REQUEST FOR AN INCIDENTAL HARASSMENT AUTHORIZATION UNDER THE MARINE MAMMAL PROTECTION ACT FOR THE BRAVO WHARF RECAPITALIZATION AT NAVAL STATION MAYPORT, JACKSONVILLE, FLORIDA NAVY REGION SOUTHEAST

Submitted to:

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

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List of Acronyms

B	logarithmic loss
B-1	Berth Bravo One
B-2	Berth Bravo Two
B-3	Berth Bravo Three
BMP	best management practice
C	linear (scattering and absorption) loss
C-1	Wharf Charlie One
CFR	Code of Federal Regulations
CV	coefficient of variation
dB	decibel
dBA	decibel (A-weighted)
ft.	feet
FR	Federal Register
h	height
Hz	Hertz
in.	inch
km	kilometer
kHz	kiloHertz
µPa	microPascal
m	meter
MLLW	mean lower low water
MMPA	Marine Mammal Protection Act
MSDD	Marine Species Density Database
NAVFAC	Naval Facilities Engineering Command
NAVFAC SE	Naval Facilities Engineering Command, Southeast
n.d.	no date
NMFS	National Marine Fisheries Service
NS	Naval Station
POC	point of contact
PTS	permanent threshold shift
R_1	range from source in meters
R_2	range from driven pile to original measurement location
rms	root-mean-square
SPL	sound pressure level
SSP	steel sheet pile
TL	transmission loss
U.S.	United States
USFWS	United States Fish and Wildlife Service
W	width
YONAH	Years of the North Atlantic Humpback

Executive Summary

In accordance with the Marine Mammal Protection Act of 1972, as amended, the United States Navy is applying for an Incidental Harassment Authorization to perform recapitalization of Bravo Wharf at Naval Station Mayport, Jacksonville, Florida. Five species of marine mammals may be present within the waters surrounding Naval Station Mayport: the North Atlantic right whale (*Eubalaena glacialis*), the humpback whale (*Megaptera novaeangliae*), the bottlenose dolphin (*Tursiops truncatus*), the Atlantic spotted dolphin (*Stenella frontalis*), and the West Indian manatee (*Trichechus manatus*). These species may occur year-round with the exception of North Atlantic right whales, which are more likely to occur between November and April due to close proximity of calving waters. The West Indian manatee is regulated by the U.S. Fish and Wildlife Service and will be managed in compliance with the *Standard Manatee Conditions for In-water Work, 2011*; it is not considered in this application.

The Navy proposes installation of approximately 880 single steel sheet piles as a part of the overall recapitalization project at Bravo Wharf. The project may require up to 24 months for completion; in-water activities are limited to a maximum of 130 days, separated into two phases. If in-water work will extend into months 13 – 24, a second IHA application will be submitted. Phase I will consist of work at berths B-2 and B-3; Phase II will consist of work at berth B-1. All piles will be driven with a vibratory hammer. Impact driving will be a contingency employed only if vibratory methods are inadequate; a similar project that has been completed at adjacent Wharf C-1 required impact pile driving on only seven piles.

The Navy used National Marine Fisheries Service promulgated thresholds for assessing pile driving impacts (National Marine Fisheries Service 2005b, 2009), outlined in Chapter 6. The Navy used the practical spreading loss equation for underwater sounds and empirically measured source levels from other similar pile driving events to estimate potential marine mammal exposures. Predicted exposures are described in Chapter 5. Shut-down procedures will ensure no Level A harassments (injury) would occur, but modeling predicted that 920 Level B harassments (behavior) may occur for bottlenose dolphins and 110 Level B harassments may occur for Atlantic spotted dolphins as a result of pile driving activities associated with the Bravo Wharf recapitalization project. Conservative assumptions (including marine mammal densities) used to estimate the exposures have likely overestimated the potential number of exposures and their severity.

Pursuant to the Marine Mammal Protection Act Section 101(a)(5)(D), the Navy submits this application to the National Marine Fisheries Service for an Incidental Harassment Authorization for the incidental taking of bottlenose dolphins and Atlantic spotted dolphins during pile driving activities as part of the Bravo Wharf Recapitalization project between 1 October 2016 and 30 September 2017. Takes would be in the form of non-lethal, temporary harassment and are expected to have a negligible impact on these species. In addition, takes would not have an immitigable adverse impact on the availability of these species for subsistence use.

1. Description of Activities

A detailed description of the specific activity or class of activities that can be expected to result in incidental taking of marine mammals.

Pursuant to the Marine Mammal Protection Act (MMPA) Section 101(a)(5)(D), the Navy submits this application to National Marine Fisheries Service for an Incidental Harassment Authorization for the incidental, but not intentional, taking of marine mammal species during pile driving activities associated with the Bravo Wharf (berths B-1, B-2, and B-3) Recapitalization project (Project) at Naval Station (NAVSTA) Mayport between 1 October 2016 and 30 September 2017. 50 Code of Federal Regulations (CFR) 216.104 sets out 14 specific items that must be included in requests for take pursuant to Section 101(a)(5)(A) of the MMPA; those 14 items are represented by the 14 sections of this application.

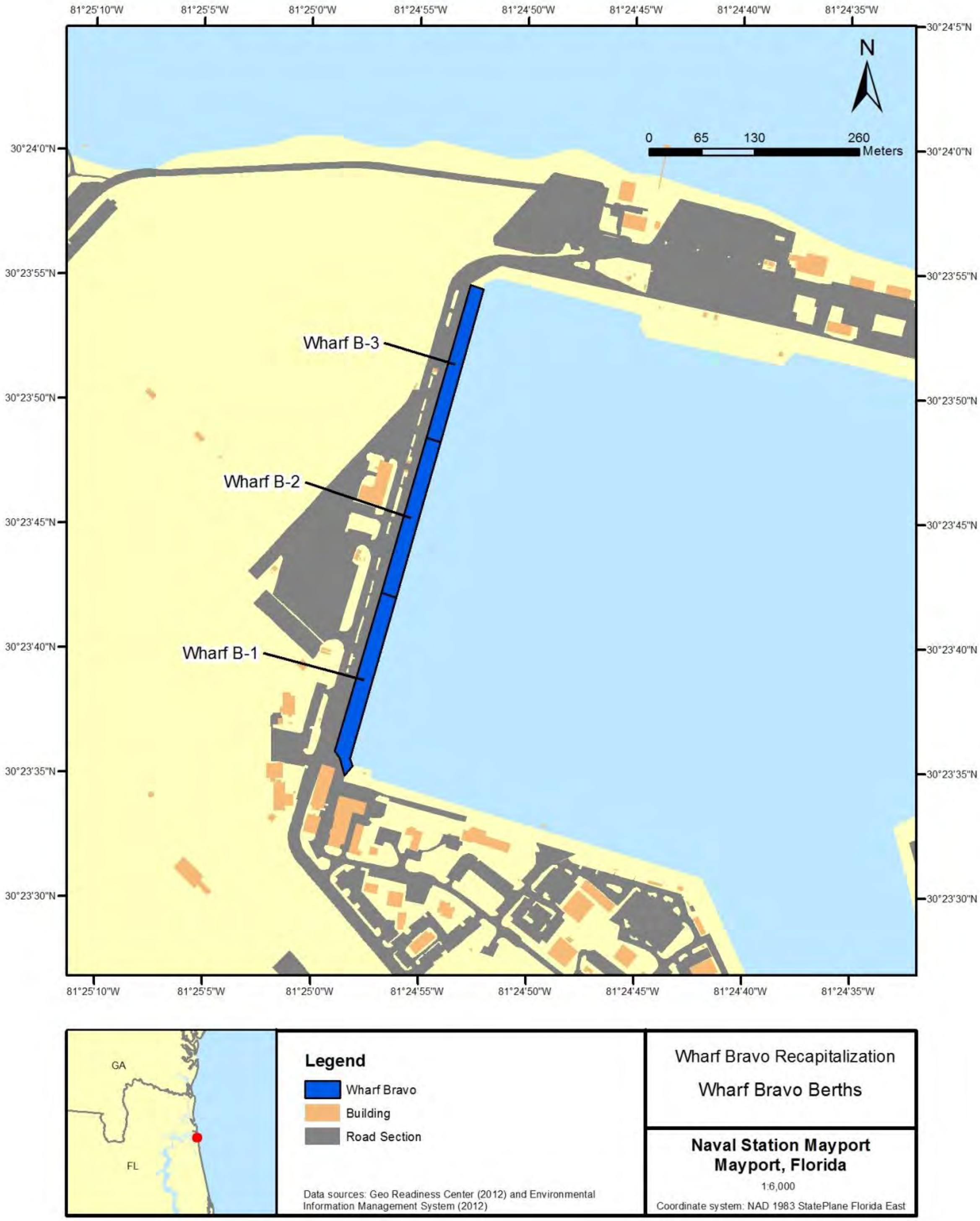
1.1. Proposed Action

The proposed action is the recapitalization, or renovation, of Bravo Wharf, consisting of berths B-1, B-2, and B-3 at NAVSTA Mayport (Figure 1-1). Recapitalization activities include the replacement of the steel sheet pile bulkhead which ties into existing steel sheet pile structure, concrete fill between existing and new steel sheet pile bulkheads, concrete pile cap and concrete encasement of sheet pile, asphalt wharf deck paving, repairs electrical and mechanical shore utilities, area lighting and anti-terrorism/force protection (AT/FP) waterfront enclave facilities. In-water work is expected to be completed within 24 months. If in-water work will extend into months 13 – 24, a second IHA application will be submitted.

The project will include the installation of approximately 880 single sheet piles to be conducted in two phases. Phase I (berths B-2 and B-3) will include the installation of approximately 590 single sheet piles over the course of approximately 73 days; averaging approximately 10 sheet pile pairs installed per day. Phase II (berth B-1) will include the installation of approximately 290 single sheet piles over the course of approximately 37 days; averaging approximately 8 to 9 sheet piles installed per day. Of the 130 days of installation, 110 days are reserved for vibratory driving and the remaining 20 days are reserved for contingency impact driving.

The use of impact driving shall be restricted to when vibratory driving is insufficient. A similar project that has been completed at adjacent Wharf C-1 required impact pile driving on only seven piles. Section 1.2 describes the elements of the proposed action in more detail.

FIGURE 1-1. BRAVO WHARF (BERTHS B-1, B-2, AND B-3) AT NAVSTA MAYPORT



1.2. Project Description

Bravo Wharf is a medium draft, general purpose berthing wharf that was constructed in 1970 and lies at the western edge of the NAVSTA Mayport turning basin. Bravo Wharf is approximately 2,000 ft long, 125 ft wide, and has a berthing depth of 50 ft mean lower low water. The wharf is one of two primary deep draft berths at the basin and is capable of berthing ships up to and including large amphibious ships; it is one of three primary ordnance handling berths at the basin. The wharf is a diaphragm steel sheet pile cell structure with a concrete apron, partial concrete encasement of the piling and asphalt paved deck.

Currently, the wharf is in poor condition due to the advanced deterioration of the steel sheeting and lack of corrosion protection. A major structural repair of the wharf is needed to maintain the long term serviceability of the structure because of widespread pitting and section loss of the steel sheet piles. Bravo Wharf berth two (B-2) has inadequate cold iron electrical capacity to support nesting of ships. Due to the structural deterioration of the wharf, load restrictions have been instituted that limit loads to a maximum of 4,500 pounds within 60 ft of the face of the wharf.

The Navy will install a new steel sheet pile bulkhead at Bravo Wharf. The wall will be anchored at the top and fill consisting of clean gravel and flowable concrete fill will be placed behind the wall. A concrete cap will be formed along the top and outside face of the wall to tie the entire structure together and provide a berthing surface for vessels. The new bulkhead will be designed for a 50-year service life.

Construction activities include:

- demolition of the existing concrete pile cap, wharf deck and utilities (including laterals and igloos);
- installation of a new steel combination wall with tieback anchors;
- placement of a combination of self-hardening fill, flowable fill, and clean fill between existing and new walls;
- installation of a new concrete cap which partially encases the new steel wall;
- installation of a sacrificial anode cathodic protection system for the new steel wall;
- installation of new foam filled fenders;
- installation of new utilities (including lateral supply lines from utilities such as water, fuel and electrical);
- repair of the wharf deck by milling and re-paving;
- replacement of lighting fixtures on galvanized steel standards; and
- replacement of security fencing

The following steps describe the construction sequence for placing the new SSP system in front of the existing deteriorated wall.

Preparation and Demolition

Existing underwater obstructions and debris (such as broken timber piles or segments of ship rails) interfering with the installation of the new SSP wall will be removed utilizing divers and cranes. The points where the new SSP is to attach to the existing sheet pile wall will be demolished above and below the waterline to expose the existing steel and any marine growth is removed from the existing wall. Along the face of the existing wall, the curb and a portion of existing concrete cap will be removed to accommodate the new concrete pavement will be placed between the new wall and the existing wall. The concrete apron along the waterside perimeter of the wharf and the utilities (including laterals and igloos) will be removed. Utilities to be installed include water, steam, fuel, waste, electrical and communications.

