

Appendix A

Incidental Harassment Authorization

Issued 25 November 2013



UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Silver Spring, MD 20910

Captain W.R. McCall
Commanding Officer
Naval Station Mayport
P.O. 280112
Jacksonville, FL 32228-0112

NOV 25 2013

Dear Captain McCall,

Enclosed is an Incidental Harassment Authorization (IHA), issued pursuant to Section 101(a)(5)(D) of the Marine Mammal Protection Act, to take small numbers of marine mammals, by Level B harassment only, incidental to work associated with the Navy's Wharf C-2 Recapitalization project at Naval Station Mayport, FL.

You are required to comply with the conditions contained in the IHA, including all mitigation, monitoring and reporting requirements. Along with mitigation measures to be incorporated, the IHA requires monitoring for the presence and behavior of marine mammals prior to, during, and after all pile driving events.

If you have any questions concerning the IHA or its requirements, please contact Ben Laws, Office of Protected Resources, at 301-427-8425.

Sincerely,

Donna S. Wieting,
Director,
Office of Protected Resources,
National Marine Fisheries Service.

Enclosure





INCIDENTAL HARASSMENT AUTHORIZATION

The U.S. Navy (Navy), Naval Station Mayport, Florida, 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 marine mammals incidental to the Wharf C-2 Recapitalization Project at Mayport, FL.

1. This Incidental Harassment Authorization (IHA) is valid from December 1, 2013 through November 30, 2014.
2. This IHA is valid only for pile driving activities associated with the Wharf C-2 Recapitalization Project at Naval Station Mayport, Florida.
3. General Conditions
 - (a) A copy of this IHA must be in the possession of the Navy, its designees, and work crew personnel operating under the authority of this IHA.
 - (b) The species authorized for taking are the bottlenose dolphin (*Tursiops truncatus truncatus*) and the Atlantic spotted dolphin (*Stenella frontalis*).
 - (c) The taking, by Level B harassment only, is limited to the species listed in condition 3(b). See Table 1 (attached) for numbers of take authorized.
 - (d) The taking by injury (Level A harassment), serious injury, or death of any of the species listed in item 3(b) of the Authorization or any taking of any other species of marine mammal is prohibited and may result in the modification, suspension, or revocation of this IHA.
 - (e) The Navy shall conduct briefings between construction supervisors and crews, marine mammal monitoring team, acoustical monitoring team, and Navy staff prior to the start of all pile driving activity, and when new personnel join the work, in order to explain responsibilities, communication procedures, marine mammal monitoring protocol, and operational procedures.

4. Mitigation Measures

In order to ensure the least practicable impact on the species listed in condition 3(b), the holder of this Authorization is required to implement the following mitigation measures:

- (a) The Navy shall implement shutdown zones sufficient to encompass the estimated distances to the 180 dB rms (re 1 μ Pa) threshold for cetaceans, in order to prevent unauthorized Level A harassment. The minimum shutdown zone for all pile driving shall be of 15 m radius. If a marine mammal comes within these zones, operations shall cease. For impact driving, the minimum shutdown zone shall be of 40 m radius.

- (b) The Navy shall establish monitoring locations as described below. Please also refer to the Marine Mammal Monitoring Plan (Monitoring Plan; attached).
- (i) For all pile driving activities, a minimum of two observers shall be deployed, with one positioned to achieve optimal monitoring of the shutdown zone and the second positioned to achieve optimal monitoring of surrounding waters of the turning basin, the entrance to that basin, and portions of the Atlantic Ocean. If practicable, the second observer should be deployed to an elevated position, preferably opposite Wharf C-2 and with clear sight lines to the wharf and out the entrance channel.
 - (ii) For three of the days on which vibratory pile driving activities are conducted, a third observer shall be positioned for visual observation of waters outside the turning basin, including the entrance to that basin and portions of the Atlantic Ocean that are within the predicted area of ensonification and are visible with binoculars and the naked eye.
 - (iii) These observers shall record all observations of marine mammals, regardless of distance from the pile being driven, as well as behavior and potential behavioral reactions of the animals. Observations within the turning basin shall be distinguished from those in the entrance channel and nearshore waters of the Atlantic Ocean.
 - (iv) All observers shall be equipped for communication of marine mammal observations amongst themselves and to other relevant personnel (e.g., those necessary to effect activity delay or shutdown).
- (c) Monitoring shall take place from 15 minutes prior to initiation of pile driving activity through 30 minutes post-completion of pile driving activity. Pre-activity monitoring shall be conducted for 15 minutes to ensure that the shutdown zone is clear of marine mammals, and pile driving may commence when observers have declared the shutdown zone clear of marine mammals. In the event of a delay or shutdown of activity resulting from marine mammals in the shutdown zone, animals shall be allowed to remain in the shutdown zone (i.e., must leave of their own volition) and their behavior shall be monitored and documented. Monitoring shall occur throughout the time required to drive a pile. The shutdown zone must be determined to be clear during periods of good visibility (i.e., the entire shutdown zone and surrounding waters must be visible to the naked eye).
- (d) If a marine mammal approaches or enters the shutdown zone, all pile driving activities at that location shall be halted. If pile driving is halted or delayed due to the presence of a marine mammal, the activity may not commence or resume until either the animal has voluntarily left and been visually confirmed beyond the shutdown zone or 15 minutes have passed without re-detection of the animal.
- (e) Monitoring shall be conducted by qualified observers, as described in the Monitoring Plan. Trained observers shall be placed from the best vantage point(s) practicable to monitor for marine mammals and implement shutdown or delay procedures when applicable through communication with the equipment operator.

Observer training must be provided prior to project start and in accordance with the monitoring plan, and shall include instruction on species identification (sufficient to distinguish the species listed in 3(b)), description and categorization of observed behaviors and interpretation of behaviors that may be construed as being reactions to the specified activity, proper completion of data forms, and other basic components of biological monitoring, including tracking of observed animals or groups of animals such that repeat sound exposures may be attributed to individuals (to the extent possible).

- (f) The Navy shall use soft start techniques recommended by NMFS for impact pile driving. The soft start requires contractors to provide an initial set of strikes from the impact hammer at reduced energy, followed by a 30-second waiting period, then two subsequent reduced energy strike sets. Soft start shall be implemented at the start of each day's impact pile driving and at any time following cessation of impact pile driving for a period of 30 minutes or longer.
- (g) Pile driving shall only be conducted during daylight hours.

5. Monitoring

The holder of this Authorization is required to conduct acoustic and marine mammal monitoring during pile driving activity. Monitoring and reporting shall be conducted in accordance with the Monitoring Plan.

