality
Mid-frequency cetaceans	Most delphinids, medium and large toothed whales	165 dB	170 dB SELcum; 224 dB PK	185 dB SELcum; 230 dB PK	237 dB	39.1 M1/3 (1+[DRm/10.081])1/2 Pa-sec Where: M = mass of the animals in kg DRm = depth of the receiver (animal) in meters	91.4 M1/3 (1+[DRm/10.081])1/2 Pa-sec Where: M = mass of the animals in kg DRm = depth of the receiver (animal) in meters

Explosive sources – Based on the best available science, NMFS uses the acoustic and pressure thresholds indicated in Table 2 above to predict the onset of behavioral harassment, TTS, PTS, tissue damage, and mortality.

Ensonified Area

Here, we describe operational and environmental parameters of the activity that will feed into identifying the area ensonified above the acoustic thresholds.

Radii for Level A and Level B harassment were calculated using algorithms specifically developed for confined underwater blasting operations by the NMFS (see Attachment B of the application, which provides more detail and spreadsheet results). The algorithms compute the cumulative sound exposure impact zone due to a pattern of

charges. The code calculates the total explosive energy from all charges through a summation of the individual energy emanating from each charge as a function of temporal and spatial separation of charges. Acoustical transmission loss is assumed to occur through cylindrical spreading. The SEL of the first detonation and each subsequent detonation is summed and transmission loss of acoustic energy due to cylindrical spreading is subtracted from the total SEL. Ultimately, the distance where the received level falls to a set SEL is calculated by spherical spreading of the total SEL (refer to section 6 and Attachment B of the IHA application for more information on how this was modeled). However, the proposed blasting would occur within the East Channel, which is open to the Hillsborough Bay on the west side of the channel, but confined by land on the north, east, and south sides of the channel. NMFS and USACE agree that acoustic energy emanating from the East Channel and into Hillsborough Bay would rapidly decrease as the energy spreads to the north and south outside of the East Channel in the Bay. Under these conditions, sound energy beyond a 45 degree angle, or a 45 degree cone shape outside of the channel mouth would attenuate, and would not result in Level B take.

Level A and B take zones (km^2) were calculated using the calculated blasting radii. Some blasting radii are contained within the water column or between the East Channel's north and south shorelines. These areas therefore are circular in shape. However, larger blasting radii extend beyond the channel's shorelines. In these cases, the areas form an irregular polygon shape that are bounded by the channel's shoreline to the north, east, and south and are cone-shaped outside of the East Channel opening to Tampa/Hillsborough Bay. The areas of these irregular polygon shapes were determined with computer software (Google Earth Pro). This area was then multiplied by the density

calculated for common bottlenose dolphins in the project area, as this is the only marine mammal species potentially occurring in the East Channel (density information provided below). Figure 10 of the application illustrates the take areas calculated for the largest blast pattern consisting of 18.1 kg (40 lbs)/delay and 40 individual charges, which was used to calculate estimated take for the confined blasting activities.

We note here that, even in absence of mitigation measures to avoid Level A take, due to the small Level A harassment zone and density of bottlenose dolphins in the proposed project area, Level A take is not anticipated (the maximum calculated take by Level A harassment is 0.02 dolphin). In addition to this, mitigation measures (discussed below) will further ensure that no takes by Level A harassment will occur.

Marine Mammal Occurrence/Density Calculation

In this section we provide the information about the presence, density, or group dynamics of marine mammals that will inform the take calculations.

As stated above, common bottlenose dolphins are the only species of marine mammal anticipated to occur in the proposed project area. Using photo-identification methods, Urian *et al.* (2009) identified 858 individual dolphins during their 6-year study in the Tampa Bay. However, as state above, data from Wells *et al.* (1995) was used for the abundance estimate of the Tampa Bay Stock of common bottlenose dolphins, as Urian *et al.* (2009) was not an abundance estimate, but a population structure study. The Wells *et al.* (1995) mark-resight method provided the most conservative, or highest average, abundance of 564 common bottlenose dolphins within the 852-km^2 study area. In order to calculate take, the USACE made an assumption that the dolphins would be

evenly distributed throughout Tampa Bay. The number of dolphins per square kilometer within this area is calculated as 0.66 (564 dolphins ÷ 852 km^2 = 0.66 dolphins/km^2).

Take Calculation and Estimation

Here we describe how the information provided above is brought together to produce a quantitative take estimate.

The USACE proposes a maximum charge weight of 725.7 kg (1,600 lbs) as a conservatively high estimate for the total amount of explosives that may be used in the largest blasting pattern. This is based on the fact that the maximum charge weight per delay would not exceed 18.1 kg (40 lbs)/delay for this project and the maximum number of charges per pattern would not exceed 40. Please refer to Table 3 of the application for the level of take associated with this charge weight as well as other charge weights. Figure 10 of the application provides visual representation of take areas plotted on an aerial photograph for 18.1 kg/delay.

A maximum of 42 blast events would occur over the one year period of this IHA. Using the Tampa Bay Stock abundance estimate (n=564), the density of common bottlenose dolphins occurring within the footprint of the project (0.66 dolphins/km^2), as well as the maximum charge weight of 18.1 kg (40 lbs)/delay, the USACE is requesting Level B take for behavioral harassment and/or TTS for up to 5.8 common bottlenose dolphins per blast (refer to Table 3 of the application). Therefore, using the maximum amount of explosives per blast event and the maximum number of blast events, an estimated 244 Level B takes would occur over the one-year period of this IHA (5.8 dolphin/blast x 42 detonations = 243.6 exposures). However, the number of dolphins subjected to TTS and/or behavioral harassment is expected to be significantly lower for

two reasons. First, the USACE will implement a test blast program to determine the smallest amount of explosives needed to fracture the rock and allow mechanical removal. This test blast program would begin with a single row pattern of charges, and would vary the number and charges/pattern as well as the charge weight/delay to determine the minimum needed and these test blasts would count toward the maximum of 42 total blast events. The maximum 1,600 lb blasting pattern of 18.1 kg (40 lb)/delay and 40 individual charges was used to calculate take due to the uncertainty regarding the minimum needed charge/delay and individual charges as well as uncertainty regarding the number of test blasts. Therefore, there would not actually be 42 blast events with the full pattern of 40 delays at full charge weight/delay (1,600 lb), as was assumed in the take calculation, and the take estimate is a conservative estimate. Second, we expect at least some of the exposures to be repeat exposures of the same individuals, as discussed further in the Small Numbers section below.