Installation of a New Bulkhead

Shore based equipment and/or barges will be used to install piles. If barges are necessary, a crane barge with a pile installation suite (pile leads, vibratory hammer and an impact hammer) will mobilize to the project site with a material barge. Otherwise, cranes and materials will be based on shore adjacent to the installation sites. Piles will be driven to the appropriate depth using the vibratory driver. A total of approximately 880 single sheet piles (Phase I – berths B-2 and B-3: 590; Phase II – berth B-1: 290) will be installed. Figure 1-2 and 1-3 illustrate sheet piles as installed at NAVSTA Mayport. Installation of up to 27 sheet pile pairs per pile-driving day is anticipated. 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 C-1 required impact pile driving on only seven piles). Once all of the piles are driven, closure plates will be attached between the existing adjacent sheet pile wall and the new wall end terminations. Typically, these are welded in place using underwater welding techniques.

In general, the pile-driving process begins by placing a choker cable around a pile and lifting it into vertical position with a crane. The pile is then lowered into position inside the template and set in place at the mud line. During vibratory driving, the pile is stabilized by the template while the vibratory driver installs the pile to the required tip elevation. Once piles are in position, vibratory installation would take less than 60 seconds to reach the required tip elevation. Time intervals between driving of each pile pair will vary, but will be a minimum of several minutes due to time required for positioning, etc.

Impact hammers have guides holding the hammer in alignment with the pile while a heavy piston moves up and down, striking the top of the pile, driving the pile into the substrate from the downward force of the hammer.

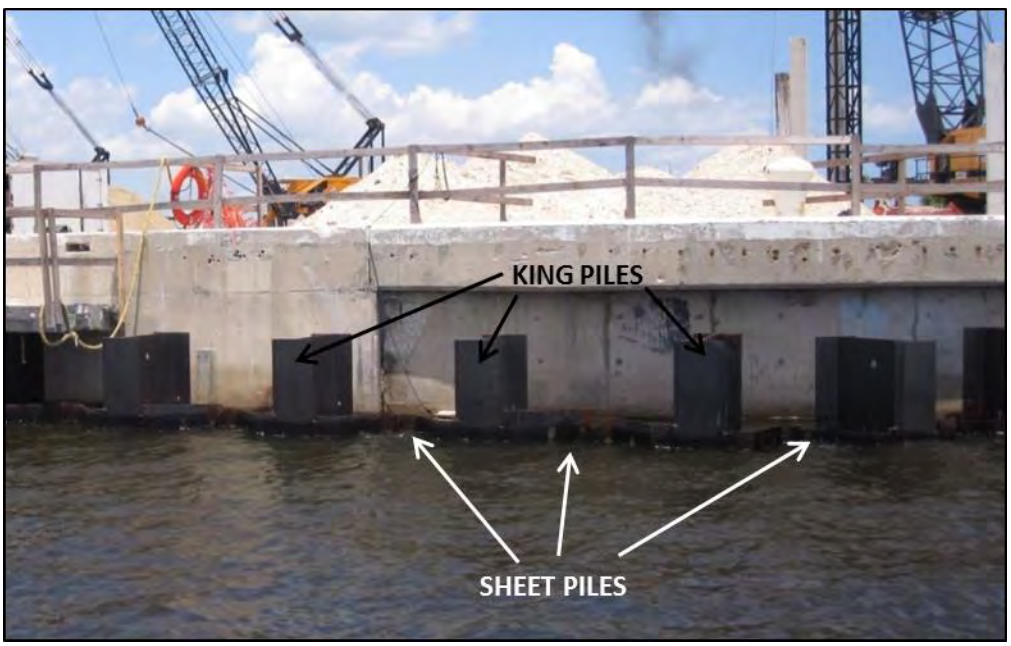
Installation of Anchors

There are multiple types of anchoring systems utilized for a sheet pile wall, including a grouted soil anchor system and a tie back wall system. Anchor rods will be installed from the new SSP wall to the anchor system. This requires drilling through the old wall to the anchor location behind the wall. In general, this anchor location may lie 40-60 feet behind (shoreward) the existing wall. After the anchor holes are driven, the anchors are placed in the holes and either the end of the anchor is grouted into the soil or the end of the anchor is attached to the tie back wall

system. The tie back wall system normally consists of sheet piles of shortened lengths that are buried below grade.

FIGURE 1-2. VIBRATORY INSTALLATION OF SHEET PILE AT NAVSTA MAYPORT

FIGURE 1-3. SHEET PILES AT NAVSTA MAYPORT



Placement of Fill

After the anchors are installed, fill operations will be conducted behind the new wall. This consists of placing either gravel fill or concrete flowable fill into the space behind the wall; trapped water behind the wall would be displaced.

Form and Placement of Pile Cap

After the fill operation is completed, the concrete pile cap will be formed and placed along the top of the new SSP wall. This consists of installing either wood or steel forms along the top of the wall down to some point below mean low water elevation. Water would be removed from the forms, steel reinforcement would be placed in the forms, and concrete would be poured to the required elevations.

Deck and Utility Placement

After the pile cap is in place, a new reinforced concrete apron will be installed and the wharf deck repaired by milling and paving. A new high mast lighting system, new security fencing, and new utilities will be installed to replace those that were removed.

Summary

The Project will entail installation of approximately 880 single sheet piles, requiring a maximum of 130 days of in-water vibratory pile driving work conducted in two phases over a 24-month period. If in-water work will extend into months 13 – 24, a second IHA application will be submitted. The acoustic analysis for vibratory pile driving used the assumption that a maximum of 27 sheet pile pairs would be driven each day, for a maximum linear distance of approximately 124 ft. 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 C-1 required impact pile driving on only seven piles). Twenty days have been conservatively allotted for contingency impact driving even though only two days of impact pile driving occurred during the adjacent Wharf C-1 project. Impact pile driving, if it were to be necessary, could occur on the same day as vibratory pile driving, but driving rigs would not be operated simultaneously. Because activities are for the repair of existing facilities only, no increase in level of use or operation is expected. No net change in the amount of vessel traffic in and around the turning basin is expected as a result of the project.

2. Location and Duration of Activities

The dates and duration of such activity and the specific geographical region where it will occur.

NAVSTA Mayport is located in northern Florida, east of Jacksonville and adjacent to the St. Johns River and the Atlantic Ocean (Figure 2-1). Ship berthing facilities are provided at 16 locations along wharves A through F around the turning basin perimeter. The turning basin is approximately 2,000 by 3,000 feet in area, and is connected to the St. Johns River by a 500-ft-wide entrance channel. Bravo Wharf is located along the western edge of the Mayport turning basin (Figure 2–2).

The project area is defined as the immediate vicinity of Bravo Wharf, out to the limit of the most distant of the underwater threshold for all marine mammal species being addressed. The most distant underwater threshold is the marine mammal behavioral disturbance (120 dB re 1 μPa rms) threshold. Under certain conditions, areas inside of the turning basin may have average ambient noise levels exceeding the 120 dB threshold. However, given the lack of actual ambient sound-recording data for this location, the Navy has assumed ambient noise levels are below 120 dB re 1 μPa rms. The distance to the 120 dB threshold is therefore the maximum range at which the Navy expects to exert an environmental impact underwater, and represents a reasonable boundary for the project area (Figure 2-2).

The Project is scheduled to begin on 1 October 2016. A maximum of 110 days of in-water vibratory pile driving work will take place over a 24-month period during the two phases of the project. Twenty additional days were modeled in case contingency impact pile driving becomes necessary, but this duration is an extremely conservative estimate; a similar project that has been completed at adjacent Wharf C-1 required impact pile driving on only seven piles, which required just two days.

FIGURE 2-1. BRAVO WHARF PROJECT REGIONAL OVERVIEW

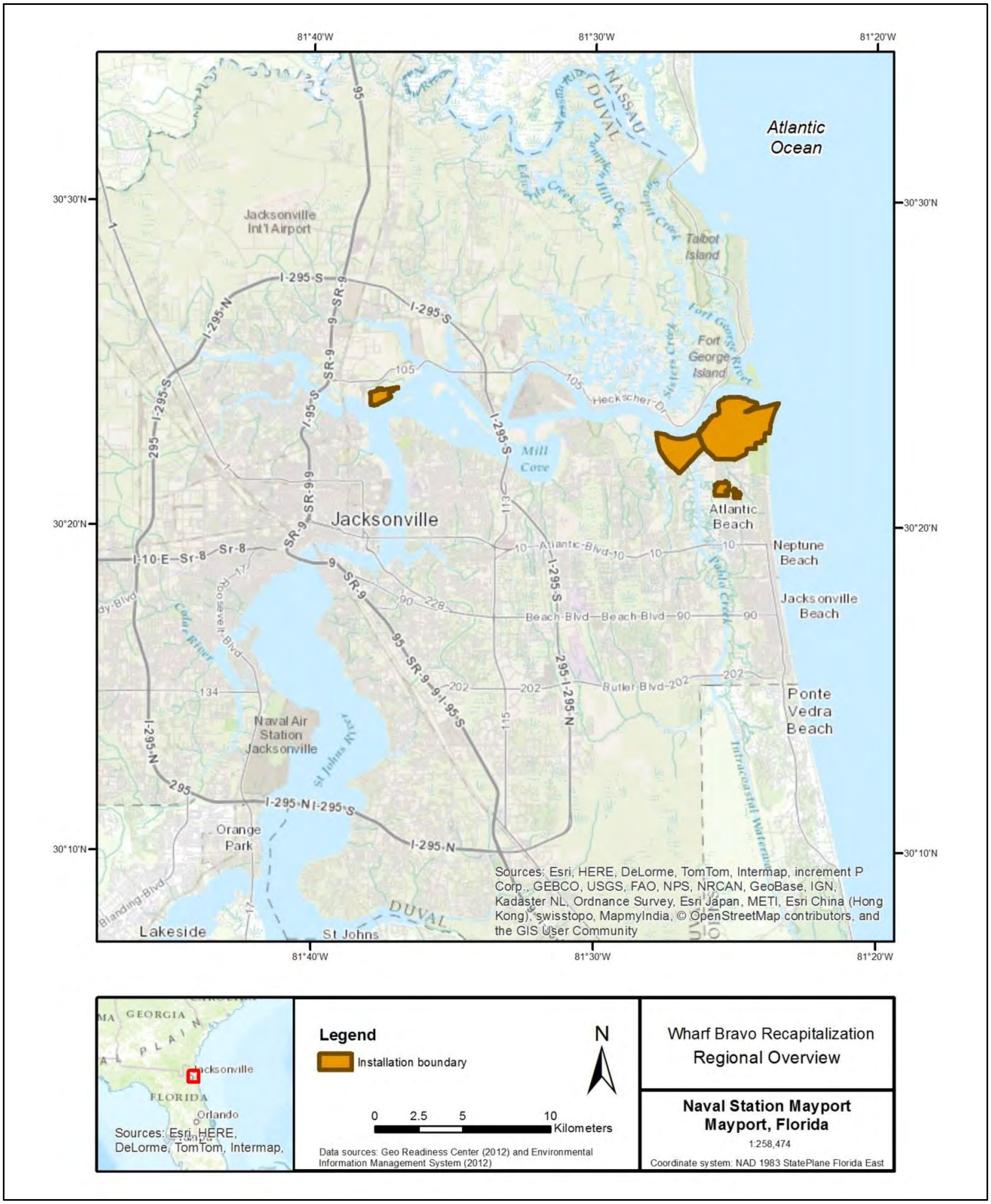


FIGURE 2-2. BRAVO WHARF RECAPITALIZATION PROJECT AREA

The Mayport turning basin is regularly dredged to a depth of 50 ft to allow for berthing of large military vessels. Salinity and temperature data for the project area are summarized in Table 2-1 and Figure 2-3, respectively.

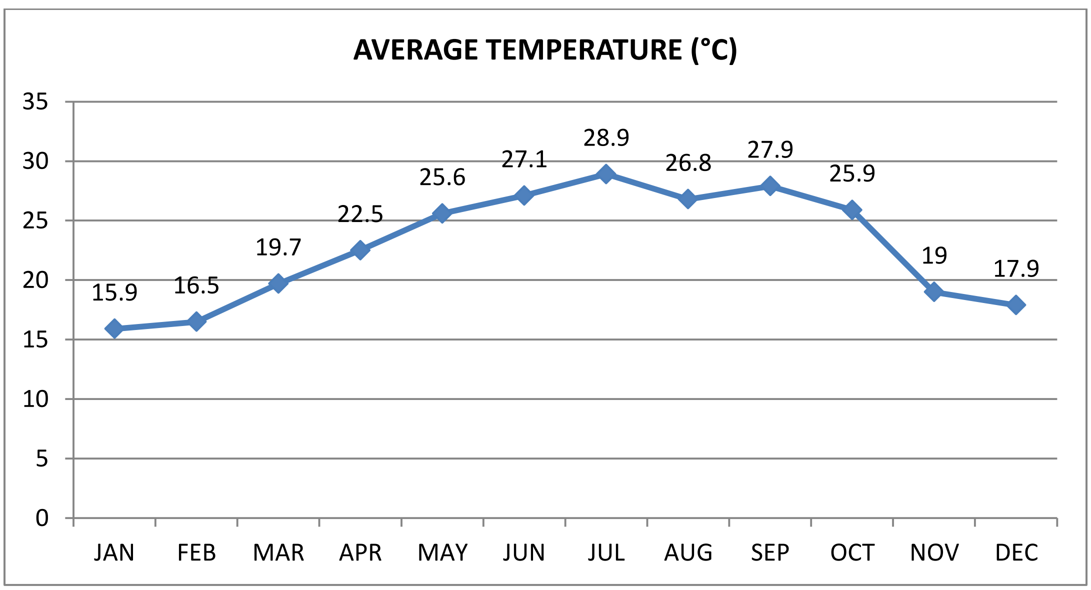
TABLE 2-1. MINIMUM AND MAXIMUM SURFACE AND BOTTOM SALINITIES

LOCATION	TIDE	WATER COLUMN	SALINITY
NAVSTA Mayport Turning Basin	Ebb	surface	30.6
		bottom	33.8
	Flood	surface	30.2
		bottom	33.6
NAVSTA Mayport Entrance Channel	Ebb	surface	30.0
		bottom	32.4
	Flood	surface	33.4
		bottom	34.7

Source: U.S. Department of the Navy 2008a

While water temperatures for the project area are not regularly recorded, average monthly temperatures at the closest NOAA station (Bar Pilot's Dock) ranged from 15.9 degrees Celsius (°C) (60.6 degrees Fahrenheit [°F]) in January to 28.9 °C (84°F) in August (Figure 2-3).