- (a) The Navy shall collect sighting data and behavioral responses to pile driving for marine mammal species observed in the region of activity during the period of activity. All observers shall be trained in marine mammal identification and behaviors, and shall have no other construction related tasks while conducting monitoring.
- (b) For all marine mammal monitoring, the information shall be recorded as described in the Monitoring Plan.
- (c) The Navy shall conduct acoustic monitoring for representative scenarios of pile driving activity. Minimum requirements are described in Section 5 of the Monitoring Plan.

6. Reporting

The holder of this Authorization is required to:

- (a) Submit a draft report on all monitoring conducted under the IHA within 90 days of the completion of marine mammal monitoring. A final report shall be prepared and submitted within 30 days following resolution of comments on the draft report from NMFS. This report must contain the informational elements described in the Monitoring Plan, at minimum (see attached), and shall also include:
 - (i) Detailed information about any implementation of shutdowns, including the distance of animals to the pile and description of specific actions that ensued and resulting behavior of the animal, if any.

- (ii) Description of attempts to distinguish between the number of individual animals taken and the number of incidences of take, such as ability to track groups within turning basin.
 - (iii) A refined take estimate based on the number of marine mammals observed during the course of construction activities.
- (b) Submit a report summarizing the acoustic monitoring data within 75 days of the completion of monitoring. A final report shall be prepared and submitted within 30 days following resolution of comments on the draft report from NMFS. This report must contain the informational elements described in the Monitoring Plan, at minimum (see attached).
- (c) Reporting injured or dead marine mammals:
 - (i) 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 (Level A harassment), serious injury, or mortality, Navy shall immediately cease the specified activities and report the incident to the Chief of the Permits and Conservation Division (301-427-8425), Office of Protected Resources, NMFS, and the Southeast Regional Stranding Coordinator (305-361-4586), NMFS. The report must include the following information:
 1. Time and date of the incident;
 2. Description of the incident;
 3. Environmental conditions (e.g., wind speed and direction, Beaufort sea state, cloud cover, and visibility);
 4. Description of all marine mammal observations in the 24 hours preceding the incident;
 5. Species identification or description of the animal(s) involved;
 6. Fate of the animal(s); and
 7. Photographs or video footage of the animal(s).

Activities shall not resume until NMFS is able to review the circumstances of the prohibited take. NMFS will work with Navy to determine what measures are necessary to minimize the likelihood of further prohibited take and ensure MMPA compliance. Navy may not resume their activities until notified by NMFS.

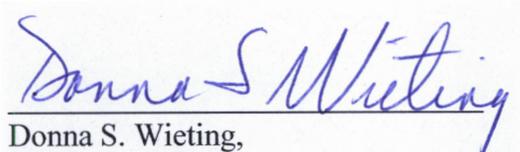
- (ii) In the event that Navy discovers an injured or dead marine mammal, and the lead observer determines that the cause of the injury or death is unknown and the death is relatively recent (e.g., in less than a moderate

state of decomposition), Navy shall immediately report the incident to the Chief of the Permits and Conservation Division, Office of Protected Resources, NMFS, and the Southeast Regional Stranding Coordinator, NMFS.

The report must include the same information identified in 6(b)(i) of this IHA. Activities may continue while NMFS reviews the circumstances of the incident. NMFS will work with Navy to determine whether additional mitigation measures or modifications to the activities are appropriate.

- (iii) In the event that Navy discovers an injured or dead marine mammal, and the lead observer 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), Navy shall report the incident to the Chief of the Permits and Conservation Division, Office of Protected Resources, NMFS, and the Southeast Regional Stranding Coordinator, NMFS, within 24 hours of the discovery. Navy shall provide photographs or video footage or other documentation of the stranded animal sighting to NMFS.

- 7. This Authorization may be modified, suspended or withdrawn if the holder fails to abide by the conditions prescribed herein, or if the authorized taking is having more than a negligible impact on the species or stock of affected marine mammals.


Donna S. Wieting,
Director, Office of Protected Resources,
National Marine Fisheries Service.

NOV 25 2013

Date

Table 1. Authorized take numbers, by species

Species	Authorized Take
Bottlenose dolphin (<i>Tursiops truncatus</i>)	365
Atlantic spotted dolphin (<i>Stenella frontalis</i>)	95

**MARINE MAMMAL MONITORING PLAN FOR
THE WHARF C-2 RECAPITALIZATION PROJECT
AT NAVSTA MAYPORT, FLORIDA**



Submitted to:

**Office of Protected Resources,
National Marine Fisheries Service,
National Oceanographic and Atmospheric Administration**

Prepared by:

**Naval Facilities Engineering Command Southeast
And
Naval Facilities Engineering Command Atlantic**

For:

Naval Station Mayport

June 2013

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ACRONYMS AND ABBREVIATIONS

C-2	Charlie Two (Wharf)
dB	decibel
EA	Environmental Assessment
ft.	foot / feet
IHA	Incidental Harassment Authorization
μPa	microPascal
m	meter
MMPA	Marine Mammal Protection Act
NAVSTA	Naval Station
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
POC	point of contact
Project	Wharf C-2 Recapitalization Project
RMS	root mean squared
SEL	sound exposure level
USFWS	U.S. Fish and Wildlife Service
ZOI	Zone of Influence

1.0 INTRODUCTION

1.1 Purpose of the Monitoring Plan

The purpose of this Monitoring Plan is to provide protocols for marine mammal monitoring during the proposed recapitalization of Wharf Charlie Two (C-2) at Naval Station (NAVSTA) Mayport, Florida (Figure 1-1). Recapitalization includes demolishing and replacing the existing concrete pile cap, wharf deck, and utilities and installation of a new steel king pile/sheet pile bulkhead around the existing wharf. This plan was developed to support the National Marine Fisheries (NMFS) Incidental Harassment Authorization (IHA) Application (U.S. Department of the Navy 2013).

Marine mammal monitoring will be conducted before, during, and after pile driving activities within the zones detailed in Section 2.3, and will represent an important minimization measure to reduce the likelihood of potential injury to marine mammals.

1.2 Scope and Timing

The scope of this Monitoring Plan includes pile driving activities that are necessary for the Wharf C-2 recapitalization project (Project). Sea turtles and smalltooth sawfish (as practicable) will be included in monitoring efforts. However, for the purposes of this submittal to NMFS in support of compliance with the Marine Mammal Protection Act (MMPA), the scope of monitoring in this document is limited to marine mammals. Marine mammal monitoring would be integrated with other marine environmental monitoring if it is required as a result of the Navy's National Environmental Policy Act (NEPA) project review or as a condition of approval by other regulatory agencies.

This Monitoring Plan will be implemented when pile driving is taking place during the period of the requested IHA (September 2013 through September 2014) for the Project.

1.3 Management

The Monitoring Plan will be managed by Naval Facilities Engineering Command (NAVFAC) Southeast. Marine mammal monitoring will be carried out by private contractors supported by local technical staff from NAVFAC Southeast and NAVSTA Mayport. NAVFAC Southeast will also be responsible for preparation of the Monitoring Report for the IHA.