Proposed Mitigation

In order to issue an IHA under Section 101(a)(5)(D) of the MMPA, NMFS must set forth the permissible methods of taking pursuant to such activity, "and other means of effecting the least practicable impact on such species or stock and its habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance, and on the availability of such species or stock for taking" for certain subsistence uses (latter not applicable for this action). NMFS regulations require applicants for incidental take authorizations to include information about the availability and feasibility (economic and technological) of equipment, methods, and manner of conducting such activity or other

means of effecting the least practicable adverse impact upon the affected species or stocks and their habitat (50 CFR 216.104(a)(11)).

In evaluating how mitigation may or may not be appropriate to ensure the least practicable adverse impact on species or stocks and their habitat, as well as subsistence uses where applicable, we carefully consider two primary factors:

1) the manner in which, and the degree to which, the successful implementation of the measure(s) is expected to reduce impacts to marine mammals, marine mammal species or stocks, and their habitat. This considers the nature of the potential adverse impact being mitigated (likelihood, scope, range). It further considers the likelihood that the measure will be effective if implemented (probability of accomplishing the mitigating result if implemented as planned) the likelihood of effective implementation (probability implemented as planned) and;

2) the practicability of the measures for applicant implementation, which may consider such things as cost, impact on operations, and, in the case of a military readiness activity, personnel safety, practicality of implementation, and impact on the effectiveness of the military readiness activity.

As discussed previously, the USACE will confine the blasts within the East Channel by boring holes into the existing rock, placing explosive charges within the holes, and stemming the holes in order to greatly reduce the energy released into the water column from the blasts (estimated to reduce the amount of energy by 60-90 percent versus open water blasting). In addition to utilizing the confined blasting, the following conditions will be incorporated into the project specifications to reduce the risk of impacts to marine mammals:

- Confined blasting will be restricted to the East Channel only;
- Blasting will be restricted to the months of April through October (this is to avoid impacts to Florida manatee, but may also serve to avoid impacts if there are seasonal increases in Tampa Bay/proposed project area during the fall/winter as reported by Scott *et al*. (1989), and discussed above);
- The blasting plan shall be provided for NMFS review at least 30 days prior to work, and the blasting plan must include detailed information about the protected species watch program as well as details about proposed blasting events (to be submitted to NMFS headquarters Protected Species Division as well as the NMFS Southeast Regional Office, the State Fish and Wildlife Commission (FWC) Office, and USFWS);
    - The blasting plan shall include:
    - A list of the observers, their qualifications, and positions for the watch, including a map depicting the proposed locations for boat or land-based observers. Qualified observers must have prior on-the-job experience observing for protected marine species (such as dolphins, manatees, marine turtles, etc.) during previous in-water blasting events where the blasting activities were similar in nature to this project;
    - The amount of explosive charge proposed, the explosive charge's equivalency in TNT, how it will be executed (depth of drilling, stemming information, etc.), a drawing depicting the placement of the charges, size of the safety radius and how it will be marked (also depicted on a map), tide tables for the blasting event(s), and estimates of times and days for blasting events (with an understanding this is an estimate, and may change due to weather, equipment, etc.). Certain blasting restrictions will be imposed including the following: 1) individual charge weights shall not exceed 18.1 kg

(40 lbs)/delay, and 2) the contractor shall not exceed a total of 42 blast events during the blast window.

- In addition to review of the blasting plan, NMFS's Southeast Region Office and State FWC shall be notified at the beginning (24 hours prior) and after (24 hours after) any blasting;
- For each explosive charge placed, three zones will be calculated, denoted on monitoring reports and provided to protected species observers before each blast for incorporation in the watch plan for each planned detonation. All of the zones will be noted by buoys for each of the blasts. These zones are:
    - Level A Take Zone: The Level A Take Zone is equal to the radius of the PTS Injury Zone. As shown in the application in Table 3, as well as Figure 10, all other forms of injurious take (*i.e.* gastro-intestinal injury, lung injury) and mortality have smaller radii than the PTS Injury Zone. Detonation shall not occur if a protected species is known to be (or based on previous sightings, may be) within the Level A Take Zone;
    - Exclusion Zone: A zone which is the Level A Take Zone + 152.4 m (500 ft). Detonation will not occur if a protected species is known to be (or based on previous sightings, may be) within the Exclusion Zone;
    - Level B Take Zone: The Level B Take Zone extends from the Exclusion Zone to the Behavior Zone radius. Detonation shall occur if a protected species is within the Level B Take Zone. Any protected species within this zone shall be monitored continuously and, if they are within the Level B Take Zone during detonation, then they shall be recorded on monitoring forms. Note that the Level B Take Zone should begin immediately beyond the end of the Level A Take Zone. However, the USACE proposes

to implement an Exclusion Zone. Also, the area immediately beyond the Level B Take Zone shall also be monitored for protected species.