FIGURE 2-3. 2012 MONTHLY WATER TEMPERATURES AT BAR PILOT'S DOCK, FLORIDA



Source: National Oceanic and Atmospheric Administration 2012

3. Marine Mammal Species and Numbers

The species and numbers of marine mammals likely to be found within the activity area

The Navy has reviewed information about marine mammal species occurring in the western Atlantic along the east coast of Florida, and has determined that those listed in Table 3-1 may occur in the vicinity of the Project. The West Indian manatee (*Trichechus manatus*) is not regulated by NMFS and therefore is not considered further in this application. The responsible regulator for manatees is the U.S. Fish and Wildlife Service (USFWS). USFWS has promulgated guidance for protecting manatee occurring in the vicinity of near shore construction. The Navy and its contractors shall comply with the conditions intended to protect manatees from in-water work as outlined in Appendix A.

North Atlantic right whale, humpback whale, and Atlantic spotted dolphin densities were calculated from the Navy's Marine Species Density Database and Technical Report (U.S. Department of the Navy 2012). Bottlenose dolphin density was calculated based on surveys of the Mayport turning basin during late 2012 and early 2013 (U.S. Department of the Navy 2014).

TABLE 3-1. SPECIES POTENTIALLY OCCURRING IN THE PROJECT AREA

SPECIES and ESTIMATED DENSITY	STOCK	OCCURRENCE and ABUNDANCE BEST (CV) / MIN	STATUS	
			MMPA	ESA
North Atlantic right whale 0.045028/ km^2	Western Atlantic	Rare / Seasonal – November to April 476 (0) / 476[1]	depleted	endangered
humpback whale 0.000556/ km^2	Gulf of Maine	Extralimital[2] 823 (0) / 823[1]	depleted	endangered
Atlantic spotted dolphin 0.005402 / km^2	Western North Atlantic	Rare / Seasonal – November to May 26,798 (0.66) / 16,151[3]	n/a	n/a
bottlenose dolphin 4.15366 / km^2	Western North Atlantic Offshore	Rare 77,532 (0.40) / 56,053	n/a	n/a
	Western North Atlantic Northern Florida Coastal	Likely – year round 1,219 (0.67) / 730[3]		
	Jacksonville Estuarine System	Likely - year round, numbers may be slightly lower in winter 412 (0.06) / unknown[4]		
	Western North Atlantic Southern Migratory Coastal	Seasonal - January to March 9,173 (0.46) / 6,326[1]		

Sources: U. S. Department of the Navy 2012; U.S. Department of the Navy (2014) Turning Basin Bottlenose Dolphin Surveys; [1]Waring et al. 2015 [2]Extralimital: there may be a small number of sighting or stranding records, but the activity area is outside the species' range of normal occurrence; Rare: there may be a few confirmed sightings, or the distribution of the species is near enough to the area of concern that the species could occur there; the species may occur but only infrequently or in small numbers; Likely: confirmed and regular sightings of the species occur year-round; [3]Waring et al. 2013; [4]National Marine Fisheries Service 2009; this is an overestimate of the stock abundance in the area covered by the study because it includes non-resident and seasonally resident dolphins; most recent SAR has insufficient data on this stock

4. Affected Species Status and Distribution

A description of the status, distribution, and seasonal distribution (when applicable) of the affected species or stocks of marine mammals likely to be affected by such activities.

4.1. North Atlantic Right Whale

The North Atlantic Right Whale was listed as endangered in 1970 (35 FR 18319) under the Endangered Species Conservation Act of 1969; its listing was revised in 2008 (73 FR 12024). A five year review was completed in August 2012 with a recommendation to maintain the species' classification as endangered (National Marine Fisheries Service 2012). North Atlantic right whales are designated as depleted under the MMPA.

The western North Atlantic minimum stock size is based on a census of individual whales identified using photo-identification techniques. A review of the photo-ID recapture database as it existed on 21 October 2011 indicated that 425 individually recognized whales in the catalog were known to be alive during 2009. Whales catalogued by this date included 20 of the 39 calves born during that year. Thus adding the 19 calves not yet catalogued brings the minimum number alive in 2009 to 444. This number represents a minimum population size. This count has no associated coefficient of variation (Waring et al. 2013).

North Atlantic right whales are most often seen as individuals or pairs (New England Aquarium 2013). They migrate annually between the north and south Atlantic coasts of the United States. They can generally be found in calving grounds off Georgia and Florida from mid-November to mid-April; and then move to feeding grounds in the Gulf of Maine and Cape Cod in the summer (though sightings may occur year-round in this area) (National Marine Fisheries Service n.d.). North Atlantic right whale calves are born during December through March after 12 to 13 months of gestation (Kraus et al. 2001)

Dives of 5 to 15 min or longer have been reported (Cetacean and Turtle Assessment Program 1982; Baumgartner and Mate 2003), but can be much shorter when feeding (Winn et al. 1995) Longer surface intervals have been observed for reproductively-active females and their calves (Baumgartner and Mate 2003). In the Cape Cod Bay foraging area, this species has been observed feeding in the top 5 meters of the water column for long periods of time (Parks et al. 2011).

Based on annual surveys conducted from December through March between 1996 -2009, North Atlantic right whales are relatively common visitors to waters offshore from NAVSTA Mayport and the adjacent federal navigation channel (New England Aquarium 2013a; Loop pers. comm. 2012). Incidental sightings of North Atlantic right whales are a regular, although infrequent, occurrence in the St. Johns River and NAVSTA Mayport turning basin, with the most recent sighting of two individuals occurring at the mouth of the St. Johns River in December 2012 (Gibbons 2011, Loop pers. comm. 2012).

Based on data in the Navy's Marine Species Density Database (MSDD), a density of 0.045028 individuals / square kilometer (km^2) has been estimated for the activity area.

4.2. Humpback Whale

Humpback whales were also listed as endangered in 1970 (35 FR 18319) under the Endangered Species Conservation Act of 1969. A status review was initiated in 2009 (74 FR 40568). Humpback whale abundance is increasing through much of the species' range. Individuals that may occur in the vicinity of Bravo Wharf are from the Gulf of Maine stock. Humpback whales are designated as depleted under the MMPA.

The most recent line-transect survey, which did not include the Scotian Shelf portion of the stock, produced an estimate of abundance for Gulf of Maine humpback whales of 331 animals (CV=0.48) with a resultant minimum population estimate for this stock of 228 animals. The line-transect based minimum estimate is unrealistic because at least 500 uniquely identifiable individual whales from the Gulf of Mexico stock were seen during the calendar year of that survey and the actual population would have been larger because re-sighting rates have historically been <1. Using the minimum count from at least 2 years prior to the year of a stock assessment report has allowed NMFS time to resight whales known to be alive prior to and after the focal year. Thus the minimum population estimate is set to the 2008 mark-recapture based count of 823.Current data suggest the Gulf of Maine stock is steadily increasing in numbers (Waring et al. 2013)

Humpback whales feed on a variety of invertebrates and small schooling fishes. The most common invertebrate prey are krill; the most common fish prey are herring, mackerel, sand lance, sardines, anchovies, and capelin (Clapham and Mead 1999). Feeding occurs both at the surface and in deeper waters, wherever prey is abundant. The humpback whale is the only species of baleen whale that shows strong evidence of cooperation when feeding in large groups (D'Vincent et al. 1985).

During the winter, most of the North Atlantic population of humpback whales is believed to migrate south to calving grounds in the West Indies region (Whitehead and Moore 1982; Smith et al. 1999; Stevick et al. 2003b), over shallow banks and along continental coasts, where calving occurs. Calving peaks from January through March, with some animals arriving as early as December and a few not leaving until June. Individuals from the U.S. and Canada are typically sighted in the West Indies in mid-February (Stevick et al. 2003b). Since humpback whales migrate south to calving grounds during the fall and make return migrations to the northern feeding grounds in spring, they are not expected off the coast of Florida during summer. There has been an increasing occurrence of humpbacks, which appear to be primarily juveniles, during the winter along the U.S. Atlantic coast from Florida north to Virginia (Clapham et al. 1993; Swingle et al. 1993; Wiley et al. 1995; Laerm et al. 1997).

The coastal region of Florida is not designated as an area of concentrated occurrence for humpback whales (U.S. Department of the Navy 2008). Examination of whaling catches revealed both northward and southward migrations are characterized by a staggering of sexual and maturational classes; lactating females are among the first to leave summer feeding grounds in the fall, followed by subadult males, mature males, non-pregnant females, and pregnant

females (Clapham 1996). On the northward migration, this order is broadly reversed, with newly pregnant females among the first to begin the return migration to high latitudes. Based on sightings, strandings, and life history, humpbacks would be expected to occur in waters off NAVSTA Mayport during fall, winter, and spring. The likelihood of occurrence is low, however, and even lower for the turning basin and Bravo Wharf activity area.

Based on data in the Navy's MSDD, a year-round density of 0.000556 individuals / km^2 has been estimated for the activity area.

4.3. Atlantic Spotted Dolphin

Atlantic spotted dolphins occurring in the Bravo Wharf activity area belong to the Western North Atlantic Stock.

The Atlantic spotted dolphin is found in nearshore tropical to warm-temperate waters, predominantly over the continental shelf and upper slope. In the western Atlantic, this species is distributed from New England to Brazil and is found in the Gulf of Mexico as well as the Caribbean Sea (Perrin 2002).

Atlantic spotted dolphins in the Gulf of Mexico were observed feeding cooperatively on clupeid fishes and are known to feed in association with shrimp trawlers (Fertl and Leatherwood 1997; Fertl and Wursig 1995). In the Bahamas, this species was observed to chase and catch flying fish (MacLeod et al. 2004). The diet of the Atlantic spotted dolphin varies depending on location, and can include burrowing and schooling fish, and squid (Jefferson et al. 2008; Herzing and Elliser 2013).

While specific seasonal occurrence information for Atlantic spotted dolphins on Florida's Atlantic coast does not exist, studies have indicated that higher numbers of individuals reported over the west Florida continental shelf from November to May than during the rest of the year, suggesting that this species may migrate seasonally (Griffin and Griffin 2003). Atlantic spotted dolphins are typically observed in deeper offshore waters. They could potentially occur in shallower coastal waters in and around the activity area, but the likelihood is low.

Based on data in the Navy's MSDD, a year-round density of 0.005402 individuals / km^2 has been estimated for the activity area.

4.4. Bottlenose Dolphin

Bottlenose dolphins occurring in the Bravo Wharf activity area may be individuals belonging to any of the following stocks: the Western North Atlantic Offshore Stock, the Western North Atlantic Northern Florida Coastal Stock, the Jacksonville Estuarine System Stock; and the Western North Atlantic Southern Migratory Coastal Stock.

Along the Atlantic coast of the U.S., where the majority of detailed work on bottlenose dolphins has been conducted, male and female bottlenose dolphins reach physical maturity at 13 years,

with females reaching sexual maturity as early as seven years (Mead and Potter 1990). Bottlenose dolphins are flexible in their timing of reproduction. Seasons of birth for bottlenose dolphin populations are likely responses to seasonal patterns of availability of local resources (Urian et al. 1996). Thayer et al. (2003) found bottlenose dolphins in North Carolina to exhibit a strong calving peak in spring, particularly May and June, and a diffuse peak from late spring to early fall. There is a gestation period of one year (Caldwell and Caldwell 1972). Calves are weaned as early as one and a half years of age (Reynolds et al. 2000), and typically remain with their mothers for a period of three to eight years (Wells et al. 1987), although longer periods are documented (Reynolds et al. 2000). There are no specific breeding locations for this species.

Dive durations as long as 15 min are recorded for trained individuals (Ridgway et al. 1969). Typical dives, however, are shallower and have a much shorter duration. Mean dive durations of Atlantic bottlenose dolphins typically range from 20 to 40 seconds at shallow depths (Mate et al. 1995)

Bottlenose dolphins typically occur in groups of 2 – 15 individuals, but significantly larger groups have also been reported (Shane et al. 1986; Kerr et al. 2005). Coastal bottlenose dolphins typically exhibit smaller group sizes than larger forms, as water depth appears to be a significant influence on group size (Shane et al. 1986). Shallow, confined water areas typically support smaller group sizes, some degree of regional site fidelity, and limited movement patterns (Shane et al. 1986; Wells et al. 1987).