2.0 WHARF C-2 RECAPITALIZATION PROJECT

Refer to the Draft Environmental Assessment (EA) (U.S. Department of the Navy 2013a) and IHA Application (U.S. Department of the Navy 2013) for a full description of the Project.

2.1 Project Area

The project area is on the Atlantic coast of northern Florida, and includes the NAVSTA Mayport turning basin out to the limit of the most distant of the acoustic thresholds for all marine mammals being addressed for the Project (Figure 2-1). Underwater thresholds are based on criteria developed by NMFS (70 FR 1871; 74 FR 41684).

2.2 Activities to be Monitored

Activities that would be subject to marine mammal monitoring include the following:

- Vibratory pile driving of steel king and sheet piles necessary to construct a new steel sheet pile wall outside the existing bulkhead. Approximately 120 steel sheet pile pairs and 119 steel king piles will be installed with a vibratory driver.
- Vibratory installation of 50 polymeric (plastic) fender piles.
- Contingency-only impact installation of steel king and/or sheet piles. Impact driving would be seldom and brief, if it occurs at all, and would only be used if an unforeseen buried obstruction prevents vibratory installation.

Marine mammal monitoring will be performed to ensure in-water activities are stopped if animals occur within the zone of influence (ZOI) for potential injury or a standard 50 feet (ft.) buffer from pile driving activities (Figure 2-2). Monitoring methods are described in Section 3 of this document.

Table 2-1 summarizes the in-water pile driving activities scheduled to take place during the timeframe covered by the IHA, and descriptions of pile installation activities follow.

Table 2-1. Activity Summary at Wharf C-2

Activity/Method	# Days	Pile Type	# Piles Installed
Structural pile driving (vibratory)	45	King pile	119
		Sheet pile	120
Fender pile driving (vibratory)	5	Polymeric pile	50
Structural pile driving (contingency impact)	20	King and sheet	contingency only ¹
Total piles installed			289

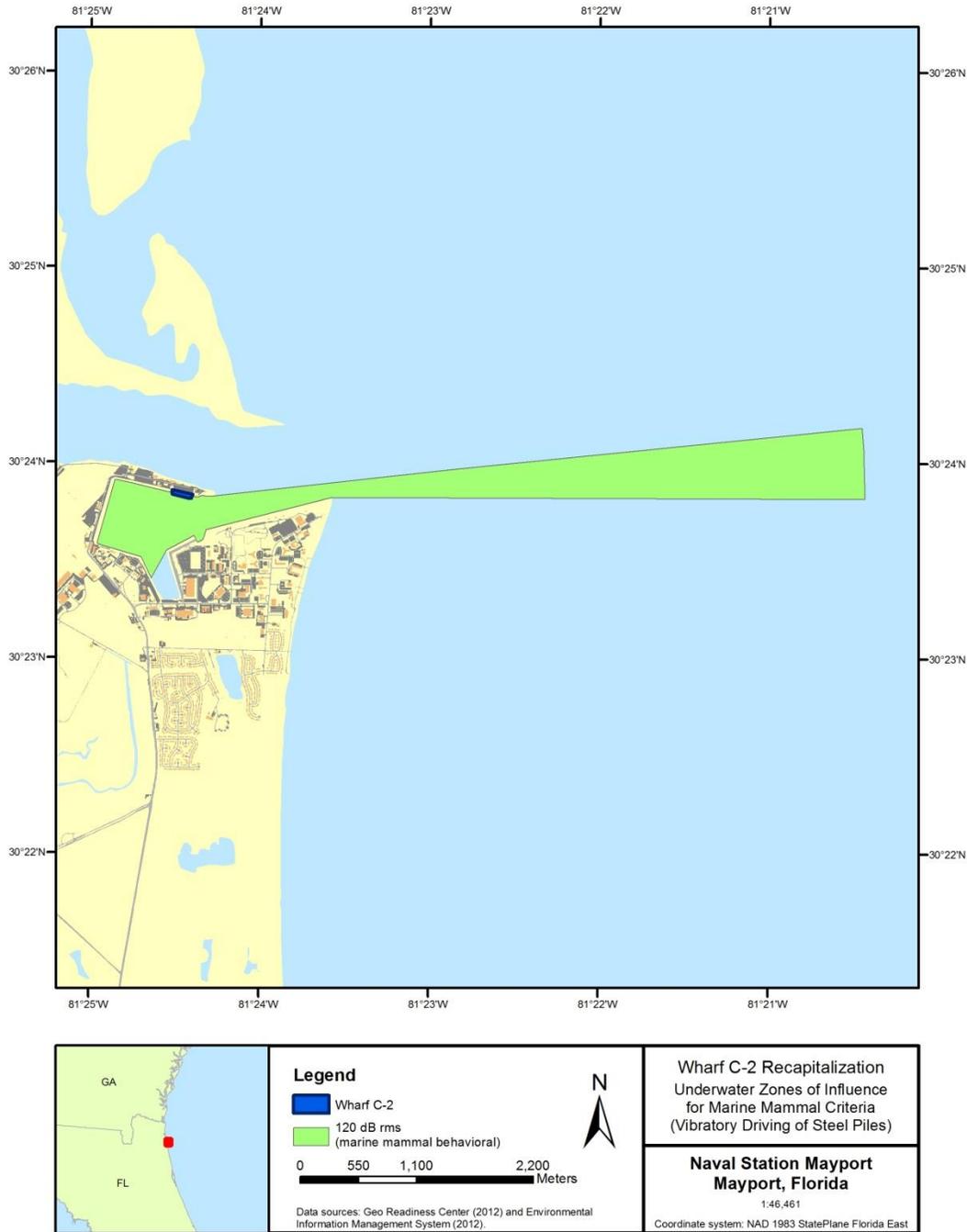
1 - A similar project that has been completed at adjacent Wharf Charlie One required impact pile driving on only seven piles.

Pile Installation

The acoustic analysis for vibratory pile driving used the assumption a maximum of three templates¹ (each consisting of five king piles and four sheet pile pairs) would be driven each day. Each pile is anticipated to require no more than 60 seconds to drive by vibratory methods. Impact pile driving would only be used as a contingency in cases when vibratory driving is insufficient (a similar project that has been completed at adjacent Wharf Charlie One required impact pile driving on only seven piles).

¹Templates are prefabricated or site constructed steel frames into which piles are set to hold piles in the proper position and alignment during driving (Hannigan 2011).

**Figure 2-1. Injury and Behavioral Zones of Influence for Marine Mammals¹ –
Vibratory Driving of Steel King and Sheet Piles**



1 - Official criteria have not been established for West Indian manatees. The Navy's IHA application, Appendix C – Standards Manatee Conditions for In-Water Work, cover standards of practice promulgated by The U.S. Fish and Wildlife Service (USFWS) for manatees.