- No blasting shall occur within East Channel if dolphins or any other protected species are present within the East Channel (Note: the Level A harassment zone is entirely within the East Channel, which is why no Level A harassment is proposed for authorization);
- Protected species observers (PSOs) shall begin the watch program at least one hour prior to the scheduled start of the blasting activities, and will continue for at least one half hour after blast activities have completed;
- The watch program shall consist of a minimum of six PSOs with a designated lead observer. Each observer shall be equipped with a two-way radio that shall be dedicated exclusively to the watch. Extra radios shall be available in case of failures. All of the observers shall be in close communication with the blasting subcontractor in order to halt the blast event if the need arises. If all observers do not have working radios and cannot contact the primary observer and the blasting subcontractor during the pre-blast watch, the blast shall be postponed until all observers are in radio contact. Observers will also be equipped with polarized sunglasses, binoculars, a red flag for backup visual communication, and a sighting log with a map to record sightings;
- All blasting events will be weather dependent. Climatic conditions must be suitable for adequate viewing conditions. Blasting will not commence in rain, fog or otherwise poor weather conditions, and can only commence when the entire Level A Take Zone, Exclusion Zone, and Level B Take Zone are visible to observers;

- The PSO program will also consist of a continuous aerial survey conducted as approved by the Federal Aviation Administration (FAA). The blasting event shall be halted if an animal is spotted approaching or within the Exclusion Zone. An "all-clear" signal must be obtained from the aerial observer before detonation can occur. Note that all observers must give the "all-clear" signal before blasting can commence. The blasting event shall be halted immediately upon request of any of the observers. If animals are sighted, the blast event shall not take place until the animal moves out of the Exclusion Zone on its own volition. Animals shall not be herded away or harassed into leaving. Specifically, the animals must not be intentionally approached by project watercraft. Blasting may only commence when 30 minutes have passed without an animal being sighted within or approaching the Exclusion Zone or Level A Take Zone;
- If multiple blast events take place in one day, blast events shall be separated by a minimum of six hours;
- After each blast, the observers and contractors shall meet and evaluate any problems encountered during blasting events and logistical solutions shall be presented to the Contracting Officer. Corrections to the watch shall be made prior to the next blasting event. If any one of the aforementioned conditions (bullet points directly above) is not met prior to or during the blasting, the contractor as advised by the watch observers shall have the authority to terminate the blasting event, until resolution can be reached with the Contracting Officer. The USACE will contact FWC, USFWS and NMFS;
- If an injured or dead protected species is sighted after the blast event, the watch observers shall contact the USACE and the USACE will contact the resource agencies at the following phone numbers:

- FWC through the Manatee Hotline: 1-888-404-FWCC and 850-922-4300;
- USFWS Jacksonville: 904-731-3336;
- NMFS Southeast Region: 772-570-5312, and Emergency Stranding Hotline – 1-877-433-8299.

- The observers shall maintain contact with the injured or dead protected species to the greatest extent practical until authorities arrive. Blasting shall be postponed until consultations are completed and determinations can be made of the cause of injury or mortality. If blasting injuries are documented, all demolition activities shall cease. The USACE will then submit a revised plan to FWC, NMFS and USFWS for review.

Based on our evaluation of the applicant's proposed measures, NMFS has preliminarily determined that the proposed mitigation measures provide the means effecting the least practicable impact on the affected species or stocks and their habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance.

Proposed Monitoring and Reporting

In order to issue an IHA for an activity, Section 101(a)(5)(D) of the MMPA states that NMFS must set forth requirements pertaining to the monitoring and reporting of such taking. The MMPA implementing regulations at 50 CFR 216.104 (a)(13) indicate that requests for authorizations must include the suggested means of accomplishing the necessary monitoring and reporting that will result in increased knowledge of the species and of the level of taking or impacts on populations of marine mammals that are expected to be present in the proposed action area. Effective reporting is critical both to compliance as well as ensuring that the most value is obtained from the required monitoring.

Monitoring and reporting requirements prescribed by NMFS should contribute to improved understanding of one or more of the following:

- Occurrence of marine mammal species or stocks in the area in which take is anticipated (*e.g.*, presence, abundance, distribution, density);
- Nature, scope, or context of likely marine mammal exposure to potential stressors/impacts (individual or cumulative, acute or chronic), through better understanding of: (1) action or environment (*e.g.*, source characterization, propagation, ambient noise); (2) affected species (*e.g.*, life history, dive patterns); (3) co-occurrence of marine mammal species with the action; or (4) biological or behavioral context of exposure (*e.g.*, age, calving or feeding areas);
- Individual marine mammal responses (behavioral or physiological) to acoustic stressors (acute, chronic, or cumulative), other stressors, or cumulative impacts from multiple stressors;
- How anticipated responses to stressors impact either: (1) long-term fitness and survival of individual marine mammals; or (2) populations, species, or stocks;
- Effects on marine mammal habitat (*e.g.*, marine mammal prey species, acoustic habitat, or other important physical components of marine mammal habitat); and
- Mitigation and monitoring effectiveness.

With some exceptions, the USACE will rely upon the same monitoring protocol developed for the Port of Miami project in 2005 (Barkaszi, 2005) and published in Jordan *et al*., 2007. A summary of that protocol is summarized here.

A watch plan will be formulated based on the required monitoring radii and optimal observation locations. The watch plan will consist of at least six observers

including at least one (1) aerial observer, two (2) boat-based observers, and two (2) observers stationed on the drill barge (Figures 12, 13, 14, & 15). The 6th observer will be placed in the most optimal observation location (boat, barge or aircraft) on a day-by-day basis depending on the location of the blast and the placement of dredging equipment. There shall also be one lead observer. This process will insure complete coverage of the three zones as well as any critical areas. The watch will begin at least 1 hour prior to each blast and continue for one half-hour after each blast (Jordan *et al* 2007).