Recent surveys have shown that bottlenose dolphins in the vicinity of Bravo Wharf occur in groups of 5 or more, pairs, and individually. Larger groups, observed infrequently, are generally seen at the entrance of the turning basin. These groups navigate into the basin, but generally not very far. A mother / calf pair was observed regularly during the winter and early spring of 2012 / 2013. Bottlenose dolphins are rarely observed lingering in a particular area in the turning basin; rather, they appear to move purposefully through the basin and then leave (Peters pers. comm. 2013).

Based on surveys being conducted in the NAVSTA Mayport turning basin during late 2012 and early 2013 (U.S. Department of the Navy 2014), a density of 4.15366 individuals / km^2 has been estimated for the project area (see Appendix C for the full report and survey details).

5. Incidental Take Authorization Requested

The type of incidental taking authorization that is being requested (i.e., takes by harassment only, takes by harassment, injury, and/or death), and the method of incidental taking.

Under the 1994 Amendments to the MMPA, harassment is statutorily defined as any act of pursuit, torment, or annoyance which:

- **Level A Harassment** has the potential to injure a marine mammal or marine mammal stock in the wild; or,
- **Level B Harassment** 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 but which does not have the potential to injure a marine mammal or marine mammal stock in the wild (National Marine Fisheries Service 2013).

The marine mammal density data used for this analysis was retrieved from the Navy's Marine Species Density Database, and the current turning basin survey effort at NAVSTA Mayport. Table 5-1 summarizes the species densities. The estimated number of exposures that could result for the one year period of construction for the Project from 1 October 2016 to 30 September 2017 is summarized in Table 5-2. Estimation of bottlenose dolphin density was based on surveys of the basin, detailed in U.S Department of the Navy (2014).

TABLE 5-1. SPECIES DENSITIES

Species	Highest Density[1] (season)
North Atlantic right whale	0.045028 / km^2 (all)
humpback whale	0.000556 / km^2 (all)
Atlantic spotted dolphin	0.005402 / km^2 (spring)
bottlenose dolphin[2]	4.15366 / km^2 (all)

[1]Refer to Roberts JJ, Mannocci L, Halpin PN (2015) Marine mammal density models for the U.S. Navy Atlantic Fleet Training and Testing (AFTT) study area for the Phase III Navy Marine Species Density Database (NMSDD). Document version 1.1. Report prepared for Naval Facilities Engineering Command, Atlantic by the Duke University Marine Geospatial Ecology Lab, Durham, North Carolina.; [2]U.S. Department of the Navy (2014) Survey Report.

Assumptions to be considered for the bottlenose dolphin incidental take estimate:

1) Individual animals may have been counted more than once.
2) The number of animals per square kilometer is assumed to be static, therefore indicating a resident population with no "refreshment" of new animals entering or leaving the area. This is not a reasonable real world assumption, but in the absence of specific data on bottlenose dolphin movements in and out of the project area it has been applied for modeling purposes and represents a conservative approach.
3) Animals with a Level B exposure can be re-exposed every 24 hours, according to the standard of analysis for incidental takes. Therefore, while 920 incidental takes are being requested, the same animal could be affected on multiple days instead of 920 different dolphins being exposed once each. For example, 92 animals could each be exposed to noise levels that reach Level B criteria ten times over the course of the 130 day in-water work period.

The density of each species was multiplied by the size of the relevant zone of influence to determine the estimated number of exposures per day. This number was rounded to the nearest whole number and multiplied by the estimated number of pile-driving days to calculate takes for the entire Project. The Navy is requesting authorization for a total of 920 Level B (behavioral) incidental takes of bottlenose dolphins, and 110 Level B (behavioral) incidental takes of Atlantic spotted dolphins over the course of the Project (Table 5–2). Exposures may be to any age / reproductive class of the species. No incidental takes are requested for any other marine mammal species.

The Navy has committed to avoiding Level A takes during this project and shall monitor the entire injury zone for both types of driving; in-water work shall be shut down should a protected species approach or enter these zones. Therefore, no Level A exposures are anticipated or requested.

Methods for developing the incidental take estimate are detailed in Chapter 6 and Appendix B.

TABLE 5-2. ESTIMATED MARINE MAMMAL EXPOSURES

SPECIES	DENSITY (per km^2)	CALCULATED EXPOSURES		TOTALS
		Level A	Level B	
VIBRATORY DRIVING – Phase I (berths B-2 and B-3)				
North Atlantic right whale	0.045028 / km^2 (all)	0	0	0
humpback whale	0.000556 / km^2 (all)	0	0	0
Atlantic spotted dolphin	0.005402 / km^2 (spring)	0	0	0
bottlenose dolphin	4.15366 / km^2 (all)	0	219	219
VIBRATORY DRIVING – Phase II (berth B-1)				
North Atlantic right whale	0.045028 / km^2 (all)	0	0	0
humpback whale	0.000556 / km^2 (all)	0	0	0
Atlantic spotted dolphin	0.005402 / km^2 (spring)	0	0	0
bottlenose dolphin	4.15366 / km^2 (all)	0	111	111
CONTINGENCY IMPACT DRIVING – Phases I and II				
North Atlantic right whale	0.045028/ km^2 (all)	0	0	0
humpback whale	0.000556 / km^2 (all)	0	0	0
Atlantic spotted dolphin	0.005402 / km^2 (spring)	0	0	0
bottlenose dolphin	4.15366 / km^2 (all)	0	40	40
SPECIES CALCULATED EXPOSURE TOTALS		**0**	**370**	**370**

Sources: U.S. Department of the Navy 2012; U.S. Department of the Navy (2014) Survey Report

6. Numbers and Species Taken

By age, sex, and reproductive condition (if possible), the number of marine mammals (by species) that may be taken by each type of taking identified in Section 5, and the number of times such takings by each type of taking are likely to occur.

The methods for estimating the number and types of exposure are described in the sections below, followed by the method for quantifying exposures of marine mammals to sources of energy exceeding those threshold values. Exposure of each was determined by:

- The potential of each species to be impacted by the acoustic sources as determined by the acoustic criterion for marine mammals.
- The potential presence of each species and their estimated density in the zone of influence for the Project.
- The area of impact for each pile driving sound source (estimated by taking into account the source levels, propagation loss and thresholds at which each acoustic criterion are met).

Potential exposures were calculated by multiplying the density of each marine mammal species potentially present by the total impacted area for each threshold value by the potential number of days of pile driving.

An introduction to the fundamentals of acoustics and use of the decibel unit can be found in Appendix B.

Assessing whether a sound may disturb or injure a marine mammal involves understanding the characteristics of the acoustic source and the potential effects that sound may have on the animal's physiology and behavior. Although it is known that sound is important for marine mammal communication, navigation, and foraging (National Research Council 2003, 2005), there are many unknowns in assessing impacts such as the potential interaction of different effects and the biological significance of responses by marine mammals to sound exposures (Nowacek et al. 2007; Southall et al. 2007). Furthermore, many factors other than the received level of sound may affect an animal's reaction, such as the animal's physical condition, prior experience with the sound, and proximity to the source of the sound (Nowacek et al. 2007).

Acoustically-mediated behaviors, including social interactions, foraging, and navigation, may be particularly vulnerable to disturbance during pile-driving activities, and it is important to understand the source characteristics of marine mammal vocalizations in order to address potential masking (see Appendix B) and disturbance. The following sections address hearing and sound production of all marine mammals that may be present in the project area during pile driving.

6.1. Hearing and Vocalization for North Atlantic Right Whales

Hearing in North Atlantic right whales and other large baleen whales is poorly understood due to the difficulty of performing experimental tests on live whales. Mathematical models and anatomical studies of whale ears have been used to estimate hearing in baleen whales. Recent morphometric analyses of North Atlantic right whale inner ears estimates a hearing range of approximately 0.01 to 22 kHz based on established marine mammal models (Parks et al. 2004; Parks and Tyack 2005; Parks et al. 2007).

North Atlantic right whales produce a variety of sounds, including moans, screams, gunshots, blows, upcalls, downcalls, and warbles that are often linked to specific behaviors (Matthews et al. 2001; Laurinolli et al. 2003; Vanderlaan et al. 2003; Parks et al. 2005; Parks and Tyack 2005). Sounds can be divided into three main categories: (1) blow sounds; (2) broadband impulsive sounds; and (3) tonal call types (Parks and Clark 2007). Blow sounds are those coinciding with an exhalation; it is not known whether these are intentional communication signals or just produced incidentally (Parks and Clark 2007). Broadband sounds include non-vocal slaps (when the whale strikes the surface of the water with parts of its body) and the “gunshot” sound; data suggests that the latter serves a communicative purpose (Parks and Clark 2007; Parks et al. 2012). Tonal calls can be divided into simple, low-frequency, stereo-typed calls and more complex, frequency-modulated, higher frequency calls (Parks and Clark 2007). Most of these sounds range in frequency from 0.02 to 15 kHz (dominant frequency range from 0.02 to less than 2 kHz; durations typically range from 0.01 to multiple seconds) with some sounds having multiple harmonics (Parks and Tyack 2005). Source levels for some of these sounds have been measured as ranging from 137 to 192 dB root-mean-square (rms) re: 1 µPa-m (decibels at the reference level of one micro Pascal at one meter) (Parks et al. 2005; Parks and Tyack 2005). In certain regions (i.e., northeast Atlantic), preliminary results indicate that right whales vocalize more from dusk to dawn than during the daytime (Leaper and Gillespie 2006; Mussoline et al. 2012; Parks et al. 2012). Vocalization rates of North Atlantic right whales are also highly variable, and individuals have been known to remain silent for hours (Gillespie and Leaper 2001). Baumgartner et al. (2005) noted that downsweep calls by North Atlantic right whales in the 16 to 160 Hz frequency band exhibited a diel pattern (fewer calls at night) that corresponded strongly to the diel vertical migration of zooplankton.

6.2. Hearing and Vocalization for Humpback Whales

While no measured data on hearing ability are available for humpback whales, Ketten (1997) hypothesized that mysticetes have acute infrasonic hearing. Houser et al. (2001) produced the first humpback whale audiogram (using a mathematical model), which was u-shaped and conformed to the typical mammalian presentation. The area of best hearing, or sensitivity, according to the model was observed between frequencies from 700 Hz to 10 kHz but the maximum range of hearing was identified between 200 Hz to 14 kHz. Au et al. (2006) noted that if the popular notion that animals generally hear the totality of the sounds they produce is applied to humpback whales, this suggests that its upper frequency limit of hearing is as high as 24 kHz.

Humpback whales are known to produce three classes of vocalizations: (1) “songs” in the late fall, winter, and spring by solitary males; (2) sounds made within groups on the wintering

(calving) grounds; and (3) social sounds made on the feeding grounds (Thomson and Richardson 1995). The best-known types of sounds produced by humpback whales are songs, which are thought to be breeding displays used only by adult males (Helweg et al. 1992). Singing is most common on breeding grounds during the winter and spring months but is occasionally heard outside breeding areas and out of season (Mattila et al. 1987; Gabriele et al. 2001; Gabriele and Frankel 2002; Clark and Clapham 2004). Humpback song is an elaborate series of patterned vocalizations which are hierarchical in nature (Payne and McVay 1971). There is geographical variation in humpback whale song, with different populations singing different songs and all members of a population using the same basic song. However, the song evolves over the course of a breeding season but remains nearly unchanged from the end of one season to the start of the next (Payne et al. 1983). Components of the song range from under 20 Hz to 4 kHz and occasionally 8 kHz, with source levels measured between 151 and 189 dB re 1 µPa-m and high-frequency harmonics extending beyond 24 kHz (Au et al. 2001; Au et al. 2006).

Social calls range in frequency from 50 Hz to over 10 kHz, with dominant frequencies below 3 kHz (Silber 1986). Female vocalizations appear to be simple; Simão and Moreira (2005) noted little complexity. "Feeding" calls, unlike song and social sounds, are highly stereotyped series of narrow-band trumpeting calls. They are 20 Hz to 2 kHz, less than 1 sec in duration, and have source levels of 162 to 192 dB re 1 µPa-m. The fundamental frequency of feeding calls is approximately 500 Hz (D'Vincent et al. 1985; Thompson et al. 1986).

6.3. Hearing and Vocalization for Atlantic Spotted Dolphins

A variety of sounds including whistles, echolocation clicks, squawks, barks, growls, and chirps have been recorded for the Atlantic spotted dolphin (Thomson and Richardson 1995). Whistles have dominant frequencies below 20 kHz (range: 7.1 to 14.5 kHz) but multiple harmonics extend above 100 kHz, while burst pulses consist of frequencies above 20 kHz (dominant frequency of approximately 40 kHz) (Lammers et al. 2003). Other sounds, such as squawks, barks, growls, and chirps, typically range in frequency from 100 Hz to 8 kHz (Thomson and Richardson 1995). Recently recorded echolocation clicks have two dominant frequency ranges at 40 to 50 kHz and 110 to 130 kHz, depending on source level (i.e., lower source levels typically correspond to lower frequencies and higher frequencies to higher source levels (Au and Herzing 2003).