Monitoring and Shutdown Zones

Table 2-2 lists the monitoring and shutdown zones, and measures associated with the occurrences of a marine mammal in each zone. For all in-water construction and demolition activities, a minimum protective shutdown zone of 15 m (50 ft.) is proposed. Sound-generating activities with larger shutdown zones follow, based on the maximum modeled distance to the Level A (injury) threshold:

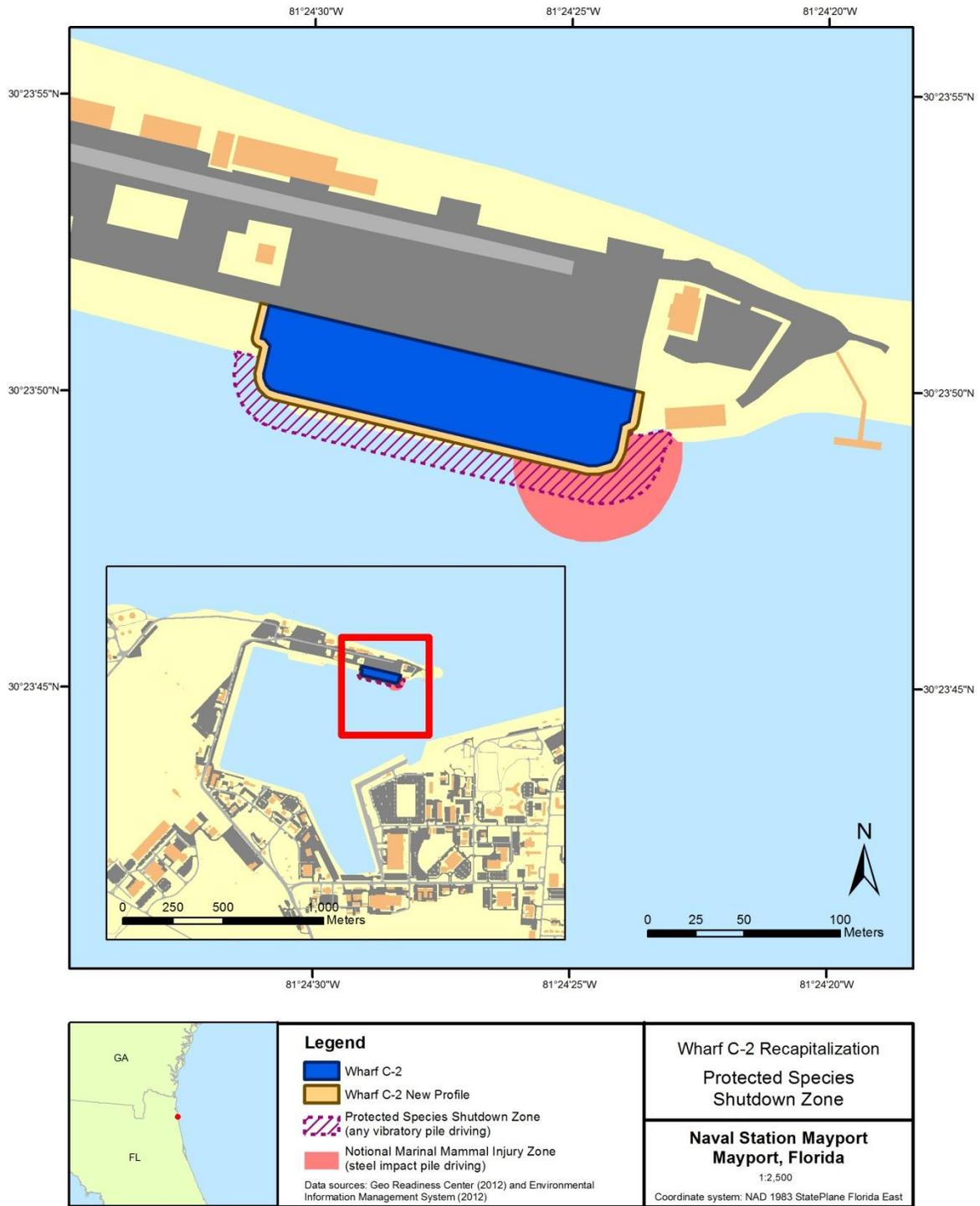
- During vibratory pile driving, the shutdown distance will initially be 15 m.
- If impact driving is needed, the shutdown distance for cetaceans will initially be 40 m during the brief duration of such activities.

Table 2-2. Monitoring and Shutdown Zones

Type of Activity	Distance from Pile Being Driven and Active In-water Equipment (any direction in water)	Measure
All in-water work ¹	50 ft. (15 m)	Shut down all in-water work if a marine mammal, sea turtle, or smalltooth sawfish (surface) is observed in the zone
Impact driving of steel piles (contingency only)	130 ft. (40 m)	Shut down pile driving if a marine mammal is observed in the zone

¹ In-water work is defined as any activity where personnel or equipment are working in the water column. Vessel movement does not constitute in-water work.

Figure 2-2. Monitoring / Shutdown Zones



3.0 MARINE MAMMAL MONITORING

3.1 Observers and Procedures

The Navy shall conduct a pre-construction briefing with the contractor. During the briefing, all contractor personnel working in the Project area will watch the Navy's Marine Species Awareness Training video.

Marine mammal observers ("observers") designated by the contractor will be placed at the best vantage point(s) practicable to monitor for marine mammals and implement shutdown/delay procedures when applicable by calling for shutdown to the equipment operator(s). The observers will have no other construction related tasks while conducting monitoring.

The contractor will adhere to all requirements of the following:

- U.S. Fish and Wildlife Services (USFWS) 2005 Standard Manatee Conditions for In-Water Work (Attachment 1)
- National Marine Fisheries Service 2006 Sea Turtle and Smalltooth Sawfish Construction Conditions (Attachment 2)
- National Marine Fisheries Services 2012 Southeast Region Marine Mammal and Sea Turtle Viewing Guidelines (Attachment 3)
- Requirements of IHA upon issuance by NMFS.

3.2 Methods

The observer(s) will monitor the shutdown zone before, during, and after pile driving and removal.

The observer(s) will be placed at the best vantage point practicable (e.g. from a small boat, construction barges, on shore, or any other suitable location) to monitor for marine mammals and implement shutdown/delay procedures when applicable by calling for the shutdown to the equipment operator(s). Elevated positions are preferable; it shall be the contractor's responsibility to ensure that appropriate safety measures are implemented to protect observers on elevated observation points. If a boat is used for monitoring, the boat shall maintain minimum distances from species (should they occur) as described in National Marine Fisheries Services' 2012 Southeast Region Marine Mammal and Sea Turtle Viewing Guidelines (Attachment 3).