Boat-based observers will be placed on vessels with viewing platforms. The boat observers will cover the Level B Take Zone where waters are deep enough to safely operate the vessel. The aerial observer will fly in a helicopter with doors removed at an average height of 500 ft. The helicopter will drop lower if they need to identify something in the water. This will provide maximum visibility of all zones as well as exceptional maneuverability and the needed flexibility for continual surveillance without fuel stops or down time, and the ability to deliver post-blast assistance. The area being monitored is a high traffic area, surrounded by an urban environment where animals are potentially exposed to multiple overflights daily, and prior experience has shown that this activity is not anticipated to result in take of marine mammals in the area.

As previously stated, blasting cannot commence until the entire Level A Take Zone, Exclusion Zone, and Level B Take Zone are visible to monitors, and would not commence in rain, fog, or other adverse weather conditions. The visibility below the surface of the water is naturally poor, so animals are not anticipated to be seen below the surface. However, animals surfacing in these turbid conditions are still routinely spotted from the air and from the boats, thus the overall observer program is not compromised,

only the degree to which animals are tracked below the surface. Observers must confirm that all protected species are out of the Exclusion Zone and the Level A Take Zone for 30 minutes before blasting can commence.

All observers will be equipped with marine-band VHF radios, maps of the blast zone, polarized sunglasses, and appropriate data sheets. Communications among observers and with the blaster is critical to the success of the watch plan. The aerial observer will be in contact with vessel and drill-barge based observers as well as the drill barge crew with regular 15-minute radio checks throughout the watch period. Constant tracking of animals spotted by any observer will be possible due to the amount and type of observer coverage and the communications plan. Watch hours will be restricted to between two hours after sunrise and one hour before sunset. The watch will begin at least one hour prior to the scheduled blast and is continuous throughout the blast. Watch continues for at least 30 minutes post blast at which time any animals that were seen prior to the blast are visually re-located whenever possible and all observers in boats and in the aircraft assisted in cleaning up any blast debris.

If any protected species are spotted during the watch, the observer will notify the lead observer, aerial observer, and/or the other observers via radio. The animal will be located by the aerial observer to determine its range and bearing from the blast pattern. Initial locations and all subsequent observations will be plotted on maps. Animals within or approaching the Exclusion Zone will be tracked by the aerial and boat based observers until they exit the Exclusion Zone. As stated earlier, animals that exit the Exclusion Zone and enter the Level B Take Zone will also be monitored. The animal's heading shall be monitored continuously until it is confirmed beyond the Level B Take Zone. Anytime

animals are spotted near the Exclusion Zone, the drill barge and lead observer will be alerted as to the animal's proximity and some indication of any potential delays it might cause.

If an animal is spotted inside the Exclusion Zone and not re-observed, no blasting will be authorized until at least 30 minutes has elapsed since the last sighting of that animal. The watch will continue its countdown up until the T-minus five (5) minute point. At this time, the aerial observer will confirm that all animals are outside the Exclusion Zone and that all holds have expired prior to clearing the drill barge for the T-minus five (5) minute notice. A fish-scare charge will be fired at T-minus five (5) minutes and T-minus one (1) minute to minimize effects of the blast on fish that may be in the area of the blast pattern by scaring them from the blast area.

An actual postponement in blasting will only occur when a protected species is located within or is approaching the Exclusion Zone at the point where the blast countdown reaches the T-minus five (5) minutes. At that time, if an animal is in or near the Exclusion Zone, the countdown will be put on hold until the Exclusion Zone is completely clear of protected species and all 30-minute sighting holds have expired.

Within 30 days after completion of all blasting events, the primary PSO shall submit a report to the USACE, who will provide it to FWC, NMFS and USFWS providing a description of the event, number and location of animals seen and what actions were taken when animals were seen. Any problems associated with the event and suggestions for improvements shall also be documented in the report.

Negligible Impact Analysis and Determination

NMFS has defined negligible impact 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 (50 CFR 216.103). A negligible impact finding is based on the lack of likely adverse effects on annual rates of recruitment or survival (*i.e.*, population-level effects). An estimate of the number of 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 harassment, NMFS considers other factors, such as the likely nature of any responses (*e.g.*, intensity, duration), the context of any responses (*e.g.*, critical reproductive time or location, migration), as well as effects on habitat, and the likely effectiveness of the mitigation. We also assess the number, intensity, and context of estimated takes by evaluating this information relative to population status. Consistent with the 1989 preamble for NMFS's implementing regulations (54 FR 40338; September 29, 1989), the impacts from other past and ongoing anthropogenic activities are incorporated into this analysis via their impacts on the environmental baseline (*e.g.*, as reflected in the regulatory status of the species, population size and growth rate where known, ongoing sources of human-caused mortality, or ambient noise levels).

For reasons stated previously in this document, the specified activities associated with the USACE's confined blasting activities in the East Channel of Big Bend Channel, Tampa Harbor are not likely to cause PTS, or other non-auditory injury, gastro-intestinal injury, lung injury, serious injury, or death to affected marine mammals. As a result, no take by injury, serious injury, or death is anticipated or authorized, and the potential for

temporary or permanent hearing impairment is very low and would be minimized through the incorporation of the required monitoring and mitigation measures.

Approximately 244 instances of take to some smaller number of Atlantic bottlenose dolphins from the Tampa Bay Stock are anticipated to occur in the form of short-term, minor, hearing impairment (TTS) and associated behavioral disruption due to the instantaneous duration of the confined blasting activities. While some other species of marine mammals may occur in the Tampa Harbor, only common bottlenose dolphins are anticipated to be potentially impacted by the USACE's confined blasting activities.