Echolocation click source levels as high as 210 dB re 1 µPa-m peak-to-peak have been recorded (Au and Herzing 2003). Spotted dolphins in The Bahamas were frequently recorded during agonistic / aggressive interactions with bottlenose dolphins (and their own species) to produce squawks (200 Hz to 12 kHz broad band burst pulses; males and females), screams (5.8 to 9.4 kHz whistles; males only), barks (200 Hz to 20 kHz burst pulses; males only), and synchronized squawks (100 Hz - 15 kHz burst pulses; males only in a coordinated group) (Herzing 1996).

There have been no data collected on Atlantic spotted dolphin hearing abilities. However, odontocetes are generally adapted to hear high-frequencies (Ketten 1997) and it can be assumed that vocalization frequencies are generally within the hearing range of a species.

6.4. Hearing and Vocalization for Bottlenose Dolphins

Bottlenose dolphins can typically hear within a broad frequency range of 200 Hz to 160 kHz (Au 1993; Turl 1993), though with exposure during testing some dolphins might receive information as low as 50 Hz (Turl 1993). Electrophysiological experiments suggest the bottlenose dolphin brain has a dual analysis system: one specialized for ultrasonic clicks and another for lower-frequency sounds, such as whistles (Ridgway 2000). Scientists have reported a range of highest sensitivity between 25 and 70 kHz, with peaks in sensitivity at 25 and 50 kHz (Nachtigall et al. 2000). Recent research on the same individuals indicates auditory thresholds obtained by electrophysiological methods correlate well with those obtained in behavior studies, except at the some lower (10 kHz) and higher (80 and 100 kHz) frequencies (Finneran and Houser 2006).

Sounds emitted by bottlenose dolphins have been classified into two broad categories: pulsed sounds (including clicks and burst-pulses) and narrow-band continuous wave sounds (whistles), which usually are frequency modulated. Clicks and whistles have dominant frequency ranges of 110 to 130 kHz and source levels of 218 to 228 dB re 1 μPa-m (Au 1993) and 3.4 to 14.5 kHz and 125 to 173 dB re 1 μPa-m, respectively (Ketten 1998). Whistles are primarily associated with communication and can serve to identify specific individuals (i.e., signature whistles) (Caldwell and Caldwell 1965; Janik et al. 2006). Up to 52% of whistles produced by bottlenose dolphin groups with mother-calf pairs have been classified as signature whistles (Cook et al. 2004).

Sound production is also influenced by group type (single or multiple individuals), habitat, and behavior (Nowacek 2005). Bray calls (low-frequency vocalizations; majority of energy below 4 kHz), for example, are used when capturing fishes, specifically sea trout (*Salmo trutta*) and Atlantic salmon (*Salmo salar*), in some regions (i.e., Moray Firth, Scotland) (Janik 2000). Additionally, whistle production has been observed to increase while feeding (Acevedo-Gutiérrez and Stienessen 2004; Cook et al. 2004). Both whistles and clicks have been demonstrated to vary geographically in terms of overall vocal activity, group size, and specific context (e.g., feeding, milling, traveling, and socializing) (Jones and Sayigh 2002; Zaretsky et al. 2005; Baron 2006). For example, preliminary research indicates characteristics of whistles from populations in the northern Gulf of Mexico significantly differ (i.e., in frequency and duration) from those in the western north Atlantic (Zaretsky et al. 2005; Baron 2006).

6.5. Sound Exposure Criteria and Thresholds

Under the MMPA, NMFS has defined levels of harassment for marine mammals. Level A harassment is defined as "any act of pursuit, torment, or annoyance which has the potential to injure a marine mammal or marine mammal stock in the wild." Level B harassment is defined as "Any act of pursuit, torment, or annoyance which 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."

Since 1997, NMFS has used generic sound exposure thresholds to determine when an activity in the ocean that produces sound might result in impacts to a marine mammal such that a take by harassment might occur (70 FR 1871). Current NMFS practice regarding exposure of marine

mammals to pile driving sounds is that cetaceans exposed to impulsive sounds ≥180 re 1 μPa rms are considered to have been taken by Level A (i.e., injurious) harassment. Level A injury thresholds have not been established for non-impulsive sounds such as vibratory pile driving, but the Navy has applied the threshold values for impulsive sounds to vibratory sound in this analysis.

Behavioral harassment (Level B) is considered to have occurred (and thus a "take" is counted) when marine mammals are exposed to underwater sounds below the injury threshold, but ≥ 160 dB re 1 μPa rms for impulsive sounds (e.g., impact pile driving) and 120 dB re 1 μPa rms for non-impulsive noise (e.g., vibratory pile driving).

6.6. Limitations of Existing Noise Criteria

To date, there is no research or data supporting a response by odontocetes to non-impulsive sounds from vibratory pile driving as low as the 120 dB re 1 μPa rms threshold. The application of the 120 dB rms re 1μPa threshold can be problematic because this threshold level can be at or below the ambient noise level of certain locations. For example, noise levels at some industrialized ports in Puget Sound, WA, have been measured at between 120 and 130 dB re 1μPa (Washington State Department of Transportation 2012). As a result, such analyses may be overly conservative, and the threshold level is subject to ongoing discussion due to these issues (74 FR 41684). NMFS is developing new science-based thresholds to improve and replace the current generic exposure level thresholds, but the criteria have not been finalized (79 FR 4672). The 120 dB re 1 μPa rms threshold level for non-impulsive noise originated from research conducted by Malme et al. (1984, 1988) for California gray whale response to non-impulsive industrial sounds such as drilling operations. Note: The 120 dB re 1 μPa rms *non-impulsive* sound threshold should not be confused with the 120 dB re 1 μPa rms *impulsive* sound criterion established for migrating bowhead whales in the Arctic as a result of research in the Beaufort Sea (Richardson et al. 1995; Miller et al. 1999).

6.7. Ambient Noise

The baseline noise level in the turning basin is referred to as the "ambient noise level". Ambient noise is comprised of sounds produced by a number of natural and anthropogenic sources. Natural noise sources can include wind, waves, precipitation, and biological sources such as shrimp, fish, and cetaceans. These sources produce sound in a wide variety of frequency ranges (Urick 1983; Richardson et al. 1995) and can vary over long (days to years) and short (seconds to hours) time scales. In shallow waters, precipitation may contribute up to 35 dB to the existing sound level, and increases in wind speed of 5 to 10 knots can cause a 5 dB increase in ambient ocean noise between 20 Hz and 100 kHz (Urick 1983). High noise levels may also occur in near shore areas during heavy surf, which may increase low frequency (200 Hz – 2 kHz) underwater noise levels by 20 dB or more within 200 yards of the surf zone (Wilson et al. 1985). At Mayport, vessel wakes in the St. Johns River may cause breaking waves on shore, contributing to the ambient acoustic environment.

Anthropogenic noise sources also contribute to ambient noise levels, particularly in ports and other high use areas in coastal regions. Normal port activities include vessel traffic (from large

ships, support vessels, and security boats), loading and maintenance operations, and other activities (sonar and echo-sounders from commercial and recreational vessels, construction, etc.) which all generate underwater sound (Urick 1983). Additionally, noise produced by mechanized equipment on wharves or adjacent shorelines may propagate underwater and contribute to underwater ambient noise levels.

The underwater acoustic environment in the Mayport turning basin is likely to be dominated by noise from day-to-day port and vessel activities. The basin is sheltered from most wave noise, but is a high-use area for naval ships, tugboats, and security vessels. When underway, these sources can create noise between 20 Hz and 16 kHz (Lesage et al. 1999), with broadband noise levels up to 180 dB re 1 µPa rms (Table 6-1) Normal port operations, including transits, docking, and maintenance by multiple tugboats and ships would continue. While there are no current measurements of ambient noise levels in the turning basin, the high levels of anthropogenic activity in the basin are likely to have elevated ambient noise levels within the basin above "quiet" habitats in which marine mammal reactions to 120 dB sounds were observed (Malme et al. 1984, 1988).

The existing sources of anthropogenic noise in the Mayport turning basin are generally non-impulsive (see Appendix B), intermittent sources such as vessel engines; this category also includes noise from vibratory pile driving. Impact pile driving noise differs from these sources in that it is impulsive, with a fast rise time and multiple short-duration (50 – 100 millisecond; Illingworth & Rodkin 2001) events. The use of impact driving during the proposed project is limited to instances when vibratory driving fails, and will be limited to a maximum of 20 strikes per day. Because of the very limited use of impact pile driving during the proposed action, the Navy expects no long-term change in the average ambient noise environment with respect to impulsive sounds as a result of impact pile driving.

TABLE 6-1. REPRESENTATIVE LEVELS OF NOISE FROM ANTHROPOGENIC SOURCES

Noise Source	Frequency Range (Hz)	Underwater Noise Level (dB re 1 µPa)
Small vessels[1]	250–6,000	151 dB rms at 1 m
Large vessels[2]	20 – 1,500	170 – 180 dB rms at 1 m
Tug docking barge[3]	200–1,000	149 dB rms at 100 m
Vibratory driving of 24-inch steel pipe pile[4]	50 – 1,500	159 dB rms at 10 m
Impact driving of 24-inch steel pipe pile[5]	50 – 1,500	186 dB rms at 10 m

m = meter ; Sources: [1]Lesage et al. 1999; [2]Richardson et al. 1995; [3]Blackwell and Greene 2002; [4]Illingworth & Rodkin 2012; [5]Washington Department of Transportation 2005

Airborne ambient noise in industrial areas such as the Mayport turning basin is comprised of sounds from trucks, cranes, compressors, generators, pumps, ship engines, and other equipment. While there are no current measurements of airborne ambient noise in the basin or wharf areas, expected noise levels range from a daytime minimum of 55 dBA to a maximum of 99 dBA,

assuming that multiple sources will be operating simultaneously (Washington State Department of Transportation 2007).

6.8. Underwater Noise from Pile Driving

Noise levels produced by pile driving are influenced by factors including pile type, driving method, and the physical environment in which the activity takes place. A number of studies have examined sound pressure levels recorded from underwater pile driving projects in California and Washington, creating a large body of data for impact driving of steel pipe piles, concrete piles, and some timber piles (California Department of Transportation 2012, U.S. Navy 2013).

Vibratory driving of steel sheet piles was monitored during the first year of construction at the nearby C-2 Wharf at Naval Station Mayport during 2015. Measurements were conducted from a small boat in the turning basin and from the construction barge itself. Details are available in U.S. Navy (2015). Source levels averaged 151 dB re 1µPa rms (U.S. Navy 2015). This level was used as a proxy for modeling installation of sheet piles at Bravo Wharf. No impact driving was measured at this location; therefore, proxy levels for impact driving have been calculated from other available source levels.

Measured sound pressure levels for 24 in. diameter steel sheet piles and 24 in. diameter steel pipe piles are available impact driving. To determine the most appropriate sound pressure levels for this project, data from studies which met the following parameters were considered:

- Pile size and type: steel pipe piles (24 in. diameter) and/or steel sheet piles (24 in. wide)
- Installation method: impact hammer
- Physical environment - water depth 15 ft. (4.5 m) or greater, sediment similar to sandy bottom in Mayport turning basin.

Table 6-2 details representative pile driving sound pressure levels measured from steel pipe piles and steel sheet piles. Comparison of measured sound pressure levels from the steel pipe piles and steel sheet piles revealed that levels from sheet pile driving were higher than those from pipe pile driving; the Navy has therefore used the more conservative sound pressure levels from steel sheet piles to model the proposed action. The selected sound pressure levels used for modeling steel piles in this application were 151 dB re 1 µPa rms for vibratory driving and 189 dB re 1µPa rms for impact driving.

TABLE 6-2. IMPACT INSTALLATION UNDERWATER SOUND PRESSURE LEVELS EXPECTED BASED ON SIMILAR IN-SITU MONITORED CONSTRUCTION ACTIVITIES

Project and Location	Pile Size and Type	Water Depth	Range to pile	RMS	Peak	SEL	Sediment
Friday Harbor Ferry Terminal, WA[a]	24 inch steel pipe	12.8 m	10 m	170	183	180	Sandy silt/clay
		13.4 m		186	205	179	
		14.3 m		186	204	179	
		10 m		194	210	185	Sandy silt/rock
		10 m		195	215	187	
		10 m		193	212	184	
Typical values, Caltrans compendium summary table[b]	24 inch steel pipe	15	NA	194	207	178	Unknown
Berth 23 Port of Oakland[b]	24 inch steel sheet pile	12 – 14 m	10 m	189[1]	205	179	Unknown

Sound levels expressed as dB re 1 µPa rms and dB re 1 µPa peak for RMS and Peak SPL measurements, respectively; 1- This data point was selected for use in acoustic modeling based on similarity to physical environment at NAVSTA Mayport and measurement location in mid-water column. Sources: [a]Washington State Department of Transportation 2005; [b]California Department of Transportation 2012

6.9. Underwater Sound Propagation

Pile driving can generate underwater noise that may result in disturbance to marine mammals within the project area. Modeling sound propagation is useful in evaluating noise levels to determine which marine mammals may be exposed at a given distance from the pile driving activity. The decrease in acoustic intensity as a sound wave propagates outward from a source is known as transmission loss (TL).