- During all observation periods, observers shall use binoculars and the naked eye to search continuously for marine mammals;
- If the shutdown zone is obscured by fog or poor lighting conditions, pile driving shall not be initiated until the entire shutdown zone is visible.
- The shutdown zone shall be monitored for the presence of marine mammals before, during, and after any pile driving or removal activity.

Pre-Activity Monitoring:

The shutdown zone shall be monitored for 15 minutes prior to in-water construction/demolition activities. If a marine mammal is present within or approaching the shutdown zone, the activity would be delayed until the animal(s) leave the shutdown zone. Activity would resume only after the observer has determined, through re-sighting or by waiting 15 minutes that the animal(s) has moved outside the shutdown zone. The observer will notify the monitoring coordinator/construction foreman / POC when construction activities can commence.

During Activity Monitoring:

The shutdown zone shall include all areas where the underwater sound pressure levels are anticipated to equal or exceed the Level A (injury) criteria for marine mammals (180 dB re 1 μ Pa isopleth for cetaceans). The shutdown zone will always be a minimum of 15 meters (m) (50 ft.) to prevent injury from physical interaction of marine mammals with construction equipment (Figure 2-2).

If a marine mammal, sea turtle, or smalltooth sawfish enters a shutdown zone during any in-water work, activity will be halted and delayed until either the animal has voluntarily left and been visually confirmed beyond the shutdown zone or 15 minutes have passed without re-detection of the animal.

Post-Activity Monitoring:

Monitoring of the shutdown zone will continue for 15 minutes following the completion of the activity.

3.3 Data Collection

The following information will be collected on sighting forms used by observers:

- Date and time that pile driving or removal begins or ends
- Construction activities occurring during each observation period
- Weather parameters identified in the acoustic monitoring (e.g., wind, temperature, percent cloud cover, and visibility)
- Tide state and water currents

If a marine mammal, sea turtle, or smalltooth sawfish enters the shutdown zone, the following information will be recorded once shutdown procedures have been implemented:

- Species, numbers, and if possible sex and age class of marine mammals
- Behavior patterns observed, including bearing and direction of travel
- Location of the observer and distance from the animal(s) to the observer

If possible, photographs of the animal(s) will be taken and forwarded to the Naval Facilities Engineering Command Southeast Environmental point of contact:

Jered Jackson
NAVFAC Southeast
Building 903
NAS Jacksonville, FL 32212
904-542-6308

Data collection forms shall be furnished to the Environmental point of contact within a mutually agreeable timeframe.

3.4 Equipment

The observer(s) shall be equipped with the following:

- binoculars (7 x 50 power or greater) to ensure sufficient visual acuity while investigating sightings
- portable radios or cellular phone(s) to rapidly communicate with the appropriate construction personnel to initiate shutdown of pile driving activity if required
- a digital camera for photographing any marine species sighted
- data collection forms
- Compass/GPS

3.5 Observer Monitoring Locations

In order to effectively monitor the shutdown zones, marine mammal observers will be positioned at the best practicable vantage point(s), taking into consideration the behavior of marine mammal species likely to enter the area, security, safety, and space limitations at the waterfront, in order to properly monitor these zones. Observers may be stationed in small vessels or on the wharf at a location that will provide adequate visual coverage for the marine mammal shutdown zone.

3.6 Interagency Notification

If the Navy encounters an injured, sick, or dead marine mammal, NMFS will be notified immediately. Such sightings will be called into the NMFS Stranding Coordinator for the Southeast:

Erin Fougères, Ph.D.
Marine Mammal Stranding Program Administrator
NOAA Fisheries
Southeast Regional Office
263 13th Avenue South
St. Petersburg, FL 33701
e-mail: erin.fougeres@noaa.gov
office: 727-824-5323
fax: 727-824-5309

The Navy will provide NMFS with the species or description of the animal(s), the condition of the animal (including carcass condition if the animal is dead), location, the date and time of first discovery, observed behaviors (if alive), and photo or video (if available).

Care should be taken in handling dead specimens to preserve biological materials in the best possible state for later analysis of cause of death, if that occurs. In preservation of biological materials from a dead animal, the finder (i.e. marine mammal observer) has the responsibility to ensure that evidence associated with the specimen is not unnecessarily disturbed.

The Florida Fish and Wildlife Conservation Commission (1-888-404-FWCC) and U.S. Fish and Wildlife Service (1-904-232-2580) will be notified if an injured, sick, or dead manatee is encountered.

4.0 REPORTING

A draft report of any incidents of marine mammals entering the shutdown zone will be forwarded to NMFS / USFWS. The Navy shall comply with reporting requirements outline in the final IHA issued by NMFS, which generally call for a draft report within 90 days of IHA expiration, and final report issued 30 days after NMFS comments are received on draft report.

5.0 SOURCE LEVEL VERIFICATION

As a part of the Navy's ongoing research on in-water acoustics, source level verification is planned concurrent to pile driving activities at NAVSTA Mayport. A contracted Senior Acoustic Consultant and Staff Consultant will collect pile driving noise data to estimate airborne and underwater source levels. Monitoring will include two underwater positions and one airborne monitoring position. These exact positions would be determined in the field during consultation with Navy personnel. All required permits and security clearances will be obtained in advance of the actual monitoring work.

Underwater sound monitoring would include the measurement of peak sound pressures, root-mean-square sound pressure levels (RMS) and sound exposure levels (SEL) of pile driving activities at Wharf C-2. Typical ambient levels would be measured during lulls in the pile installation and reported in terms of RMS sound pressure levels. Frequency spectra in narrow-band or 1/3rd octave bands would be provided for pile driving sounds. A technical report summarizing the data collected will be prepared within 75 days of completion of monitoring.

6.0 REFERENCES

Hannigan, P. (2011). Pile Driving Equipment. 2011 PDCA Professor Pile Institute. Produced by GRL Engineers, Inc. Retrived from <http://www.piledrivers.org/pdpi-pat-hannigan.htm>. Accessed on 04 November 2012

Jacksonville Environmental Protection Board. (1995). Rule 4: Noise Pollution Control. Chapter 368 Ordinance Code. Retrieved from <http://www.coj.net/departments/regulatory-boards-and-commissions/docs/environmental-protection-board/epb-rule-4.aspx>. Accessed on 20 December 2012.

U.S. Department of the Navy. (2013). Request for an Incidental Harassment Authorization Under the Marine Mammal Protection Act for the Wharf C-2 Recapitalization Project, Navy Region Southeast.

U.S. Department of the Navy (2013a). Draft Environmental Assessment Wharf C-2 Recapitalization at Naval Station Mayport, Florida.