For bottlenose dolphins within the proposed action area, there are no known designated or important feeding and/or reproductive areas in the proposed project area, which consists of a man-made channel with a history of maintenance dredging. Many animals perform vital functions, such as feeding, resting, traveling, and socializing, on a diel cycle (*i.e.*, 24-hour cycle). Behavioral reactions to noise exposure (such as disruption of critical life functions, displacement, or avoidance of important habitat) are more likely to be significant if they last more than one diel cycle or recur on subsequent days (Southall *et al*., 2007). Consequently, a behavioral response lasting less than one day and not recurring on subsequent days is not considered particularly severe unless it could directly affect reproduction or survival (Southall *et al*., 2007). The USACE's proposed confined blasting action at the Tampa Harbor, Big Bend Channel's East Channel includes up to two planned blasting events per day over multiple days; however, they are very short in duration and in a relatively small area surrounding the blast holes (compared to the range of the animals) located solely with the East Channel, and are only expected to potentially result in momentary exposures and reactions by marine mammals

in the proposed action area, which would not be expected to accumulate in a manner that would impact reproduction or survival.

Atlantic common bottlenose dolphins are the only species of marine mammals under NMFS jurisdiction that are likely to occur in the proposed action area. They are not listed as threatened or endangered under the ESA; however the BSE stocks are considered strategic under the MMPA. To reduce impacts on these stocks (and other protected species in the proposed action area), the USACE must delay operations if animals enter designated zones, and will not conduct blasting if any dolphins (or other protected species) are located within the East Channel. Due to the nature, degree, and context of the Level B harassment anticipated and described in this notice (see "Potential Effects on Marine Mammals and Their Habitat" section above), the activity is not expected to impact rates of recruitment or survival for any affected species or stock, particularly given NMFS's and USACE's plan to implement mitigation, monitoring, and reporting measures to minimize impacts to marine mammals. Also, the confined blasting activities are very short in duration and there are no known important areas in the USACE's proposed action area. Additionally, the proposed confined blasting activities would not adversely impact marine mammal habitat.

As mentioned previously, NMFS estimates that one species of marine mammals under its jurisdiction could be potentially affected by Level B harassment over the course of the IHA. The population estimates for the marine mammal species that may be taken by Level B harassment is estimated to be 564 individuals. To protect these marine mammals in the proposed action area, USACE would be required to cease or delay confined blasting activities if any marine mammals enters designated exclusion zone.

NMFS has preliminarily determined, provided that the aforementioned mitigation and monitoring measures are implemented, that the impact of conducting the confined blasting activities in the East Channel of the Big Bend Channel in the Tampa Harbor may result, at worst, in a temporary modification in behavior and/or low-level physiological effects (Level B harassment) of common bottlenose dolphins.

While behavioral modifications, including temporarily vacating the area immediately after confined blasting operations, may be made by these species to avoid the resultant underwater acoustic disturbance, alternate areas are available within this area and the confined blasting activities will be instantaneous and sporadic in duration. Due to the nature, degree, and context of Level B harassment anticipated, the proposed activity is not expected to impact rates of annual recruitment or survival of any affected species or stock, particularly given the NMFS and applicant's proposal to implement mitigation and monitoring measures that would minimize impacts to marine mammals. 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 proposed monitoring and mitigation measures, NMFS preliminarily finds that the total marine mammal take from USACE's proposed confined blasting operations would have a negligible impact on the affected marine mammal species or stocks.

In summary and as described above, the following factors primarily support our preliminary determination that the impacts resulting from this activity are not expected to adversely affect the species or stock through effects on annual rates of recruitment or survival:

- No mortality is anticipated or authorized;

- No injury is anticipated or authorized;
- Take is limited to Level B harassment, and would be expected to be mainly temporary and short-term behavioral disturbance and potential for a small number of TTS takes;
- The USACE's proposed confined blasting activities within the East Channel includes up to two planned blasting events per day over multiple days (up to a maximum of 42 blast events total), but these would be very short in duration and in a small area relative to the range of the animals; and
- While temporary short-term avoidance of the area may occur due to blasting activities, the proposed project area does not represent an area of known biological importance such that temporary avoidance would constitute an impact to the foraging, socialization, and resting activities of bottlenose dolphins.

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 proposed monitoring and mitigation measures, NMFS preliminarily finds that the total marine mammal take from the proposed activity will have a negligible impact on the affected marine mammal species or stocks.

Small Numbers

As noted above, only small numbers of incidental take may be authorized under Section 101(a)(5)(D) of the MMPA for specified activities other than military readiness activities. The MMPA does not define small numbers and so, in practice, where estimated numbers are available, NMFS compares the number of individuals taken to the most appropriate estimation of abundance of the relevant species or stock in our determination

of whether an authorization is limited to small numbers of marine mammals. Additionally, other qualitative factors may be considered in the analysis, such as the temporal or spatial scale of the activities.

As noted above, the number of instances of take proposed for authorization equates to approximately 43 percent of the estimated stock abundance if each instance represents a different individual marine mammal. However, as noted above, NMFS anticipates that the calculated number of exposures represents some repeated exposures of some individuals; in other words, the number of exposures is likely an overestimate of individuals. Urian *et al.* (2009) studied fine-scale population structure of bottlenose dolphins in Tampa Bay, and concluded that there are five discrete communities (that are not defined as separate stocks) of bottlenose dolphins in Tampa Bay. They found significant differences in location and association patterns among these communities and note that all five communities differed significantly in latitude, longitude, or both. Based on the range patterns of these discrete communities, only one of these communities, Community 5, is expected to occur in the USACE proposed project area. The other four communities range farther south of the proposed project location. In addition, Community 5 appeared to be the smallest community of the five identified communities. Therefore, we conclude that the takes associated with the USACE proposed confined blasting actually represents no more than 20 percent of the total Tampa Bay stock of bottlenose dolphins.

Based on the analysis contained herein of the proposed activity (including the proposed mitigation and monitoring measures) and the anticipated take of marine

mammals, NMFS preliminarily finds that small numbers of marine mammals will be taken relative to the population size of the affected species or stocks.