The formula for transmission loss is:

$$TL = B * log_{10}\left(\frac{R_1}{R_2}\right) + C * R_1, \text{ where}$$

B = logarithmic (predominantly spreading) loss

C = linear (scattering and absorption) loss

R_1 = range from source in meters

R_2 = range from driven pile to original measurement location (generally 10 m)

The amount of linear loss (C) is proportional to the frequency of a sound. Due to the low frequencies of sound generated by impact and vibratory pile driving, this factor was assumed to be zero for all calculations in this assessment and transmission loss was calculated using only logarithmic spreading. Therefore, using practical spreading (B=15), the revised formula for transmission loss is $TL = 15 \log_{10} (R_1/10)$.

6.10. Calculated Zones of Influence

The practical spreading loss model discussed above was used to calculate the propagation of pile driving sound in and around the Mayport turning basin. A total of 130 days of pile driving were modeled; 110 days of vibratory driving (73 days for Phase I, and 37 days for Phase II), plus 20 days of contingency impact driving distributed as needed across both phases. No sound mitigation methods (bubble curtains, cofferdams, etc.) are proposed and therefore no attenuation was included in the acoustic model.

For vibratory driving, the acoustic analysis used the assumption that a maximum of 27 sheet pile pairs would be driven each day, for a maximum daily length of approximately 124 ft.

For impact driving, modeling assumed a maximum of 20 strikes of the impact hammer per day, which is expected to take no more than five to ten minutes to complete.

TABLE 6-3. CALCULATED DISTANCES TO / AREAS ENCOMPASSED BY THE UNDERWATER MARINE MAMMAL NOISE THRESHOLDS FOR PILE DRIVING

Pile Type	Driving Method	Threshold (dB re 1µPa rms)	Distance (m)[1]	Area (km²)
Steel sheet piles	vibratory	Level A (injury): 180	< 1	0
		Level B (behavior): 120	1,166	0.614439
	impact (contingency only)	Level A (injury): 180	40	0.002
		Level B (behavior): 160	858	0.51

All sound levels expressed in dB re 1 µPa rms. dB = decibel; rms = root-mean-square; µPa = micro Pascal
Practical spreading loss (15 log, or 4.5 dB per doubling of distance) used for calculations.
[1]Sound pressure levels used for calculations are 151 dB rms and 189 dB rms for vibratory and impact driving, respectively.

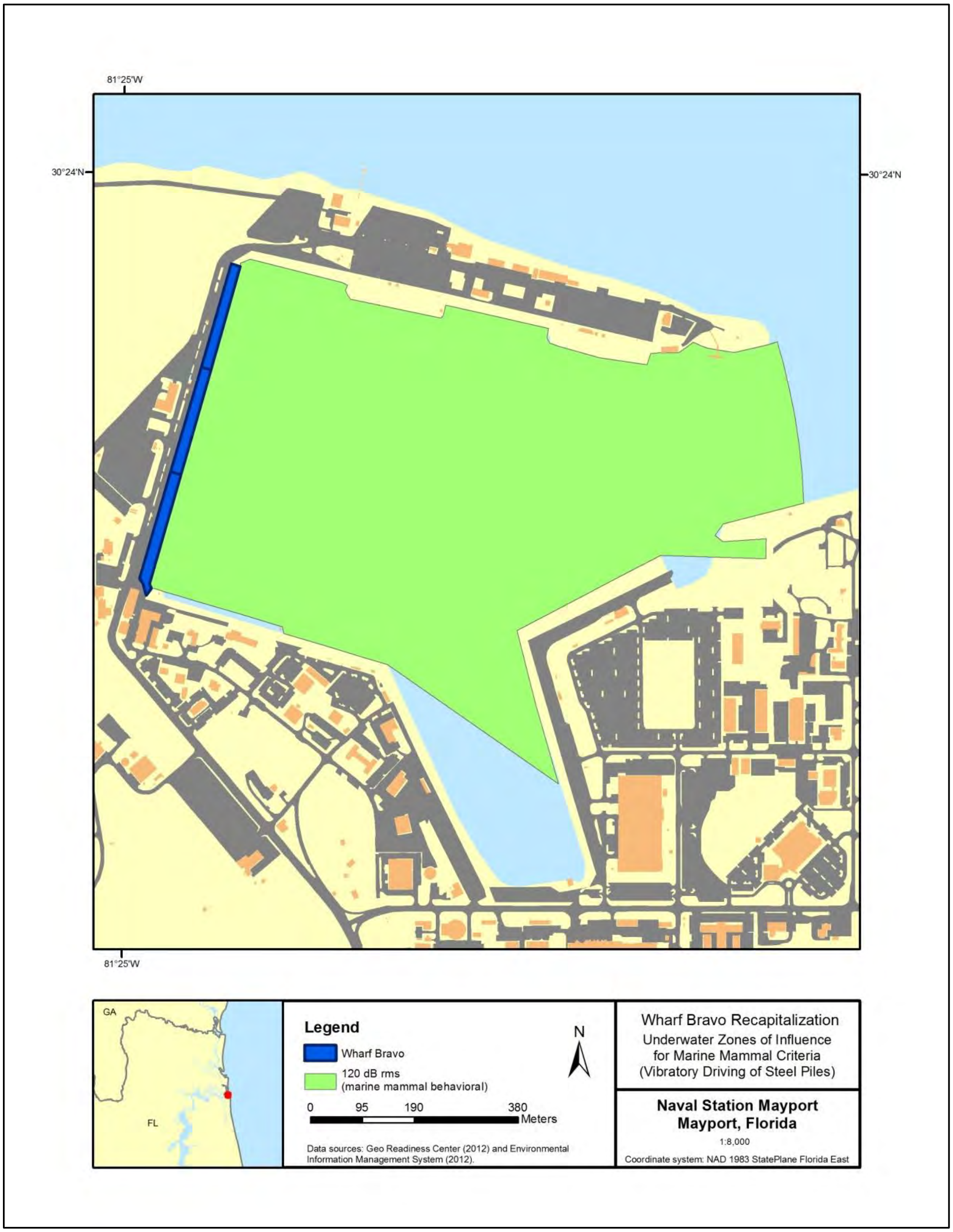
The calculations presented in Table 6-3 assume a field free of obstruction, which is unrealistic because the Mayport turning basin does not represent open water conditions (free field) and sounds will attenuate as they encounter land or other solid obstacles. As a result, the distances calculated may not actually be attained at the project area. The actual distances to the behavioral disturbance thresholds for impact and vibratory pile driving are likely to be shorter than those

calculated due to the irregular contour of the waterfront and the maximum fetch (farthest distance sound waves travel without obstruction [i.e. line of sight]) at the project area. Table 6-3 also depicts the actual areas encompassed by the marine mammal thresholds during the project.

Figures 6-1 and 6-2 depict the areas of each underwater sound threshold that are predicted to occur at the project area due to pile driving for marine mammals during each stage of the project. Note: injury zone for vibratory pile driving is not visible due to the size of the zone (> 1 m) and map scale.

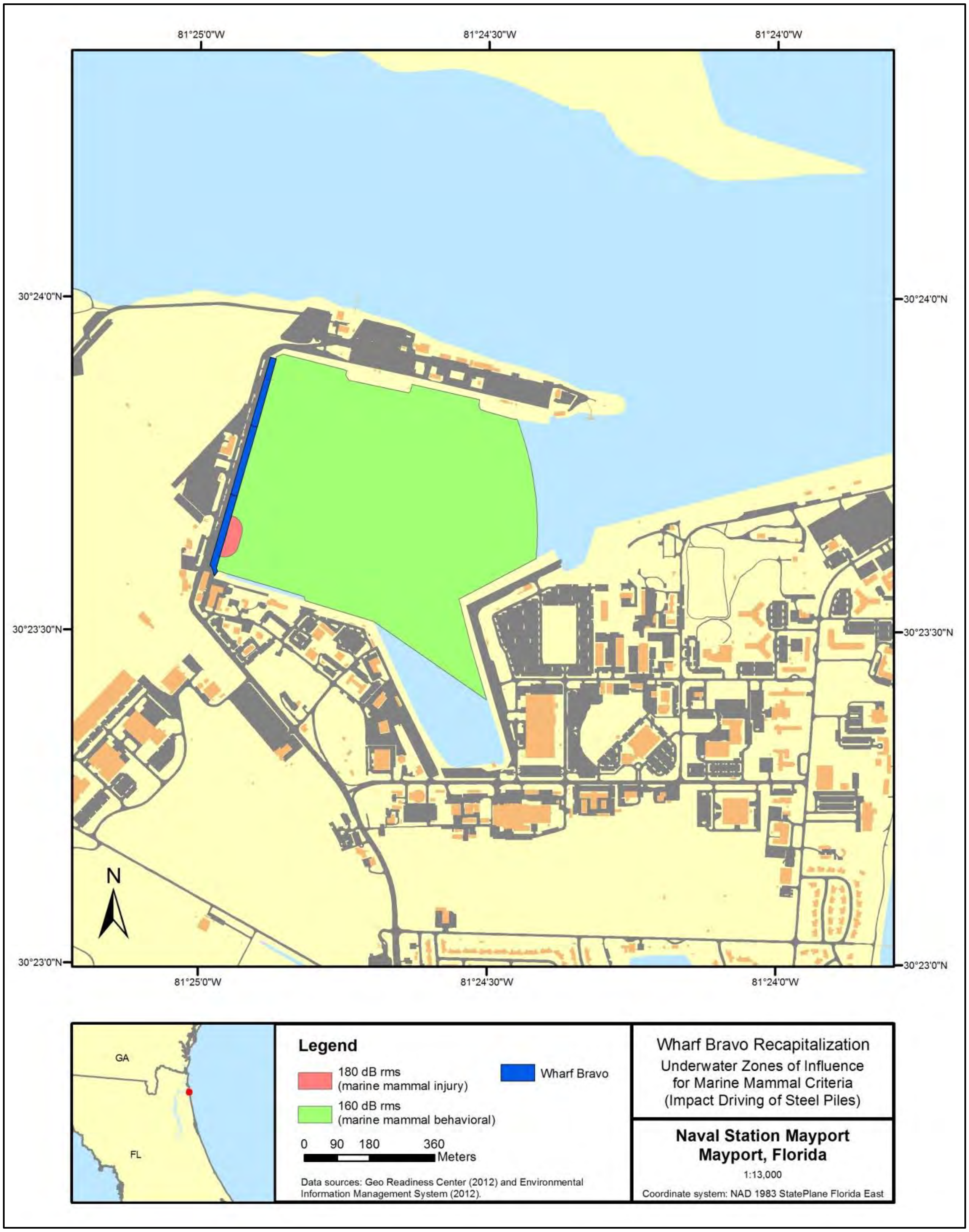
Marine mammal densities were multiplied by the size of the applicable zone of influence to estimate number of incidental takes per day. This number was rounded to the nearest whole number and multiplied by the estimated number of pile-driving days to calculate takes for the entire Project. (see Chapter 5).

FIGURE 6-1. INJURY AND BEHAVIORAL ZONES OF INFLUENCE FOR MARINE MAMMALS[1] - VIBRATORY DRIVING OF STEEL SHEET PILES



[1] Official criteria have not been established for West Indian manatees

FIGURE 6-2. INJURY AND BEHAVIORAL ZONES OF INFLUENCE FOR MARINE MAMMALS[2] - IMPACT DRIVING OF STEEL SHEET PILES (CONTINGENCY ONLY)



[2] Official criteria have not been established for West Indian manatees; marine mammal injury zone of influence illustrated represents a notional pile driving location

7. Impacts to Marine Mammal Species or Stocks

The anticipated impact of the activity upon the species or stock of marine mammals

The effects of pile driving noise on marine mammals depend on several factors, including:

- Type, depth, intensity, and duration of the pile driving sound,
- the species,
- size of the animal and its proximity to the source,
- depth of the water column,
- substrate of the habitat, and
- sound propagation properties of the environment.

Impacts to marine mammals from pile driving activities are expected to result primarily from acoustic pathways. As such, the degree of effect is intrinsically related to the received level and duration of the sound exposure, which are in turn influenced by the distance between the animal and the source. The farther away from the source, the less intense the exposure will be. The substrate and depth of the habitat affect the sound propagation properties of the environment. Shallow environments are typically more structurally complex, which leads to rapid sound attenuation. In addition, substrates that are soft (i.e., sand), such as those in the turning basin, will absorb and attenuate the sound more readily than hard substrates (rock) which may reflect the acoustic wave. Soft porous substrates will also likely require less time to drive the pile, and possibly less forceful equipment, which would ultimately decrease the intensity of the acoustic source to other locations

Potential behavioral disturbances are modeled to occur, but the type and severity of these disturbances are difficult to define due to individual differences in response and limited studies addressing the behavioral effects of sounds on marine mammals. The behavioral responses with greatest potential to occur during the proposed Project are habituation and temporary relocation (Ridgway et al. 1997; Finneran et al. 2003; Wartzok et al. 2003). The time required to drive each pile by vibratory methods would be less than sixty seconds, so the potential behavioral disturbances are anticipated to be discreet and brief.