Appendix B

Sample Photos of Wharf C-2 Deterioration

FIGURE B-1. VIEW OF A MINOR AREA OF CONCRETE DETERIORATION IN THE CONCRETE CAP ALONG THE CONSTRUCTION JOINT NEAR STATION 5+50, LOOKING NORTH



FIGURE B-2. VIEW OF THE TYPICAL SECTION LOSS ALONG THE EDGES OF THE PRECAST CONCRETE PANELS OF THE WHARF CAP NEAR STATION 0+90, LOOKING NORTHEAST



FIGURE B-3. VIEW OF THE SPALL ALONG THE CONCRETE CURB AT STATION 4+40 THAT WAS 3 FT LONG BY 12 IN. WIDE BY 8 IN. HIGH WITH EXPOSED AND CORRODED REINFORCING STEEL, LOOKING SOUTH



FIGURE B-4. VIEW OF SOUTHEASTERN CORNER OF DECK – NOTE DISLOCATION OF THE BULL RAIL



Appendix C

Contractor's Project Schematic

Appendix D

Standard Manatee Conditions for In-Water Work

STANDARD MANATEE CONDITIONS FOR IN-WATER WORK

July 2005

The permittee shall comply with the following conditions intended to protect manatees from direct project effects:

- a. All personnel associated with the project shall be instructed about the presence of manatees and manatee speed zones, and the need to avoid collisions with and injury to manatees. The permittee shall advise all construction personnel that there are civil and criminal penalties for harming, harassing, or killing manatees which are protected under the Marine Mammal Protection Act, the Endangered Species Act, and the Florida Manatee Sanctuary Act.
- b. All vessels associated with the construction project shall operate at "Idle Speed/No Wake" at all times while in the immediate area and while in water where the draft of the vessel provides less than a four-foot clearance from the bottom. All vessels will follow routes of deep water whenever possible.
- c. Siltation or turbidity barriers shall be made of material in which manatees cannot become entangled, shall be properly secured, and shall be regularly monitored to avoid manatee entanglement or entrapment. Barriers must not impede manatee movement.
- d. All on-site project personnel are responsible for observing water-related activities for the presence of manatee(s). All in-water operations, including vessels, must be shutdown if a manatee(s) comes within 50 feet of the operation. Activities will not resume until the manatee(s) has moved beyond the 50-foot radius of the project operation, or until 30 minutes elapses if the manatee(s) has not reappeared within 50 feet of the operation. Animals must not be herded away or harassed into leaving.
- e. Any collision with or injury to a manatee shall be reported immediately to the FWC Hotline at 1-888-404-FWCC. Collision and/or injury should also be reported to the U.S. Fish and Wildlife Service in Jacksonville (1-904-232-2580) for north Florida or Vero Beach (1-561-562-3909) for south Florida.
- f. Temporary signs concerning manatees shall be posted prior to and during all in-water project activities. All signs are to be removed by the permittee upon completion of the project. Awareness signs that have already been approved for this use by the Florida Fish and Wildlife Conservation Commission (FWC) must be used. One sign measuring at least 3 ft. by 4 ft. which reads *Caution: Manatee Area* must be posted. A second sign measuring at least 8 1/2" by 11" explaining the requirements for "Idle Speed/No Wake" and the shut down of in-water operations must be posted in a location prominently visible to all personnel engaged in water-related activities.

FWC Approved Manatee Educational Sign Suppliers

ASAP Signs & Designs

624-B Pinellas Street
Clearwater, FL 33756
Phone: (727) 443-4878
Fax: (727) 442-7573

Vital Signs

104615 Overseas Highway
Key Largo, FL 33037
Phone: (305) 451-5133
Fax: (305) 451-5163

Wilderness Graphics, Inc.

P.O. Box 1635
Tallahassee, FL 32302
Phone: (850) 224-6414
Fax: (850) 561-3943
www.wildernessgraphics.com

Universal Signs & Accessories

2912 Orange Avenue
Ft. Pierce, FL 34947
Phone: (800) 432-0331
or (772) 461-0665
Fax: (772) 461-0669

Cape Coral Signs & Designs

1311 Del Prado Boulevard
Cape Coral, FL 33990
Phone: (239) 772-9992
Fax: (239) 772-3848

New City Signs

1829 28th Street North
St. Petersburg, FL 33713
Phone: (727) 323-7897
Fax: (727) 323-1897

Municipal Supply & Sign Co.

1095 Fifth Avenue, North
P.O. Box 1765
Naples, FL 33939-1765
Phone: (800) 329-5366
or (239) 262-4639
Fax: (239) 262-4645
www.municipalsigns.com

**United Rentals Highway
Technologies**

309 Angle Road
Ft. Pierce, FL 34947
Phone: (772) 489-8772
or (800) 489-8758 (FL only)
Fax: (772) 489-8757

CAUTION: MANATEE HABITAT

All project vessels

IDLE SPEED / NO WAKE

When a manatee is within 50 feet of work
all in-water activities must

SHUT DOWN

Report any collision or injury to:

1-888-404-FWCC (1-888-404-3922)

Florida Fish and Wildlife Conservation Commission

Appendix F

Fundamentals of Acoustics

Bioacoustics, or the study of how sound affects living organisms, is a complex and interdisciplinary field that includes the physics of sound production and propagation, the source characteristics of sounds, and the perceptual capabilities of receivers. This appendix is intended to introduce the reader to the basics of sound measurements and sound propagation, as well as the hearing and vocal production abilities of species that may occur in the project area. The potential for noise from pile driving to cause auditory masking for marine mammals within the project area is also considered.

E.1 Fundamentals of Acoustics

Sound is an oscillation in pressure, particle displacement, or particle velocity, as well as the auditory sensation evoked by these oscillations, although not all sound waves evoke an auditory sensation (i.e., they are outside of an animal's hearing range) (ANSI S1.1-1994). Sound may be described in terms of both physical and subjective attributes. Physical attributes may be directly measured. Subjective (or sensory) attributes cannot be directly measured and require a listener to make a judgment about the sound. Physical attributes of a sound at a particular point are obtained by measuring pressure changes as sound waves pass. The following material provides a short description of some of the basic parameters of sound.

Sound can be characterized by several factors, including frequency, intensity, and pressure (Richardson et al. 1995). Sound frequency (measured in Hertz [Hz]) and intensity (amount of energy in a signal [Watts per meter²]) are physical properties of the sound which are related to the subjective qualities of pitch and loudness (Kinsler et al. 1999). Sound intensity and sound pressure (measured in Pascals [Pa]) are also related; of the two, sound pressure is easier to measure directly, and is therefore more commonly used to evaluate the amount of disturbance to the medium caused by a sound ("amplitude").