Unmitigable Adverse Impact Analysis and Determination

There are no relevant subsistence uses of the affected marine mammal stocks or species 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)

Section 7(a)(2) of the Endangered Species Act of 1973 (ESA: 16 U.S.C. 1531 *et seq*.) requires that each Federal agency insure that any action it authorizes, funds, or carries out is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of designated critical habitat. To ensure ESA compliance for the issuance of IHAs, NMFS consults internally, in this case with the NMFS Southeast Region (SERO) Protected Resources Division Office, whenever we propose to authorize take for endangered or threatened species.

No incidental take of ESA-listed species is proposed for authorization or expected to result from this activity. Therefore, NMFS has determined that formal consultation under section 7 of the ESA is not required for this action.

Proposed Authorization

As a result of these preliminary determinations, NMFS proposes to issue an IHA to USACE for conducting confined blasting activities within the East Channel of the Big Bend Channel, located in the Tampa Harbor, Hillsborough Bay (part of Tampa Bay). The

proposed IHA will be valid from April 1, 201 through March 31, 2020, but blasting activities shall only occur April 1 through October 31 annually, provided the previously mentioned mitigation, monitoring, and reporting requirements are incorporated. This section contains a draft of the IHA itself. The wording contained in this section is proposed for inclusion in the IHA (if issued):

U.S. Army Corps of Engineers, Jacksonville District, P.O. Box 4970, Jacksonville, Florida (FL) 32232, is hereby authorized under section 101(a)(5)(D) of the Marine Mammal Protection Act (MMPA) (16 U.S.C. 1371(a)(5)(D)), to harass small numbers of marine mammals incidental to blasting operations in the East Channel of the Big Bend Channel as part of the Tampa Harbor Big Bend Channel Expansion Project in Hillsborough Bay (part of Tampa Bay) in Hillsborough County, Florida:

1. This Authorization is valid from April 1, 2019, through March 31, 2020, but blasting may occur only between April 1 and October 31, annually unless the U.S. Fish and Wildlife Service (USFWS) grants an extension of the blasting period.

2. This Authorization is valid only for the U.S. Army Corps of Engineers (USACE) activities associated with the blasting within the East Channel of the Big Bend Channel in the Tampa Harbor in Hillsborough County, Florida.

3. Species Authorized and Level of Takes

(a) The incidental taking of marine mammals, by Level B harassment only, is limited to the following species in the waters of Hillsborough Bay (part of Tampa Bay) and the Atlantic Ocean:

(i) Odontocetes – 244 takes from the Tampa Bay Stock of Atlantic bottlenose dolphin (*Tursiops truncatus*).

(ii) If any marine mammal species under NMFS jurisdiction other than bottlenose dolphin are encountered during blasting operations and are likely to be exposed to sound thresholds equal to or greater than Level B harassment, then the Holder of this Authorization must delay or suspend blasting operations to avoid take.

(b) The taking by injury (Level A harassment), serious injury, or death of any of the species listed in Condition 3(a) above or the taking of any kind of any other species of marine mammal is prohibited and may result in the modification, suspension or revocation of this Authorization.

4. The methods authorized for taking by Level B harassment are limited to explosives with a maximum charge weight per delay of 40 lb (18.1 kg)

5. The taking of any marine mammal in a manner prohibited under this Authorization must be reported immediately to the Office of Protected Resources, National Marine Fisheries Service (NMFS), at 301-427-8401.

6. Mitigation and Monitoring Requirements

The Holder of this Authorization is required to implement the following mitigation and monitoring requirements when conducting the specified activities to achieve the least practicable impact on affected marine mammal species or stocks:

(a) The USACE must ensure that the Florida Fish and Wildlife Conservation Commission (FWC), the U.S. Fish and Wildlife Service (USFWS), and NMFS (Headquarters Protected Resources Division and SERO Protected Resources) are provided the contractor's approved blasting plan for review prior to any blasting activities. This blasting proposal must include information concerning a watch program

and details of the blasting events. This information must be submitted at least 30 days prior to the proposed date of the blast(s) to the following addresses:

(i) FWC-ISM

620 South Meridian Street

Mail Stop 6A

Tallahassee, FL 32399-1600 or

ImperiledSpecies@myfwc.com and Dr. Allen Foley *allen.foley@myfwc.com*

(ii) NMFS Office of Protected Resources

1315 East West Highway

Silver Spring, MD 20910

(iii) NMFS Southeast Regional Office (SERO)

Protected Species Management Branch

263 13th Avenue South

St. Petersburg, FL 33701, and

(iv) USFWS

1339 20th Street

Vero Beach, FL 32960-3559

(b) The contractor's blasting plan shall include at least the following information:

(i) A list of Protected Species Observers (PSOs), their qualifications, and positions for the watch, including a map depicting the proposed locations for boat or land-based PSOs. NMFS-qualified PSOs must have prior on-the-job experience observing for marine mammals and other protected species during previous in-water

blasting events where the blasting activities were similar in nature to the blasting project in the Tampa Harbor.

(ii) The amount of explosive charge proposed, the explosive charge's equivalency in TNT, how it will be executed (depth of drilling, stemming, in-water, etc.), a drawing depicting the placement of the charges, size of the exclusion zone, and how it will be marked (also depicted on a map), tide tables for the blasting event(s), and estimates of times and days for blasting events (with an understanding this is an estimate, and may change due to weather, equipment, etc.).

(c) The USACE shall notify SERO (Ms. Laura Engleby, Marine Mammal Branch Chief, *nmfs.ser.research.notification@noaa.gov*) and FWC (Dr. Allen Foley, *allen.foley@myfwc.com*) at the initiation and completion of all in-water blasting.

(d) A test blast program shall be completed prior to implementing a construction blasting program. The test blast program shall have all the same monitoring and mitigation measures in place for marine mammals and other protected species (see below).

(e) The weight of explosives to be used in each blast shall be limited to the lowest poundage of explosives that can adequately break the rock.