7.1. Potential Physiological Responses

No Level A exposures are expected because of the mitigation measures outlined in Chapter 11 and the conservative modeling assumptions discussed in Chapter 5, but if they occurred, they would be the result of physiological responses to both the type and strength of the acoustic signature (Viada et al. 2008). The only real potential for Level A exposures would be as a result of impact pile driving, and that method would only be used as a contingency in cases when vibratory driving is insufficient (a similar project that has been completed at adjacent Wharf C-1 required impact pile driving on only seven piles, which required less than two days). Such potential exposures would be mitigated through monitoring, and are not expected to occur.

Physiological responses to impact/impulsive sound stimulation range from non-injurious vibration or compression of tissue to injurious tissue trauma, although mitigations would prevent such occurrences during this Project. The Navy is aware of how important such mitigations are and understands the risks of injury associated with impulsive sounds. Sound-related trauma can be lethal or sub lethal; lethal impacts are those resulting in immediate death or serious debilitation in or near an intense sound source (Ketten 1995). Ears are the most sensitive organ to pressure and are the organs most sensitive to injury (Ketten 2000). Sub lethal damage to the ear from a pressure wave can rupture the tympanum, fracture the ossicles, and damage the cochlea, cause hemorrhage, or cause leakage of cerebrospinal fluid into the middle ear (Ketten 1995). Sub lethal impacts also include hearing loss, which is caused by exposure to perceptible sounds. Moderate injury implies partial hearing loss. Permanent hearing loss (also called permanent threshold shift or PTS) can occur when the hair cells of the ear are damaged by a very loud event, as well as by prolonged exposure to noise. Instances of temporary threshold shifts and/or auditory fatigue are well documented in marine mammal literature as being one of the primary avenues of acoustic impact. Temporary loss of hearing sensitivity has been documented in controlled settings using captive marine mammals exposed to strong sound exposure levels at various frequencies (Ridgway et al. 1997; Kastak et al. 1999; Finneran et al. 2005). While injuries to other sensitive organs are possible, they are less likely since pile driving impacts are almost entirely acoustically mediated, versus explosive sounds which also include a shock wave resulting in damage.

7.2. Potential Behavioral Responses

The intent of the proposed project is to accomplish all pile driving using vibratory pile driving. 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 C-1 required impact pile driving on only seven piles, which required less than two days). The time required to drive each pile by vibratory methods would be less than sixty seconds, so potential behavioral disturbances are anticipated to be discreet and brief.

Studies of marine mammal responses to vibratory pile driving are limited, but suggest the potential for behavioral disturbance can be negligible. Marine mammal monitoring at the Port of Anchorage marine terminal redevelopment project found no response by marine mammals swimming within the threshold distances to noise impacts from construction activities including pile driving (both impact hammer and vibratory driving) (Integrated Concepts & Research Corporation 2009). Background noise levels at this port are typically at 125 dB. Most marine mammals observed during the two lengthy construction seasons - beluga whales, harbor seals, harbor porpoises, and Steller sea lions - were observed in smaller numbers.

Responses to impulsive impact pile driving (if it were to be needed) are expected to be more acute than response to continuous vibratory driving. 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 impulsive 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; also see reviews in Gordon et al. 2004; Wartzok et al. 2003; and Nowacek et al. 2007).

Regardless of the source, potential behavioral responses to sound are highly variable. The magnitude of each potential behavioral change ultimately determines the severity of the response. A number of factors may influence an animal's response to noise, including its previous experience, its auditory sensitivity, its biological and social status (including age and sex), and its behavioral state and activity at the time of exposure.

A comprehensive review of acoustic and behavioral responses to noise exposure by Nowacek et al. (2007) concluded one of the most common responses is displacement. To assess the significance of displacements, it is necessary to know the areas to which the animals relocate, the quality of that habitat, and the duration of the displacement in the event they return to the pre-disturbance area. Short-term displacement may not be of great concern unless the disturbance happens repeatedly; due to the short duration of this project, chronic displacement of bottlenose dolphins is not expected. Similarly, long-term displacement may not be of concern if adequate replacement habitat is available. The affected habitat within the basin is highly developed and experiences a high level of human use and anthropogenic noise from vessels and port activities, making it poor quality for resting, socializing, and foraging. Animals utilizing this habitat are likely already habituated to most anthropogenic disturbances including pile driving, which has been repeatedly conducted in the basin over the last several years. Potential disturbances due to the proposed pile driving are expected to be intermittent and brief, and animals are expected to return to the area when the pile driving is complete.

Marine mammals exposed to pile driving sound over the course of the Project would likely avoid affected areas if they experience noise-related discomfort. As described in the section above, individual responses to pile driving noise are expected to be variable. Some individuals may occupy the Project area during pile driving without apparent discomfort while others may be displaced with undetermined long-term effects. Avoidance of the affected area during pile driving operations would reduce or eliminate the likelihood of injury impacts, but would also reduce access to foraging areas, although whether or not foraging opportunities in the Project area are better than in areas outside the ZOI is not known. Noise-related disturbance may also inhibit some marine mammals from entering / exiting the turning basin. Given the duration of the project there is a potential for displacement of marine mammals from the affected area due to these behavioral disturbances during the in-water work period. However, the time required to drive each pile by vibratory methods would be less than sixty seconds, so potential behavioral disturbances are anticipated to be discreet and brief. Further, since pile driving will only occur during daylight hours, marine mammals transiting the activity area or foraging or resting in the project area at night will not be affected.

Habituation is a response that occurs when an animal's reaction 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. 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. Behavioral state or differences in individual tolerance levels may affect the type of response as well. For example, animals that are resting may show greater behavioral change in response to disturbing noise levels than animals that are highly motivated to remain in an area for feeding (Richardson et al. 1995; National Research Council 2003; Wartzok et al. 2003). Indicators of disturbance may include sudden changes in the

animal's behavior or avoidance of the affected area. A marine mammal may show signs that it is startled by the noise and/or it may swim away from the sound source and avoid the area. Increased surfacing time and temporary cessation of foraging in the project area could indicate disturbance or discomfort in marine mammals.

Effects of pile driving activities will be experienced by individual marine mammals, but will not cause population-level impacts or affect the continued survival of the species because the brief and intermittent nature of pile driving is unlikely to cause long term disruptions to biologically significant behaviors important for survival (e.g. foraging, mating).

7.3. Conclusions Regarding Impacts to Species or Stocks

Individual marine mammals may be exposed to high sound pressure levels during pile removal and installation, which may result in Level B behavioral harassment. Any marine mammals exposed (harassed) may change their normal behavior patterns (i.e., swimming speed, foraging habits, etc.) or be temporarily displaced from the area of construction. Any exposures will likely have only a minor effect on individuals and no effect on their populations. The sound generated from vibratory pile driving is non-impulsive, which is not known to cause injury to marine mammals, and mitigations are in place to ensure injury does not occur. Each discreet vibratory pile driving action is also brief, requiring less than sixty seconds to completely drive a pile. Impact pile driving is anticipated to be seldom used, and only when vibratory driving is insufficient (a similar project that has been completed at adjacent Wharf C-1 required impact pile driving on only seven piles, which required less than two days) and mitigation is expected to prevent adverse physiological underwater impacts to marine mammals from impact pile driving. Nevertheless, potential behavioral disturbances are unavoidable. The expected level of unavoidable exposure (defined as acoustic harassment) is presented in Chapter 6. This level of effect is not anticipated to have any adverse impact to North Atlantic right whales', humpback whales', Atlantic spotted dolphins', or bottlenose dolphins' population recruitment, survival, or recovery (in the case of listed species).

8. Impact on Subsistence Use

The anticipated impact of the activity on the availability of the species or stock of marine mammals for subsistence uses.

Potential marine mammal disturbances resulting from the Project will be limited to populations for which there is no known historic or current subsistence use. Therefore, no impacts on the availability of species or stocks for subsistence use are considered.

9. Impacts to Marine Mammal Habitat and the Likelihood of Restoration

The anticipated impact of the activity upon the habitat of the marine mammal populations, and the likelihood of restoration of the affected habitat.

Activities associated with the Project are expected to result in removal of a small amount of low-quality habitat in the turning basin between the new and existing bulkheads, and disturb sediments, and benthic and forage fish communities, on a temporary, highly localized scale. The turning basin is dredged regularly to allow for deep draft naval ships' berthing; the last dredging took place during the spring of 2015. This, combined with the amount of vessel traffic in the relatively confined space of the turning basin and the transition to the federal navigation channel, has resulted in a determination the Bravo Wharf project area encompasses relatively low quality habitat for most marine species.

Pile installation and deployment of anchors and / or spuds from barges may result in temporary, small scale disturbance of benthic communities and marine vegetation in the immediate vicinity of the project. Benthic organisms may be disturbed, buried or crushed by anchors and / or spuds and removal of piles; this may result in a temporary degradation or loss of isolated foraging habitat for marine mammals. However, sediments and marine vegetation are expected to return to their prior conditions and cover within a short time of the conclusion of the in-water work.

The new surfaces associated with the piles and exposed concrete will likely result in establishment of fouling communities on Bravo Wharf itself, and may attract fish and benthic organisms resulting in very small scale shifts in prey distribution.

Overall, small-scale, temporary changes to habitat and community assemblages in the immediate project area are expected to occur, but natural sedimentation and succession / recruitment will likely return the project footprint to pre-construction conditions within a short amount of time after in-water work is completed.

10. Impacts to Marine Mammals from Loss or Modification of Habitat

The anticipated impact of the loss or modification of the habitat on the marine mammal populations involved.

The Project is not expected to have any habitat-related effects that could cause significant or long-term consequences for individual or populations of marine mammals because of the relatively small footprint and existing disturbed conditions. Further, all impacts will be temporary, with in-water pile driving work being completed in a maximum of 130 days. Information provided in Chapter 9 (Impacts on Marine Mammal Habitat and the Likelihood of Restoration) indicates there may be temporary impacts, but those impacts would be limited to the immediate area within the turning basin. Impacts will cease upon the completion of activities associated with the Project.

11. Means of Affecting the Least Practicable Adverse Impacts – Minimization Measures

The availability and feasibility (economic and technological) of equipment, methods, and manner of conducting such activity or other means of affecting the least practicable adverse impact upon the affected species or stocks, their habitat, and on their availability for subsistence uses, paying particular attention to rookeries, mating grounds, and areas of similar significance.

The Navy shall employ the measures listed in this section to avoid and minimize impacts to marine mammals and their habitats. Best Management Practices (BMPs) are intended to avoid and minimize potential environmental impacts. BMPs and minimization measures are included in the construction contract plans and specifications and must be agreed upon by the contractor prior to any construction activities. Upon signing the contract, it becomes a legal agreement between the contractor and the Navy. Failure to follow the prescribed BMPs and minimization measures is a contract violation.

General Construction Best Management Practices

1. All work shall adhere to performance requirements of the Clean Water Act, Section 404 permit and Section 401 Water Quality Certification. No in-water work shall begin until after issuance of regulatory authorizations.
2. The construction contractor is responsible for preparation of an Environmental Protection Plan. The plan shall be submitted and implemented prior to the commencement of any construction activities and is a binding component of the overall contract. The plan shall identify construction elements and recognize spill sources at the site. The plan shall outline BMPs, responsive actions in the event of a spill or release, and notification and reporting procedures. The plan shall also outline contractor management elements such as personnel responsibilities, project site security, site inspections, and training.
3. No petroleum products, lime, chemicals, or other toxic or harmful materials shall be allowed to enter surface waters.
4. Washwater resulting from washdown of equipment or work areas shall be contained for proper disposal, and shall not be discharged unless authorized.
5. Equipment that enters surface waters shall be maintained to prevent any visible sheen from petroleum products.
6. No oil, fuels, or chemicals shall be discharged to surface waters, or onto land where there is a potential for re-entry into surface waters shall occur. Fuel hoses, oil drums, oil or fuel transfer valves, fittings, etc. shall be checked regularly for leaks, and be maintained and stored properly to prevent spills.
7. No cleaning solvents or chemicals used for tools or equipment cleaning shall be discharged to ground or surface waters.
8. Construction materials shall not be stored where high tides, wave action, or upland runoff could cause materials to enter surface waters.

9. Barge operations shall be restricted to tidal elevations adequate to prevent grounding of a barge.

Pile Removal and Installation Best Management Practices

1. A containment boom surrounding the work area shall be used during creosote-treated pile removal to contain and collect any floating debris and sheen. The boom may be lined with oil-absorbing material to absorb released creosote.
2. Oil-absorbent materials shall be used in the event of a spill if any oil product is observed in the water.
3. All creosote-treated material and associated sediments shall be disposed of in a landfill that meets Florida environmental standards.
4. Removed piles and associated sediments (if any) shall be contained on a barge. If a barge is not utilized, piles and sediments may be stored in a containment area near the construction site.
5. Pilings that break or are already broken below the waterline may be removed by wrapping the piles with a cable or chain and pulling them directly from the sediment with a crane. If this is not possible, they shall be removed with a clamshell bucket. To minimize disturbance to bottom sediments and splintering of piling, the contractor shall use the minimum size bucket required to pull out piling based on pile depth and substrate. The clam shell bucket shall be emptied of piling and debris on a contained barge before it is lowered into the water. If the bucket contains only sediment, the bucket shall remain closed and be lowered to the mud line and opened to redeposit the sediment. In some cases (depending on access, location, etc.), piles may be cut below the mud line and the resulting hole backfilled with clean sediment.
6. Any floating debris generated during installation shall be retrieved. Any debris in a containment boom shall be removed by the end of the work day or when the boom is removed, whichever occurs first. Retrieved debris shall be disposed of at an upland disposal site.
7. Whenever activities that generate sawdust, drill tailings, or wood chips from treated timbers are conducted, tarps or other containment material shall be used to prevent debris from entering the water.
8. If excavation around piles to be replaced is necessary, hand tools or a siphon dredge shall be used to excavate around piles to be replaced.