Because of the wide range of pressures and intensities encountered during measurements of sound, a logarithmic scale known as the decibel is used to evaluate these properties; in acoustics, "level" indicates a sound measurement in decibels. The decibel [dB] scale expresses the logarithmic strength of a signal (pressure or intensity) relative to a reference value of the same units. This document reports sound levels with respect to sound pressure only. Each increase of 20 dB reflects a ten-fold increase in signal pressure, i.e., an increase of 20 dB means ten times the pressure, 40 dB means one hundred times the pressure, 60 dB means one thousand times the pressure, and so on.

The sound levels in this document are given as sound pressure levels [SPL]. For measurements of underwater sound, the standard reference pressure is 1 microPascal [μPa , or 10^{-6} Pascals], and is expressed as "dB re 1 μPa ". For airborne sounds, the reference value is 20 μPa , expressed as "dB re 20 μPa ". Sound levels measured in air and water are not directly comparable, and it is important to note which reference value is associated with a given sound level.

Airborne sounds are commonly referenced to human hearing using a method which weights sound frequencies according to measures of human perception, de-emphasizing very low and very high frequencies which are not perceived well by humans. This is called A-weighting, and the decibel level measured is called the A-weighted sound level [dBA]. A similar method has been proposed for evaluating underwater sound levels with respect to marine mammal hearing. While preliminary weighting functions for marine mammal hearing have been developed

(Southall et al. 2007), they are not yet applied to sound exposure from pile driving activities. Therefore, underwater sound levels given in this document are not weighted and evaluate all frequencies equally.

Table E-1 summarizes common acoustic terminology. Two of the most common descriptors are the instantaneous peak SPL and the root-mean-square [rms] SPL. The peak SPL is the instantaneous maximum or minimum over- or underpressure observed during each sound event and is presented in dB re 1 μ Pa peak. The rms level is the square root of the energy divided by a defined time period, given as dB re 1 μ Pa rms.

Table E-1. Definitions of Acoustical Terms

Term	Definition
Decibel [dB]	A unit describing the amplitude of sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure or intensity of the sound measured to the appropriate standard reference value. This document uses only sound pressure measurements to calculate decibel levels. The reference pressure for water is 1 microPascal (μ Pa) and for air is 20 μ Pa (approximate threshold of human audibility).
Sound Pressure Level [SPL]	Sound pressure is the force per unit area, usually expressed in microPascals (or 20 micro Newtons per square meter), where 1 Pascal is the pressure resulting from a force of 1 Newton exerted over an area of 1 square meter. Sound pressure level is the quantity that is directly measured by a sound level meter, and is expressed in decibels referenced to the appropriate air or water standard.
Frequency, Hz	Frequency is expressed in terms of oscillations, or cycles, per second. Cycles per second are commonly referred to as Hertz (Hz). Typical human hearing ranges from 20 Hz to 20,000 Hz; hearing ranges in non-humans are widely variable and species specific.
Peak Sound Pressure (unweighted), dB re 1 μ Pa peak	The maximum absolute value of the instantaneous sound pressure expressed as dB re 1 μ Pa peak.
Root-Mean-Square [rms], dB re 1 μ Pa	The rms level is the square root of the pressure divided by a defined time period, expressed in decibels. For impulsive sounds, the rms has been defined as the average of the squared pressures over the time that comprise that portion of waveform containing 90 percent of the sound energy for one impact pile driving impulse. For non-impulsive sounds, rms energy represents the average of the squared pressures over the measurement period and is not limited by the 90 percent energy criterion. Expressed as dB re 1 μ Pa.
Sound Exposure Level [SEL], dB re 1 μ Pa ² sec	Sound exposure level is a measure of energy. Specifically, it is the dB level of the time integral of the squared-instantaneous sound pressure, normalized to a 1-second period. It can be an extremely useful metric for assessing cumulative exposure because it enables sounds of differing duration to be compared in terms of total energy.
Waveforms, μ Pa over time	A graphical plot illustrating the time history of positive and negative sound pressure of individual pile strikes shown as a plot of μ Pa over time (i.e., seconds).
Frequency Spectra, dB over frequency range	A graphical plot illustrating the frequency content over a given frequency range. Bandwidth is generally defined as linear (narrowband) or logarithmic (broadband) and is stated in frequency (Hz).
A-Weighted Sound Level, dBA	A frequency-weighted measure used for airborne sounds only. A-weighting de-emphasizes the low and high frequency components of a given sound in a manner similar to the frequency response of the human ear and correlates well with subjective human reactions to noise. A-weighted levels are referenced to 20 μ Pa unless otherwise noted.

Term	Definition
Ambient Noise Level	The background noise level, which is a composite of sounds from all sources near and far. The normal or existing level of environmental noise at a given location, given in dB referenced to the appropriate pressure standard.

Adapted and derived from URS Corporation (2007)

E.2 Sound vs. Noise

Sound may be purposely created to convey information, communicate, or obtain information about the environment. Examples of such sounds are sonar pings, marine mammal vocalizations/echolocations, tones used in hearing experiments, and small sonobuoy explosions used for submarine detection.

Noise is undesired sound (ANSI S1.1-1994). Whether a sound is noise depends on the receiver (i.e., the animal or system that detects the sound). For example, small explosives and sonar used to locate an enemy submarine produce *sound* that is useful to sailors engaged in anti-submarine warfare, but is likely to be considered undesirable *noise* by marine mammals. Sounds produced by naval aircraft and vessel propulsion are considered noise because they represent possible energy inefficiency and increased detectability, which are undesirable.

Noise also refers to all sound sources that may interfere with detection of a desired sound and the combination of all of the sounds at a particular location (ambient noise).

E.3 Description of Noise Sources

Ambient noise in the project area is a composite of sounds from natural sources, normal port activities, and temporary projects such as maintenance dredging or pile driving. Ambient noise in the Mayport turning basin is addressed in Chapter 5 of the IHA Application.

In-water construction activities associated with this project include vibratory and impact pile driving. The sounds produced by these activities fall into two sound types: impulsive (impact driving) and non-impulsive (vibratory driving). Distinguishing between these two general sound types is important because of each sound type may cause different types of physical effects, particularly with regard to hearing (Ward 1997).

Impulsive sounds (e.g., explosions, seismic airgun pulses, and impact pile driving) are referred to as pulsed sounds in Southall et al. (2007), and are brief, broadband, atonal transient sounds which can occur as isolated events or be repeated in some succession (Southall et al. 2007). Impulsive sounds are characterized by a relatively rapid rise from ambient pressure to a maximal pressure value followed by a decay period that may include a period of diminishing, oscillating maximal and minimal pressures (Southall et al. 2007). Impulsive sounds generally have a greater capacity to induce physical injury compared with sounds that lack these features (Southall et al. 2007).

Non-impulsive sounds (“non-pulsed” in Southall et al. 2007) can be tonal, broadband, or both. They lack the rapid rise time and can have longer durations than impulsive sounds. Non-impulsive sounds can be either intermittent or continuous sounds. Examples of non-impulsive

sounds include vessels, aircraft, and machinery operations such as drilling, dredging, and vibratory pile driving (Southall et al. 2007).