(f) The explosives shall be confined in a hole with drill patterns (*i.e.*, holes in the pattern) that are restricted to a minimum of 8 ft (2.4 m) separation from a loaded hole.

(g) The hours of blasting shall be restricted from two hours after sunrise to one hour before sunset to ensure adequate observation of marine mammals in the project area.

(h) Select explosive products and their practical application method to address vibration and air blast (overpressure) control for protection of existing structures and marine wildlife.

(i) Loaded blast holes shall be individually delayed to reduce the maximum lbs per delay at point detonation (in order to spread the explosive's total pressure over time), which in turn will reduce the mortality radius. Delay timing adjustments with a minimum of eight milliseconds (ms) between delay detonations to stagger the blast pressures and prevent cumulative addition of pressures in the water.

(j) The USACE shall require the contractor to cap the hole containing explosives with rock in order to spread the explosive's outward potential of the blast and total overpressure over time, thereby reducing the chance of injuring a marine mammal or other protected species.

(k) The blast design shall match, to the extent possible, the energy needed in the "work effort" of the borehole to the rock mass to minimize excess energy vented into the water column or hydraulic shock.

(l) Due to USFWS requirements, blasting operations shall not occur during the period from November 1 through March 31(due to the increased likelihood of manatees (*Trichechus manatus latirostris*) being present within the project area).

(m) Calculate, establish, and monitor a Level A Take Zone (equal to the PTS injury zone), Exclusion (*i.e.*, the Level A Take Zone plus 500 ft [152.4 m], and a Level B Take Zone (extending from the Exclusion Zone to the Level B Take Zone radius). All of the zones shall be noted by buoys for each of the blasts.

(n) The watch program shall begin at least one hour prior to the schedule start of blasting to identify the possible presence of marine mammals and is continuous throughout the blast. The watch program shall continue for at least 30 minutes after detonations are complete.

(o) The watch program shall consists of a minimum of six NMFS-qualified PSOs (at least one aerial-based PSO, two boat-based PSOs, two drill barge-based PSOs, and one PSO placed in the most optimal observation location on a day-by-day basis depending on the location of the blast and the placement of dredging equipment). NMFS-qualified PSOs must be approved in advance by NMFS's Office of Protected Resources, to record the effects of the blasting and dredging activities and the resulting noise on marine mammals. Each PSO shall be equipped with a two-way marine-band VHF radio that shall be dedicated exclusively to the watch. Extra radios shall be available in case of failures. All of the PSOs shall be in close communication with the blasting sub-contractor in order to half the blast event if the need arises. If all PSOs do not have working radios and cannot contact the primary PSO and the blasting sub-contractor during the pre-blast watch, the blast shall be postponed until all PSOs are in radio contact. PSOs shall be equipped with polarized sunglasses, binoculars, a red flag for back-up visual communication, and appropriate data sheets (*i.e.*, a sighting log with a map) to record sightings and other pertinent data. All blasting events are weather dependent and conditions must be suitable for optimal viewing conditions to be determined by the PSOs.

(p) The watch program shall include a continuous aerial survey to be conducted by aircraft, as approved by the Federal Aviation Administration. The aerial-based PSO is in contact with vessel and drill barge-based PSOs and the drill barge with

regular 15-minute radio checks through the watch period. The aerial PSO shall fly in a turbine engine helicopter with the doors removed to provide maximum visibility of the zones.

(q) Boat-based PSOs shall be placed on one of two vessels, both of which have attached platforms that place the PSOs eyes at least 10 ft (3 m) above the water surface enabling optimal visibility of the water from the vessels. The boat-based PSOs cover the Exclusion Zone and Level B Take Zone where waters are deep enough to safely operate.

(r) If any marine mammals are spotted during the watch, the PSO shall notify the aerial-based PSO and/or other PSOs via radio. The animal(s) shall be located by the aerial-based PSO to determine its range and bearing from the blast pattern. Initial locations and all subsequent re-acquisitions shall be plotted on maps. Animals within or approaching the Exclusion Zone are tracked by the aerial and boat-based PSOs until they have exited the Exclusion Zone, the drill barge shall be alerted as to the animal's proximity and some indication of any potential delays it might cause.

(s) If any animal(s) is sighted inside the Exclusion Zone or Level A Take Zone and not re-acquired, no blasting is authorized until at least 30 minutes has elapsed since the last sighting of that animal(s). The PSOs on watch shall continue the countdown up until the T-minus five minutes point. At this time, the aerial-based PSO confirms that all animals are outside the Exclusion Zone and Level A Take Zone and that all holds have expired prior to clearing the drill barge for the T-minus five minutes notice.

(t) The blasting event shall be halted immediately upon request of any of the PSOs. An “all clear” signal must be obtained from the aerial PSO before the detonation can occur.

(u) If animals are sighted, the blast event shall not take place until the animal moves out of the Exclusion Zone under its own volition. Animals shall not be herded away or harassed into leaving. Specifically, the animals must not be intentionally approached by project watercraft. Blasting may only commence when 30 minutes has passed without an animal being sighted within, or approaching, the Exclusion Zone or Level A Take Zone.

(v) After the blast, any animal(s) seen prior to the blast are visually relocated whenever possible.

(w) The PSOs and contractors shall evaluate any problems encountered during blasting events and logistical solutions shall be presented to the Contracting Officer. Corrections to the watch shall be made prior to the next blasting event. If any one of the aforementioned conditions is not met prior to or during the blasting, the watch PSOs shall have the authority to terminate the blasting event. If any one of the aforementioned conditions is not met prior to or during the blasting, the watch PSOs shall have the authority to terminate the blasting event, until resolution can be reached with the Contracting Officer.

(x) A fish-scare charge shall be fired at T-minus five minutes and T-minus one minute to minimize effects of the blast on fish that may be in the same area of the blast pattern by scaring them from the blast area.