Timing Restrictions

All in-water construction activities shall occur during daylight hours (one hour post sunrise to one hour prior to sunset[3]). Non in-water construction activities could occur between 6:00 AM and 10:00 PM during any time of the year.

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[3] Sunrise and sunset are to be determined based on the National Oceanic and Atmospheric Administration data which can be found at http://www.srrb.noaa.gov/highlights/sunrise/sunrise.html.

Additional Minimization Measures for Marine Mammals

The following minimization measures shall be implemented during pile driving to avoid marine mammal exposure to Level A injurious noise levels generated from impact pile driving and to reduce to the lowest extent practicable exposure to Level B disturbance noise levels.

Coordination

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

Acoustic Minimization Measures

Vibratory installation shall be used to the extent possible to drive steel piles to minimize higher sound pressure levels associated with impact pile driving.

Soft Start

The objective of a soft-start is to provide a warning and / or give animals in close proximity to pile driving a chance to leave the area prior to an impact driver operating at full capacity; thereby, exposing fewer animals to loud underwater and airborne sounds. A soft start procedure shall be used at the beginning of each day's in-water pile driving or if pile driving has ceased for more than 30 minutes, for impact driving only.

The contractor shall provide an initial set of strikes from the impact hammer at reduced energy, followed by a 30-second waiting period, then two subsequent sets. (The reduced energy of an individual hammer cannot be quantified because they vary by individual drivers. Also, the number of strikes will vary at reduced energy because raising the hammer at less than full power and then releasing it results in the hammer "bouncing" as it strikes the pile resulting in multiple "strikes").

Standard Conditions

Conditions in this section include those that will be followed for the protection of all ESA-listed species, not only those being addressed in this application. The contractor will adhere to all requirements of the following:

- 2011 Standard Manatee Conditions for In-Water Work
- Sea Turtle and Smalltooth Sawfish Construction Conditions
- Southeast Regional Marine Mammal and Sea Turtle Viewing Guidelines

Sea Turtle Lighting Conditions

- Lighting on construction equipment shall be minimized through reduction, shielding, lowering, and appropriate placement to avoid excessive illumination of the nearby marine turtle nesting beach while still being consistent with human safety requirements.

- All permanent exterior lighting fixtures associated with the wharf redevelopment should be assessed by NAVSTA Mayport Environmental Department and designed according to the NAVSTA Mayport Light Management Plan to minimize light contribution to urban sky glow which could be visible from the marine turtle nesting beach.

Visual Monitoring and Shutdown Procedures

A separate Marine Species Monitoring Plan will be submitted to NMFS and USFWS; it includes all details for monitoring. Major components of the monitoring plan are summarized below.

Observers and Procedures

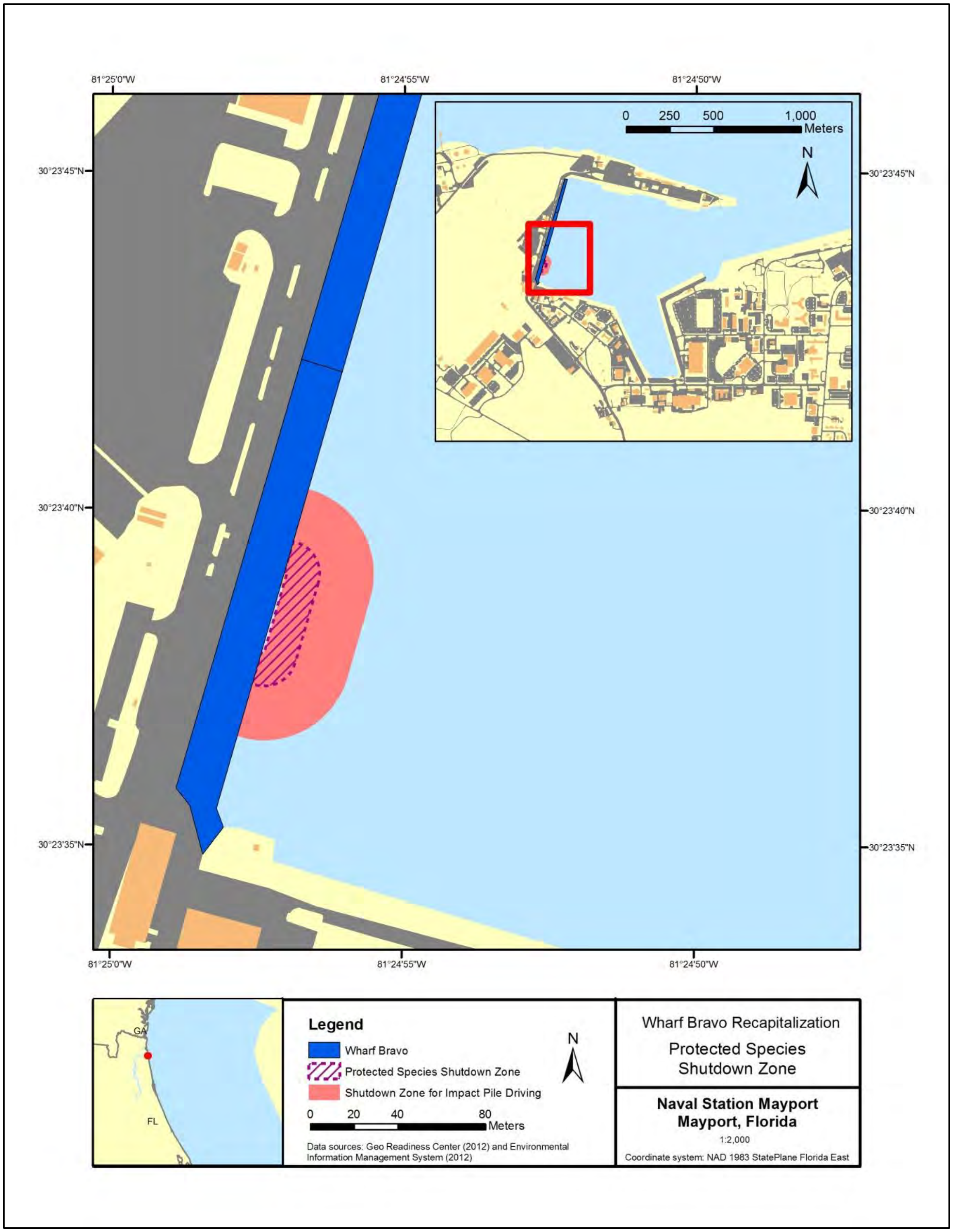
The Navy shall conduct a pre-construction briefing with the contractor. During the briefing, all contractor personnel working in the Project area will watch the Navy's Marine Species Awareness Training video. An informal guide will be included with the Monitoring Plan to aid in identifying species should they be observed in the vicinity of the Project.

Marine species observers ("observers") designated by the contractor will be placed at the best vantage point(s) practicable to monitor for protected species and implement shutdown/delay procedures when applicable by calling for the shutdown to equipment operators. The observers shall have no other construction related tasks while conducting monitoring. Potential locations for two marine mammal observers include the construction barge and elevated building on Naval Station Mayport with a view of the turning basin.

Methods

The observer(s) will monitor the entire shutdown zone (Figure 11-1) before, during, and after pile driving and removal. The shutdown zone for contingency only impact pile driving was calculated based on acoustic modeling at a notional pile location on the wharf. The zone to be monitored is 40 m (132 ft.) in each direction from the pile being driven. However, the shutdown zone for the vast majority of in-water work (i.e. during vibratory pile driving) will be 15 m (50 ft.) from the pile being driven. The observer(s) will have full visibility of the shutdown zone regardless of the type of driving taking place, and will be able to immediately report a marine mammal observation and initiate shutdown procedures.

FIGURE 11-1. SHUTDOWN ZONES FOR VIBRATORY AND (CONTINGENCY ONLY) IMPACT PILE DRIVING



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 species 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 will maintain minimum distances from all species (should they occur) as described in the Southeast Region Marine Mammal and Sea Turtle Viewing Guidelines.

During all observation periods, observers would use binoculars and the naked eye to search continuously for marine mammals and ESA-listed species (with the exception of fish, which are not likely to be visible from the surface). If the shutdown zone is obscured by fog or poor lighting conditions, pile driving will not be initiated, and will cease if already in progress, until the entire shutdown zone is visible.

Pre-Activity Monitoring

The shutdown zone will be monitored for 15 minutes prior to in-water construction/demolition activities. If a protected species is observed in or approaching the shutdown zone, the activity shall be delayed until the animal(s) leaves 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(s) will notify the monitoring coordinator/construction foreman / point of contact (POC) when construction activities can commence.

Activity Monitoring

The shutdown zone will always be a minimum of 15 m (50 ft.) to prevent injury from physical interaction of protected species with construction equipment (Figure 11-1). For contingency impact pile driving, the larger 40 m (132 ft.) shutdown zone (indicated by red polygon in Figure 11-1 for a notional pile location) shall be implemented; the standard shutdown zone will continue to be applied for all other protected species.

If a protected species approaches or 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. Note: protected fish species will not likely be visible to observers at the surface.

Bulkhead sheet pile installation shall be completed only after confirmation that no manatees or marine turtles will be trapped in the area to be filled between the existing and new bulkheads.

Post-Activity Monitoring

Monitoring of the shutdown zone will continue for 30 minutes following the completion of the activity.

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 and sea state

If a protected species approaches or 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 the species
- 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.

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

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 Fougeres, 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).

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. Observers should not handle dead animals.

Reporting

A draft report of any incidents of marine mammals entering the shutdown zone will be forwarded to NMFS / USFWS no later than 31 December 2017. A final report would be prepared and submitted to NMFS within 30 days following receipt of comments on the draft report from NMFS.

12. Minimization of Adverse Effects on Subsistence Use

Where the proposed activity would take place in or near a traditional Arctic subsistence hunting area and/or may affect the availability of a species or stock of marine mammal for Arctic subsistence uses, the applicant must submit either a plan of cooperation or information that identifies what measures have been taken and/or will be taken to minimize any adverse effects on the availability of marine mammals for subsistence uses. A plan must include the following:

(i) A statement that the applicant has notified and provided the affected subsistence community with a draft plan of cooperation;

(ii) A schedule for meeting with the affected subsistence communities to discuss proposed activities and to resolve potential conflicts regarding any aspects of either the operation or the plan of cooperation;

(iii) A description of what measures the applicant has taken an/or will take to ensure that proposed activities will not interfere with subsistence whaling or sealing; and

(iv) What plans the applicant has to continue to meet with the affected communities, both prior to and while conducting activity, to resolve conflicts and to notify the communities of any changes in the operation.

As detailed in Chapter 8, no impacts on the availability of species or stocks for subsistence use are considered. Therefore, no minimization efforts are applicable.

13. Monitoring and Reporting Measures

The suggested means of accomplishing the necessary monitoring and reporting that will result in increased knowledge of the species, the level of taking or impacts on populations of marine mammals that are expected to be present while conducting activities and suggested means of minimizing burdens by coordinating such reporting requirements with other schemes already applicable to persons conducting such activity. Monitoring plans should include a description of the survey techniques that would be used to determine the movement and activity of marine mammals near the activity site(s) including migration and other habitat uses, such as feeding.

A separate Marine Species Monitoring Plan is being submitted to NMFS. It includes all details for Project monitoring efforts.

14. Research

Suggested means of learning of, encouraging, and coordinating research opportunities, plans, and activities relating to reducing such incidental taking and evaluating its effects.

At this time the Navy does not anticipate any specific research conducted in conjunction with the Project.

The Navy strives to be a world leader in marine species research and has provided more than $100 million over the past five years to universities, research institutions, federal laboratories, private companies, and independent researchers around the world to increase the understanding of marine species physiology and behavior with several projects ongoing in Washington.

The Navy sponsors 70 percent of all U.S. research concerning the effects of human-generated sound on marine mammals and 50 percent of such research conducted worldwide. Major topics of Navy-supported research include the following:

- Gaining a better understanding of marine species distribution and important habitat areas
- Developing methods to detect and monitor marine species before and during training
- Understanding the effects of sound on marine mammals
- Developing tools to model and estimate potential effects of sound

The Navy has sponsored several workshops to evaluate the current state of knowledge and potential for future acoustic monitoring of marine mammals. The workshops brought together acoustic experts and marine biologists from the Navy and outside research organizations to present data and information on current acoustic monitoring research efforts and to evaluate the potential for incorporating similar technology and methods into Navy activities. The Navy supports research efforts on acoustic monitoring and will continue to investigate the feasibility of passive acoustics as a potential monitoring tool. Overall, the Navy will continue to research and contribute to university/external research to improve the state of the science regarding marine species biology and acoustic effects. These efforts include monitoring programs, data sharing with NMFS from research and development efforts, and future research as previously described.

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