In environments with non-porous boundaries (i.e. rock seafloor, rigid sides, etc.), reverberation may extend the duration of both impulsive and non-impulsive sounds.

E.4 Vocalization and Hearing of Marine Mammals

All marine mammals that have been studied can produce sounds and use sounds to forage, orient, detect and respond to predators, and facilitate social interactions (Richardson et al., 1995). Measurements of marine mammal sound production and hearing capabilities provide some basis for assessing whether exposure to a particular sound source may affect a marine mammal behaviorally or physiologically. Marine mammal hearing abilities are quantified using live animals either via behavioral audiometry or electrophysiology (see Schusterman 1981; Au 1993; Wartzok and Ketten 1999; Nachtigall et al. 2007). Behavioral audiograms, which are plots of animals' exhibited hearing threshold versus frequency, are obtained from captive, trained live animals using standard testing procedures with appropriate controls, and are considered to be a more accurate representation of a subject's hearing abilities. Behavioral audiograms of marine mammals are difficult to obtain because many species are too large, too rare, and too difficult to acquire and maintain for experiments in captivity. Consequently, our understanding of a species' hearing ability may be based on the behavioral audiogram of a single individual or small group of animals. In addition, captive animals may be exposed to local ambient sounds and other environmental factors that may impact their hearing abilities and may not accurately reflect the hearing abilities of free-swimming animals. For animals not available in captive or stranded settings (including large whales and rare species), estimates of hearing capabilities are made based on anatomical and physiological structures, the frequency range of the species' vocalizations, and extrapolations from related species.

Electrophysiological audiometry measures small electrical voltages produced by neural activity when the auditory system is stimulated by sound. The technique is relatively fast, does not require a conscious response, and is routinely used to assess the hearing of newborn humans. It has recently been adapted for use on non-humans, including marine mammals (Dolphin, 2000). For both methods of evaluating hearing ability, hearing response in relation to frequency is a generalized U-shaped curve or audiogram showing the frequency range of best sensitivity (lowest hearing threshold) and frequencies above and below with higher threshold values.

Direct measurement of hearing sensitivity exists for approximately 25 of the nearly 130 species of marine mammals. Table provides a summary of sound production and hearing capabilities for marine mammal species in the Project Area. For purposes of this analysis, marine mammals are arranged into the following functional hearing groups based on their generalized hearing sensitivities: high-frequency cetaceans, mid-frequency cetaceans, low-frequency cetaceans (mysticetes), phocid pinnipeds (true seals), otariid pinnipeds (sea lions and fur seals); of these, only mid- and low-frequency cetaceans occur in the Project Area.

Table E-2. Hearing and Vocalization Ranges for Marine Mammal Functional Hearing Groups and Species Potentially Occurring within the Project Area

Functional Hearing Group	Species	Sound Production		General Hearing Ability Frequency Range
		Frequency Range	Source Level (dB re 1 μ Pa @ 1 m)	
Mid-Frequency Cetaceans	Bottlenose dolphin	100 Hz to 100kHz	137 to 236	150 Hz to 160 kHz
Low-Frequency Cetaceans	North Atlantic right whale; humpback whale	10 Hz to 20 kHz	137 to 192	7 Hz to 22 kHz

Adapted and derived from Southall et al. (2007) and Richardson et al. (1995)

dB re 1 μ Pa @ 1 m: decibels (dB) referenced to (re) 1 micro (μ) Pascal (Pa) at 1 meter; Hz: Hertz; kHz: kilohertz

E.4.1 Auditory Masking

Natural and artificial sounds can disrupt behavior by auditory masking, or interfering with a marine mammal’s ability to detect and interpret other relevant sounds, such as communication and echolocation signals (Wartzok et al. 2004). Masking occurs when both the signal and masking sound have similar frequencies and either overlap or occur very close to each other in time. A signal is very likely to be masked if the noise is within a certain “critical bandwidth” around the signal’s frequency and its energy level is similar or higher (Holt 2009). Noise within the critical band of a marine mammal signal will show increased interference with detection of the signal as the level of the noise increases (Wartzok et al. 2004). In delphinid subjects, for example, relevant signals needed to be 17 to 20 dB louder than masking noise at frequencies below 1 kHz in order to be detected and 40 dB greater at approximately 100 kHz (Richardson et al. 1995). Noise at frequencies outside of a signal’s critical bandwidth will have little to no effect on the detection of that signal (Wartzok et al. 2004).

Additional factors influencing masking are the temporal structure of the noise and the behavioral and environmental context in which the signal is produced. Continuous noise is more likely to mask signals than intermittent noise of the same amplitude; quiet “gaps” in the intermittent noise allow detection of signals which may not be detectable during continuous noise (Brumm and Slabbekoorn, 2005). The behavioral function of a vocalization (e.g. contact call, group cohesion vocalization, echolocation click, etc.) and the acoustic environment at the time of signaling may both influence call source level (Miksis-Olds and Tyack, 2009; Holt et al. 2011), which directly affects the chances that a signal will be masked (Nemeth and Brumm, 2010).

Noise from anthropogenic sources could cause masking of vocalizations which may rise to the level of behavioral harassment (as defined by the MMPA) if it disrupts communication, echolocation, or other hearing-dependent behaviors. Impact pile driving produces high-amplitude low-frequency noise (10 – 2,000 Hz), which is likely to be audible to all three marine mammal species considered, and is likely to overlap the vocalizations of low-frequency cetaceans (North Atlantic right and humpback whales; Table E-2). While the amplitude of impact pile driving noise may exceed marine mammal vocalization amplitudes within an unknown range of the driven pile, impact pile driving noise is unlikely to entirely mask social (non-echolocation)

signals due to the intermittent nature impact pile driving noise and the limited duration of impact pile driving associated with this project. Impact pile driving will be conducted only in the rare event that an obstruction is encountered during vibratory pile driving, and will be limited to a maximum of 20 strikes per day. We therefore estimate that the likelihood of noise from impact pile driving masking signals important to the behavior and survival of any of the three marine mammal species in the project area is negligible.

Vibratory pile driving produces frequencies from 10 Hz to 2 kHz, which would be within the range of audible sound and vocal production (see Table E-2) for all marine mammal species that may occur in the project area. Given the source levels (151 – 180 dB rms re 1 μ Pa at 10m) and frequency range (10 – 2,000 Hz) of vibratory pile driving noise (Illingworth & Rodkin 2012), we estimate that any masking event that could rise to Level B harassment under the MMPA would occur within the zones of behavioral harassment estimated for vibratory pile driving (see Chapter 5 in the IHA Application) (Parks et al. 2011). Therefore, potential masking effects are not considered separately in this IHA application.

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