(y) The Contractor shall use hydrophones to record the SEL and SPL associated with up to 42 confined blasting events. The Contractor shall also record the associated work (including borehole drilling and fish scare charges) as separate recordings. The Contractor shall provide nearby hydrophone records of drilling operation of 30 minutes over three early contract periods at least 18 hours apart. The Contractor shall provide hydrophone or transducer records within the contract area of three 10-minute quiet periods (not necessarily continuous) over three early contract periods at least 18 hours apart or prior to the contractor's full mobilization to the site, and 10 close-approaches of varied vessel sizes. Information to be provided as both an Excel file and recording for each hydrophone (.wav file) shall include:

- GPS location of the hydrophone aboard the vessel. The hydrophone shall be located outside of the range that would cause clipping (overloading of the hydrophone, causing the absolute peaks to be lost).
- Water depth to the sediment/rock bottom. The hydrophone shall be placed at the shallower of 3 m (9.84 ft, or 9 ft, 10 inches) depth or the mid-water column depth.
- Information provided by the Blasting Contractor regarding the blast pattern or drilling. The minimum data shall include, as appropriate for blast shots or drilling; the date, time and blast number of the shot; the average water depth of the shot pattern or the average depth to sediment/rock at the nearest five shot holes closest to the hydrophone location; GPS location of the closest shot hole in the blast pattern to the hydrophone; the maximum charge weight per delay of the shot pattern in pounds of explosives; and the largest charge weight per delay of the closest delay sequence to the hydrophone.

7. Reporting Requirements

The Holder of this Authorization is required to:

(a) Submit a draft report on all activities and monitoring results to the Chief of the Permits and Conservation Division, Office of Protected Resources, NMFS, within 90 days after completion of the demolition and removal activities. This report must contain and summarize the following information:

(i) Dates, times, locations, weather, sea conditions during all blasting activities and marine mammal sightings;

(ii) Species, number, location, distance, and behavior of any marine mammals, as well as associated blasting activities, observed before, during, and after blasting activities.

(iii) An estimate of the number (by species) of marine mammals that may have been taken by Level B harassment during the blasting activities with a discussion of the nature of the probably consequences of that exposure on the individuals that have been exposed. Describe any behavioral responses or modifications of behaviors that may be attributed to the blasting activities.

(iv) A description of the implementation and effectiveness of the monitoring and mitigation measures of the Incidental Harassment Authorization as well as any additional conservation recommendations.

(b) Submit a final report to the Chief, Permits and Conservation Division, Office of Protected Resources, NMFS, within 30 days after receiving comments from NMFS on the draft report. If NMFS decides that the draft report needs no comments, the draft report shall be considered to be the final report.

(c) In the unanticipated event that the specified activity clearly causes the take of a marine mammal in a manner prohibited by this IHA, such as an injury, serious injury or mortality, USACE shall immediately cease the specified activities and immediately report the incident to the Chief of the Permits and Conservation, Office of Protected Resources and the NMFS Southeast Region Marine Mammal Stranding Network. The report must include the following information:

(i) Time, date, and location (latitude/longitude) of the incident; description of the incident; status of all noise-generating source use in the 24 hours preceding the incident; water depth; environmental conditions (*e.g.*, wind speed and direction, Beaufort sea state, cloud cover, and visibility); description of all marine mammal observations in the 24 hours preceding the incident; species identification or description of the animal(s) involved; fate of the animal(s); and photographs or video footage of the animal(s) (if equipment is available).

Activities shall not resume until NMFS is able to review the circumstances of the prohibited take. NMFS shall work with USACE to determine what is necessary to minimize the likelihood of further prohibited take and ensure MMPA compliance. USACE may not resume their activities until notified by NMFS via letter or email, or telephone.

In the event that USACE discovers an injured or dead marine mammal, and the lead PSO determines that the cause of the injury or death is unknown and the death is relatively recent (*i.e.*, in less than a moderate state of decomposition as described in the next paragraph), USACE shall immediately report the incident to the Chief of the Permits and Conservation Division, Office of Protected Resources and the NMFS Southeast

Region Marine Mammal Stranding Network. The report must include the same information identified in the paragraph above. Activities may continue while NMFS reviews the circumstances of the incident. NMFS will work with USACE to determine whether modifications in the activities are appropriate.

In the event that USACE discovers an injured or dead marine mammal, and the lead PSO determines that the injury or death is not associated with or related to the activities authorized in the IHA (*e.g.*, previously wounded animal, carcass with moderate to advanced decomposition, or scavenger damage), USACE shall report the incident to the Chief of the Permits and Conservation Division, Office of Protected Resources and the NMFS Southeast Region Marine Mammal Stranding Network within 24 hours of discovery. USACE shall provide photographs or video footage (if available) or other documentation of the stranded animal sighting to NMFS and the Marine Mammal Stranding Network.

8. To the greatest extent feasible, USACE is encouraged to coordinate its monitoring studies on the distribution and abundance of marine mammals in the project area with the NMFS's Southeast Fisheries Science Center, USFWS, and any other state or Federal agency conducting research on marine mammals. Also, report to NMFS and USFWS any chance observations of marked or tag-bearing marine mammals or carcasses, as well as any rare or unusual species of marine mammals.

9. A copy of this Authorization must be in the possession of all contractors and PSOs operating under the authority of this Incidental Harassment Authorization.

Request for Public Comments

We request comment on our analyses, the draft authorization, and any other aspect of this Notice of Proposed IHA for the proposed confined blasting activities within the East Channel of the Big Bend Channel, Tampa Harbor. Please include with your comments any supporting data or literature citations to help inform our final decision on the request for MMPA authorization.

Dated: March 14, 2018.

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Donna S. Wieting,

Director, Office of Protected Resources,

National Marine Fisheries Service.

[FR Doc. 2018-05504 Filed: 3/16/2018 8:45 am; Publication Date: 3/19/2018]